THE

INDIAN FORESTER,

A MONTHLY MAGAZINE

OF

FORESTRY,

AGRICULTURE, SHIKAR & TRAVEL.

EDITED BY

J. W. OLIVER,

CONSERVATOR OF FORESTS, AND DIRECTOR OF THE FOREST SCHOOL, DEHRA DUN.

VOL. XXVII. (1901).

Allahabad:
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Forestry at the Paris Exhibition of 1900.

By J. S. Gamble, C.I.E., F.R.S., &c.

On the left bank of the Seine, just below the Pont d'Jéna, stands a fine building, chiefly of iron, wood and glass, adorned on its façade by scenes of forest and hunting life, either in frescoes or in groups of plaster statuary. Its lower floor is on the level of the quay, its first floor on the level of the bridge and the gardens of the Champ de Mars, while its galleries look out over the river and over the sunken road of the Quai d'Orsay. It has two angular red-tiled towers, somewhat recalling inverted flower pots, but is a fine and picturesque building on the whole. This is the "Palais des Forêts, de la Chasse, Pêche et Cueillettes," and is the home of most of the exhibition of objects which belong to classes 49 to 54 of the Exhibition Catalogue. The collections illustrating the fisheries of France and several other nations will be found very interesting, as well the exhibits of fire-arms, most especially remarkable among which is the collection of guns and other arms of various periods sent by the Emperor of Russia, in which may be seen the beautiful specimens of chased and ornamented weapons presented at various times to members of the Imperial Russian Court by the first Napoleon, the French Government and the city of Paris. Most of the chief English gunmakers have exhibits in this court. But what is of most interest to foresters is the series of exhibits shown by France, Russia, Austria, Hungary, the United States, Canada, Japan, Roumania, Sweden and some other countries, illustrating forest work and forest products. Indeed, most of the forest collections are here brought together, and it is only for a few that we have to go to other courts. Western Australia, India and Ceylon have each their collections in their own courts, so have Russian Siberia, Italy, Norway, Finland, Servia and Portugal, while the collections of the

French colonies are found in the different small houses in the Trocadero Gardens, in which are displayed the special exhibits of each.

2. The arrangement of forest exhibits has been determined by the classes appointed in the official catalogue. These are:—

Class 49. *Material and methods of exploitation and forest industries.*—Collections of seeds, plants, and specimens of indigenous and exotic forest species. Tools used in the collection and drying of seed, in nurseries, in forest works. Methods of nursery cultivation. Working-plans and methods of forest culture. Forest topography. Forest works, houses of the staff, saw-mill, systems of extraction and transport. Restoration of denuded slopes, fixation of dunes, etc.

Class 50. *Products of forest exploitation and forest industries.*—Specimens of forest produce. Timber and firewood, scantlings, cooperage wood, split wood, dye woods. Cork, textile barks, tanning, resinous and perfume-yielding products. Forest mines, industries, cork, charcoal, wood-wool, etc.

Class 54. *Appliances, implements and products of the collection of forest produce.*—Plants, roots, barks, leaves, fruits used in medicine, dyeing, paper-making, for oil, etc., etc. Caoutchouc, gutta-percha, gums and resins.

Classes 51 to 53 apply only to hunting and fishing.

Thus it will be seen that Class 49 is the class in which scientific forestry in general is represented; Class 50 deals with timber and timber works, and the large forest industries; while Class 54 deals with the various minor forest industries and the important minor products. The above classification is translated "very freely" from the French, but gives a better general notion of the real arrangement than does the translation printed in the Catalogue of the Royal Commission. It is perhaps a little unfortunate that, for jury purposes and for awards, the classification is somewhat difficult to follow. It is not fully clear at first sight whether timber specimens belong to Class 49 or to Class 50; but the answer is, if one thinks it over, that those specimens which illustrate trees, their size, growth and characters of wood, belong to Class 49, while those which are exhibited to show industrial value, capability for receiving polish, for use for special purposes as timber or furniture wood, and so on, belong to Class 50. The present paper is due to the facilities which I was afforded as a member of the jury of Class 49, for visiting and inspecting the different collections in that class.

30. The forest collections of *France* are all in the Forest Palace. They consist of a fine collection of wood specimens belonging to the Forest School at Nancy, with the addition of new specimens to represent species before imperfectly shown; of an admirable collection of fruits, cones and seeds of fruit trees; of a rich series illustrating the small forest industries and containing such articles as sticks, toys, sabots, baskets, agricultural implements,

pipes, bobbins, shuttles, fans, bellows, brooms, musical instruments and many others; a collection of the books published by the Government or written by Forest Officers; various fine pictures and photographs of the "reboisement" works, with two dioramic views showing the torrent of "La Grollay" in Savoy on one side at the commencement of work, and on the other ten years after the works undertaken for the stoppage of the torrent had been completed; working-plans and their results; models and pictures of forest houses, saw-mills, wire-tramways, and so on; and photographs and maps illustrating the splendid work done in the correction of the dunes on the coast of Gascony.

I was especially interested in the pictures of a forest-road called the Route de Combe de Laval in the Department of the Drôme, constructed in order to allow of the easy extraction of the timber and forest produce of the Forêt de Leute situated on the top of a plateau with precipitous slopes. The road reminded me of some of the Himalayan and South Indian hill roads, and notably of that from Kalsi to Chakrata. The project was, so M. Thil, the Inspector of Forests who is in charge of the Forest Exhibition, told me, made by M. Brive, and the work was carried out by M. de Rouville, both Forest Inspectors. The length was over 6 kilometres and the cost 171,788 francs. Much of the work was simply tunnelling or deep cutting in solid Jurassic limestone. A working model of a wire-tramway with endless wire working round horizontal or inclined drums at either end was also of interest. M. Thil was good enough to show me many books, working-plans, and other objects of much importance, and to explain the forest maps and the beautiful series of water-colour sketches, coloured and uncoloured photographs and maps illustrating forest work. The exhibition of the French Forest Department is ornamented by living specimens of young trees in fine growth contributed by the Forest School of "Les Barres," and by fine well-stuffed and life-like forest birds and animals, among which the "sanglier" is naturally conspicuous.

Among private exhibits, first and foremost perhaps are the portable tramways of Decauville & Co., whose chief agent, M. Schlüssel, was most kind, and as a fellow-member of the jury of Class 49, ready to afford information and explanations on all matters connected with forest transport. Forest saw-mills were exhibited, in full working, by M. Jametel of 41, Cours de Vincennes, Paris, and MM. Guilliet et fils of Auxerre, and I was interested to notice the vertical saw used, having the M teeth in the centre straight, and those above and below turned down and up respectively. Forest tools, guards' hammers and axes, saws, notably a very good portable band-saw, were exhibited by M. Emile Aubry of 131, Rue Vieille-du-Temple, Paris. M. Demorlaine, Garde General at Compiegne, exhibits an ingenious little machine for measuring the depth of the cuts (quarres) made for the tapping of *Pinus maritima* for the extraction of resin. As might be expected, the

well-known firm of Vilmorin-Andrieux et Cie have a magnificent exhibit of living specimens of forest trees, besides a very complete collection of fruits, cones and seeds. Finally the Forest Society of Franche-Comté, probably the chief and most energetic of the forest societies in the Provinces of France, shows maps of the forests of Levier and La Joux in the Jura, their own publications, and an ingenious "compas euregistreur," a caliper furnished with a small apparatus of two wheels, one of which unrolls a tape which is rolled on the other, and registers the diameters of the trees measured. Such an instrument ought to be very useful, perhaps not alone, but as a check on the note-books of the keepers of the records in a valuation survey.

Outside the Forest Palace may be seen some remarkable pieces of oak in log; a huge walnut stem, which ought to give an immense quantity of the best veneers; and two silver firs, one cut into a big beam, the other into planking. They were trees of 100 to 130 feet high and 2½ to 3½ feet in diameter. These firs are exhibited by M. Bouvet, Conseiller General, to show the size that the silver fir is capable of attaining in the Jura, and to prove that the local dealers are capable of cutting timber of the largest size the market is able to take.

The exhibits in Class 50 are numerous and very interesting to dealers and furniture-makers, less so to Forest Officers, but the beautiful specimens of valuable exotic woods, burrs and root pieces are worthy of notice. Among the exotic woods I saw teak, padauk, blackwood, satinwood and a wood that looked very like *Gluta travancorica*. The teak was a rather poor and very light-coloured specimen; it may perhaps have not been true teak, but one of the woods from W. Africa or Madagascar which dealers call African or other teak, but which come from trees in no way related to the *Tectona grandis* of India and Indo-China.

The official catalogue gives a brief but interesting account of the French Forest Service, which contains a considerable amount of valuable statistics and information, with a description of the chief systems of working, both in the Government and the Communal forests, and of the works undertaken for the "reboisement" of denuded hill lands and the fixation of dunes. A useful little work, copies of which were presented to the members of the Jury of Class 49, is the "Agenda du Forestier" or Forester's pocket-book published for the Forest Society of Franche-Comté by M. Paul Jacquin of Besançon. From it we gather the following statistics:—

	Sq. miles.
Area of Government Forest	4,205
Area of Communal Forest	7,404
Total ...	11,609

Of the Government Forest area, 2·5 per cent. is worked in simple coppice, 29·2 per cent. in coppice under standards, 16·8

per cent. in coppice under conversion, and 51·5 per cent. in high forest. In the Communal Forests, 68 per cent. is worked in coppice and 31 per cent. in high forest. The area of private forest is about 24,000 square miles, so that the total wooded area comes to nearly 36,000 square miles. The outturn in timber of the Government Forests comes to about 268 million cubic feet, of which about two-thirds is firewood. All produce is sold standing in the forest and removed by the purchaser.

The staff of the Forest Department consists of 1 Inspector-General, 3 Administrators, 32 Conservators, 200 Inspectors, 215 Assistant Inspectors, 250 "Gardes Généraux" and 3,500 "Brigadiers" and Forest Guards. The revenue comes to about £1,227,000, and the expenditure to about £560,000 yearly.

A most important part of the forest work in France is the re-clothing of denuded mountain tracts. In this work, in which such splendid success has been attained and of which the French Forest Officers are naturally very proud, the Government has spent over 2½ million pounds sterling partly in the acquisition of land, partly in works of restoration, and over 630 square miles have been thus reclaimed. Many important books and pamphlets were distributed, with great liberality, to the members of the Jury and to the Forest Congress. Among these are M. Mélard's valuable paper, often quoted herein, on the insufficient production of timber of construction in the world; the account of the forest of Fontainebleau by M. Reuss, and M. Prouvé's paper on regeneration by plantation. Then there are two important papers on the reclamation of dunes by Messrs. Delassasseigne and Lafond, and a splendid and most interesting series of works on "reboisement" by Messrs. de Gorsse, Buisson, Champsaur, Kuss, Campagne, Mougin, Bernard, Dellon, Calas, Banby and M. Bernard, some having plates of great interest, and all discussing important questions.

4. The forest exhibits of the *French Colonies* are also interesting. Chief among them naturally comes *Algeria*, whose exhibit is in their own building at the bottom of the Trocadero Gardens between the main central avenue and the British Indian and Canadian pavilions. In examining the exhibits, one's attention is at once drawn to excellent maps showing the extent of the forests of all categories, and a collection of photographs of the forests of the cork oak. The products of the working of the cork oak forest are shown by fine specimens of cork and sections of the tree in all stages. The Atlas Cedar is represented by a magnificent round, and the appearance and scent of the wood exactly recall those of the deodar of the Himalaya. Alfa grass and the alfa industry are well represented, as is also the "crin végétal," or vegetable hair, which is produced by the leaves of the palm *Chamærops humilis*. Cups and vases, boxes and plates illustrate the beautiful marking of the root wood of the thuja (*Callitris quadrivalvis*), the result of frequent forest fires and the consequent

production of a multitude of root shoots. The forests of Algeria cover an extent of about 9,000 square miles, most of which is Government Forest. There are 3 Conservators, 17 Inspectors, 19 Assistant Inspectors, 31 "Gardes Généraux," and 860 Brigadiers and Forest Guards. The revenue comes to about £95,000 and the expenditure to about £124,000 yearly; the deficit being presumably covered by the surplus of the Forest Administration in France.

5. The *Tunis* section adjoins that of Algeria, and in a kind of miniature Arab town, are brought together exhibits illustrating the progress of the protectorate. In the forest section a good map shows the distribution of the forests, but, as in Algeria, the chief exhibits are those of cork furnished by the oaks (*Quercus Suber* and *Quercus Mirbeckii*) known to the French as "chêne-liège" and chêne-zéen." The Government possesses 317 square miles of cork oak forest, all under management and yielding an annual revenue of £24,000. The cork oak gives chiefly cork and tanning bark, and the zéen provides wood for construction purposes. An interesting exhibit is a relief map of the oasis of Nefta, where important works are being carried on to stop the damage done by drifting sand. There is also a collection of forest seeds.

6. The *Ivory Coast* Colony, adjoining the British Colony of the Gold Coast, has a small forest exhibit chiefly of wood specimens. The chief forest products of the colony consist of palm oil and nuts, india-rubber and mahogany; the latter, however, is not the same tree as that of the West Indies, but another species, indeed, belonging to some other family, whose identification does not seem to be yet certain. It is, however, a handsome wood and makes pretty furniture.

7. *Senegal* also sends a forest exhibit with maps of the country showing the localities where the chief trees are found, sections of wood, botanical specimens, and a manuscript list of the principal trees from which I gather that one of the most important is the Gum Arabic (*Acacia Senegalensis*). The other trees are, many of them, of genera well-known in India. Thus one of the chief furniture woods is yielded by *Afzelia africana*, a blackwood by *Dalbergia Melanoxylon*, a red cedar by *Cedrela odorata*, a good timber by *Terminalia macroptera*, while the *Borassus* palm appears to be as useful as it is in India. The numerons species of *acacia* seem to indicate a dry climate, though M. Schlüssel, who knew the colony well, told me that it is by no means all dry, but that in parts the forests were fine, and possessed large timber and a moist climate.

8. *Madagascar* exhibits an interesting collection of woods, carefully made and well-labelled, among which we noticed some fine ebony, blackwood and woods resembling those of the Indian *Mimusops* and *Chikrassia*. The whole exhibit is the work of a French Assistant Inspector, M. Girod-Genest, whose indefatigable

energy is shown by an album of coloured drawings of Malagasy trees, done by himself and accompanied by valuable notes on their uses and methods of growth. Considering the importance of the forest resources of Madagascar, it is astonishing to find that the representative of the Government in charge of the department is only an Assistant Inspector on the same rate of pay as he would be receiving in France. It is therefore all the more to his credit that he has been able to do so much.

9. The last of the French colonies represented, in a forest point of view, is *Indo-China*, the vast region adjoining the British dependency of Burma, which consists of the states of Cambodia, Anam, Cochin-China and Tonkin. Here, too, as in Madagascar, the Forest Officer is only an Assistant Inspector, M. Boude, but he has succeeded in bringing together a really valuable and important collection of timbers of the greatest interest. Fine pieces of teak from the Laos States, great rounds of a *Dalbergia*, a *Lagerströmia* with cork bands in the wood such as are seen in the Indian *Dalbergia paniculata*, and some *Menispennaceæ* and *Capparideæ* were those that chiefly attracted my attention. The officer in charge, M. Viterbo, from Hanoi, was most kind in explaining his Exhibition, and showed me also the admirable plates in the splendid "Flore Forestière de la Cochinchine," at which the veteran botanist M. Pierre is now working in Paris.

10. The forest exhibits of *Italy* are shown in the gallery of the splendid and highly ornamented Italian pavilion in the Avenue des Nations, the first met with on the left bank of the Seine, below the Pont des Invalides. Most important, perhaps, were the working-plan books and records, and the fine photographs of "reboisement" works in the Italian Alps. Among these I was specially interested in two, which represented the slopes at Sambuta, the first taken in 1889, and showing a very unfavorable looking locality; the second in 1899 showing the same with stone revetments in the lower valley and wattled barriers in the upper, and a fine set of young trees growing up, evidently bidding fair before long to convert the hillside into a useful forest. The collection of wood specimens was chiefly of young trees or branches cut longitudinally, and the two sections then hinged together. For the larger trees, these specimens were insufficient, but of the smaller trees and shrubs some were very fine and comparatively large. The flowers and fruit of the forest trees of Italy were represented by branches in spirit, and the seeds of the trees were shown in reversed bottles. There were also interesting collections of insects and fungi of importance in forest economy, as well as in agriculture. There were no private exhibitors in Class 49, but in the Engineering Section in the Champ de Mars is an exhibit of considerable interest showing the use of wire-netting in the protection of river banks, bridge piers and groynes, and in the works for the settlement of torrents. The netting is used instead of wattles for fascines, and has met with considerable success. The patentee of the system

is Giulio Serrazanetti of Bologna, whose interesting book on the subject was distributed to members of the Jury.

Italy possesses only about 15,800 square miles of forests, about 14 per cent. of her area, and these forests are of poor production only, so that the imports exceed in value the exports by a large sum.

11. *Spain* has no forest exhibition, and *Portugal* is represented but poorly in a small show in their National Pavilion. The chief exhibit was one of cork and objects illustrating the cork industry. There was a herbarium of plants and a collection of insects poorly named, as well as a set of wood specimens, shown by means of radial wedges mounted on wooden stands. But the most interesting part of the exhibit was in the picture of dunes and the photographs and maps illustrating the works undertaken to prevent their extension.

In the Portuguese Colonial Pavilion in the Trocadero Gardens are small forest exhibits from Timor and St. Thomé with some fine rounds of the woods of importance in those colonies. The forest area of Spain is about 25,000 square miles, being about 13 per cent. of its territory. That of Portugal is under 2,000 square miles. In both the imports of wood largely exceed the exports.

12. The forests of *Germany* are not represented in the Exhibition, but the Prussian Ministry of Public Works has a fine exhibit in the Champ de Mars, illustrating the works undertaken on the Northern Coast for the stoppage of the dunes and their re-clothing with forest. The works are illustrated by plaster models painted by H. Walger of Berlin and represent the "Kurische Nehrung," the narrow sandy belt between the sea and the Kurische Haff near Memel, in the extreme north-east corner of East Prussia. Works for the protection of the villages and cultivation on the Prussian coast from being damaged if not destroyed by shifting sands have been undertaken in many places on the coast of Germany, both on the North Sea and on the Baltic. Those of the North Sea have been completed, as have those of Mecklenburg and most of those in Pomerania, and it is only now in the extreme north-east that work still remains to be done. So far as I can gather from the official papers on the subject and from the models and photographs exhibited, there is very little difference in the system employed from that of the better-known regions of the French coasts of the Bay of Biscay, except that whereas on the French Coast it is the pinuster (*Pinus maritima*), which is chiefly employed, on that of Prussia the most important species is the Scots pine (*Pinus sylvestris*) aided, especially in a belt along the seashore by the *Pinus montana*. Great use is made of broken branches strewn over the ground among the young pines and in suitable places sea-grass or "gourbet" (*Ammophila*) is planted. A sum of about £4,000 yearly is spent on such works. In addition to the models, a fine collection of photographs is exhibited, as well as herbaria of

the plants commonly found on the coast sands, on well-prepared carefully mounted sheets. The jury were received and shown all these exhibits by Herr Bock, Inspector of Forests at Königsberg, who was most courteous and obliging. Germany possesses a forest area of about 54,000 square miles, about 26 per cent. of her area; but her imports of wood still very largely exceed her exports.

13. *Belgium*, *Holland* and *Switzerland* have no forest exhibits, nor has *Denmark*, at any rate in Class 49. The areas of forest in these countries are, approximately, as follows:—

Belgium	sq. m. 1,950	or	17	per cent.	of her territory.
Holland	„ 960	„	7½	„	„
Switzerland	„ 3,250	„	20	„	„
Denmark	„ 930	„	6⅓	„	„

in all, the imports of timber largely exceed the exports.

14. I now come to the magnificent forest exhibition sent from *Austria* and shown in several bays of the Forest Palace. Taken all round, it is probably the most complete of the non-French collections, though it is really difficult to say if it is really better than the fine exhibits of Hungary and Russia. Its chief advantage, however, over these latter, lies in its being all considered as one collection, while in the others several separate collections are shown, which perhaps, especially in the case of Hungary, make a better general show. In inspecting the Austrian collections the jury of Class 49 had the assistance of one of their members, Herr Ferdinand Wang, Conservator of Forests at Vienna, who was most kind and obliging, as was also Dr. M. O. Popper, Director of Domains, a member of the jury of Class 50.

The first thing to be examined was the beautiful forest map of Austria, which includes Bohemia and Moravia, on which can be seen at a glance the distribution of forest and the zones occupied by the chief classes of tree, firs, pines, oaks, etc.; also the administrative forest areas. Then we have a fine series of photographs, acting as object-lessons in sylviculture, all of them of importance, and most carefully selected. Various specimens of working-plans lie on a table accompanied by their maps and control-books, and illustrate the pains taken in Austria not only to ensure a proper management of the forest areas, but also to record and register information of value connected with them.

Timber-transport is illustrated by models, photographs and transparencies. "Reboisement" works are shown by tabular statements, maps, plans, models and photographs, mostly referring to the Tyrol and Salzburg. From a carefully prepared table, I gathered that the area so far treated amounts to 250 square miles and the money expended to nearly £100,000.

A very important exhibit is that of the experimental stations, the chief of which is the one at Mariabrünn near Vienna, which is probably the best equipped forest experimental

station in the world. There are others scattered all over the Empire, as may be seen from a map which illustrates them; and the chief subjects they consider are (1) cultivation of forest trees, (2) thinnings and cleanings, (3) production of material. While mentioning experiments, I may as well allude to a working model of a machine for testing woods which interested me very much. It is a very simple machine designed by Herr Friedrick of Mariabrünn, and made by the well-known firm of J. Amsler, Laffon and Son of Schaffhausen in Switzerland. It is worked by a small hydraulic press, which enables the weights to be gradually increased, and the increase to be accurately measured, and even the model which hardly stands more than 3 or 4 feet high can be made to test bars of a square inch in section for transverse strength or cubes of 1 inch for resistance to crushing weight. There ought to be a machine of this description in India attached to the Forest School at Dehra. Forest houses are illustrated by pictures which give the types on which the houses provided for the staff from the rank of Inspector down to that of Forest Guard, are built, and compare those built at the present day with the much less convenient houses of the past.

In frames on the wall is seen a series of specimens to illustrate the effects of judicious thinning, and some of the fine transparencies are also devoted to this subject. Other tabular frames show the effects of the smoke of factories on forest trees; while on shields are displayed the beautiful collections of forest tools and implements.

It would take long to describe in detail all the interesting forest exhibits of the Austrian section; in addition to what we have mentioned there are collections of seeds in reversed bottles (probably the best system yet discovered of exhibiting seeds as well as gums and other small articles of produce); specimens of wood sections; complete exhibits to illustrate the manufacture of wood-wool and paper pulp; and (most important) a full account with specimens to illustrate the distillation of wood and the manufacture from it of acetic acid, methylated spirit, creosote and other important chemical products. I regret that I had not sufficient time fully to examine and note about the fine collection under Class 50, chiefly the work of Dr. Popper.

The forest area in Austria is about 37,500 square miles or 30 per cent. of the area of the Empire, and the yearly production of wood reaches about a thousand million cubic feet. There is a considerable excess of exports over imports of wood, Austria being one of the few European countries in which this is the case. By the kindness of the Austrian Government, a number of valuable papers on forest subjects were distributed free to members of the Forest Congress and to members of the Juries. Some of the most important are the following:—

(1) The restoration of forest in the Karst on the coasts of Austria and Illyria, by Josef Pucich, Conservator at Trieste.

(2) The Home industries of wood in Austria, by Professor Lauboeck.

(3) The question of the beech in the Austrian forests, by Leopold Hufnagl.

(4) The disadvantageous influence of bad treatment on the future of forest growths, by Hermann Reuss, Director of the Forest School of Weisskirchen in Moravia.

(5) The study of the effects of damage to the bark of spruce trees produced by large game, by the same.

(6) Forest Police in Austria.

(7) The regulation of torrents in Austria.

(8) Guide to the Government Forests and those of public establishments in Austria.

The latter work gives a very interesting account of the Forest Department in the Empire. As before stated, the area of forest amounts to about 37,500 square miles, but of this only 5,868 are the property of Government or of public establishments. Of the forest area, 51 per cent. is spruce, 18 per cent. silver fir, 20½ per cent. beech or hornbean, 4 per cent. larch, 3 per cent. pine, only 1·3 per cent. oak. The staff consists of one Ministerial Councillor, 9 Conservators, 109 Inspectors, 254 other officers, and 1,301 Forest Guards. The annual receipts come to rather more than £600,000 and the expenditure to about £478,000, but if full account is taken of the cost of direction on the one hand and the value of free grants on the other, the *net* revenue comes to nearly £175,000 which calculates out to about 1*s.* 3*d.* per acre.

15. The exhibits of *Hungary* compete, in extent and value, with those of her partner in the dual Monarchy. But they are split up among several exhibitors instead of being grouped together, and in any case *Croatia* and *Slavonia* forms a separate section. The Hungarian Forest Section, like that of Austria, occupies a considerable length on both sides of the building at the back of the Pavilion "des Forêts et de la Chasse" with the main path for sightseers passing down the centre. There is also an annexe in a chalet behind. On one side is a dioramic hunting scene with the animals of the Hungarian forests, some of them very cleverly set up and shown in life-like attitudes. The king exhibits wild boar heads, the Archduke Joseph Augustus 100 heads of roedeer, and other noblemen and sportsmen of Hungary exhibit fine trophies, with collections of guns from the most ancient old matchlock to the latest breechloader. The jury of Class 49 were again fortunate in having, as one of their members, the Officer in charge of the forest collections, who was most kind and most anxious to show us everything he could. This was Herr Jean Földi, Conservator of Forests at Buda-Pesth, to whom the arrangement of the splendid Hungarian forest collection had evidently been a labour of love. I do not propose to follow in the few remarks I have to make, the classification adopted for Jury purposes; all I can expect to be able to do is to indicate

the chief exhibits which interested me, and those to which a visitor might most satisfactorily devote his attention.

The most conspicuous object on entering the section, and the one which any visitor must first study, is a magnificent relief map of Hungary showing the forests. These relief maps are made by cutting out the contours on the staff map of the country and arranging them at the proper height one above the other. The "steps" between the contours can then be filled in, and the result is a relief map which only requires painting and printing to be ready for use. But the work is one requiring great care and taking much time, and the makers of the big Hungarian map, Messrs. Gregersen, Vaitzik and Terfi, deserve the greatest credit for the success of their work. There are other good maps also and many fine photographs.

The exhibition of working-plan books and maps, tables or production and analysis of typical trees, is one of considerable interest, as are the books containing historical descriptions of the forests. The volumes published by the Forest Society must be full of interest to those who read Hungarian. The damage done in Europe of late years by the "Nun" moth (*Liparis Monacha*) is well known, but it is not so well known that the results of using mineral tar to cover the holes of the trees for a certain distance and keep the caterpillars off, have often been a serious damage to the wood. An exhibit of sections shows how the parts covered with tar have got covered over and caused holes and bad places to be made. The damage is greater in broad-leaved trees than in conifers, and it is probable that if a vegetable tar is used the damage will be less.

There is a very fine collection of models, some of large size, illustrating forest fellings and extraction, works of re-clothing denuded areas, saw-mills, water-sluices, forest houses, etc. The finest of these models were prepared by Herr Charles Kaán, Forest Officer of Beszterczebánya. Another noticeable model is that exhibited by Herr A. Masztics of Liptó-Ujvár, representing a seed-drying house of a new and perfected design. The "sécherie" produces 6,000 kilos of seed yearly, and gives a yearly revenue of about £1,000. Another fine model is Herr G. Marton's model of "reboisement" work in the region of the Karst.

The Royal Forest School of Selmeczbánya (Chemnitz) exhibits specimens of the drawings done by the students; models of saw-mills, forest houses, seed factories, and works for the utilization of oak; plans and photographs of the school with maps and working-plans of the forests attached to it; books and instruments used in teaching; collections of insects, gall nuts, medicinal plants and the diseases of trees. The importance of this Forest School will be understood when it is known that in the eight years, 1881 to 1898, 1,306 students appeared for the final examinations, of whom 1,031 passed and received diplomas. There are also four secondary

schools and a separate school in Croatia-Slavonia. An account of the schools given in Colonel Bailey's paper on "Forestry in Hungary," published by the Royal Scottish Arboricultural Society in 1887, in which work is also given an excellent description of the Hungarian forests and an account of a tour made through them. It is at Selmeczbánya also that is situated the central experimental station whose publications form an exhibit and who also show a fine collection of the diseases of plants caused by parasitic fungi, which are excellently prepared.

Among noticeable exhibits is an excellent apparatus for sowing small seeds in nurseries exhibited by the Director of the Royal Forest School, Herr Louis Fekete. Another seed-sower, this time for large seeds, such as acorns and beech-mast, is exhibited by Jean Lotos, a forest guard. It is a plough with a share to open the drill, then behind it comes the arrangement for sowing the seeds, and this is followed by a reversed share which closes the furrow. Another useful instrument is a sowing stick, exhibited by Herr A. Gábor, which is used for dibbling large seeds like acorns in vacant spots in the forests.

I was much interested in an important series of photographs showing the growth of planted oak forest at intervals of 10 years from the sowing of the seed to its fitness for felling at 100 years of age. This is accompanied by a table of the production of oak and the working-plan of the Forest of Balincz, made by Herr Attila Párnai. I was also struck by the value of a new forest compass "Système Csiby" which combines a theodolite, compass, and plane table. It seems to me an improvement even on the excellent instrument in use in France and which we employed at Nancy. I was told that its cost was 360 francs. It would probably be well suited for forest survey work in India.

To enumerate all the many interesting things in the Hungarian exhibition would be impossible, and it is sufficient to add that the collection of wood specimens and specimens to illustrate forest industries, and especially the cutting of veneers, is very complete.

The collection of Croatia-Slavonia occupies a corner and also the chief part of the chalet outside the Forest Palace. The Forest School of Zagráb exhibits a collection of oaks and their acorns, and a set of the tools used in forest work in the great oak forests of the province. The Forest Association exhibits their publications, with a fine map, photographs, collections of wood-sections and manufactured articles. The chief species of tree are the oak and beech, the forests of which occupy about 29 and 60 per cent. respectively of the forest area, leaving only 11 per cent. for conifers. The oaks are sometimes of very large size as may be seen from the splendid specimens of which the chalet is constructed. One of these was about 42 feet long, 50 inches in diameter in the middle, and had a content of about 570 cubic feet. It was about 300 years old, and there were several others nearly as big used as supports for the

building. One specimen had about 10 feet diameter. The size and straightness of the Slavonian oak timber was most striking.

The area of forest in Hungary comes to about 29,000 square miles, that in Croatia-Slavonia 5,800 square miles, total 34,800 square miles, making about 28 per cent. of the area of the kingdom. Of the Hungarian area, 4,400 square miles belong to the Government. The beautiful relief maps already referred to show the distribution of species very well, firs on the mountains, oak along their bases, beach on the slopes. The oak forests constitute 28 per cent., the beech 51 per cent., and the remaining 21 per cent. only are conifers. The usual rotation of high forest is 100 years, and every endeavour is being made to replace the beech, which is of small value, by oak and other more valuable kinds. I have not been able to find the revenue and expenditure of recent years, but Colonel Bailey gives it for 1885 as revenue £500,000, expenditure £332,000, surplus £168,000. It is now probably considerably more. As is the case for Austria, so in Hungary, the exports of timber largely exceed the imports. M. Mélard (Insuffisance de la production des bois d' œuvre dans le monde, Paris, 1900) puts the value of this excess at 8 million pounds sterling. The most noticeable point about the forest literature and the forest exhibits of Hungary is the evident desire of the State to improve the administration of the forests, to restore areas denuded of forest to their former condition, and to foster in every way the increase in the forest area in view of the benefits which are to be expected from it both financially, industrially, and in its effect on agriculture.

The staff consists, for the Government Forests of Hungary and Croatia-Slavonia, of the following officers (using the terms which make the grades correspond as nearly as possible to those of France):—

	Hungary.	*Croatia-Slavonia.*
Inspector-General	3	1
Conservators	10	2
Inspectors	23	6
Assistant Inspectors ...	100	24
Gardes Généraux	291	48
Brigadiers and Forest Guards ...	1,012	317

Among the valuable and important pamphlets on forest matters in Hungary, distributed to the members of the Jury and to those of the Forest Congress, the following are most noticeable:—

(1) Orders regarding working-plans.

(2) History of the Forest School of Selmeczbánya, by E. Vadas.

(3) Organization of the special schools for Forest Guards.

(4) Plantation and cultivation of willows as a protection against inundations, by Ignace Darányi.

(5) Measures of defence against the "Nun" moth, by F. Szakmáry.

(6) History of the National Forest Society.

(7) History of the question of forest experiments.

(8) Law No. 31 of 1879 on forests.

The general catalogue of the Exhibition of Hungary and the special forest catalogue also contain most interesting information.

16. The forests of *Bosnia-Herzegovina* are not represented by exhibits, but it is right to draw attention to the pamphlet by Herr Ch. Petraschek, the head of the Forest Department, on the development of sylviculture in these States, which are under the protection of Austria-Hungary. It explains how, when the States were taken over in 1878, a Turkish forest law was found which had never actually been put in force, but which has been made the basis of the forest work of the future. The area of forest is more than 10,000 square miles, 80 per cent. of which belongs to the Government, but much overburdened with customary rights. There is a large stock of over-mature oak which is now being exploited, but with great attention to the maintenance of the annual yield and improvement,—a practice, which is of interest to all those who, like the Forest Officer in India, have to deal with forest fires, is worth noting. When the person who has fired the forest cannot be discovered, the commune on whose territory it has broken out, is expected to fence the forest and maintain the fence as long as may be necessary to ensure reproduction. The application of this measure has had a great success in stopping incendiarism.

17. *Roumania* has a large Government forest exhibit in the Forest Palace with a separate exhibit of even greater value in the Roumanian National Pavilion in the "Rue des Nations" for the Crown domains. This latter collection has a fine relief map; a good series of photographs; a collection of specimens of wood in book form with the bark at one end and a sliding glass panel at the side which discloses specimens of the leaves, flowers and fruit; a herbarium of forest plants, and a series of models. The chief of these models is one of the methods of extraction of timber by means of forest railways, and another shows a saw-mill with 10 vertical and several circular saws.

The Government collection chiefly contains exhibits of worked-up timber, such as pieces of oak for cooperage, parquet floors, veneers, etc., but there is also a splendid series of photographs of forest scenes and forest works, and some excellent large maps to illustrate the distribution of forest in the country. The sections of trees are also well prepared and interesting. A felling saw is exhibited by Messrs. Davidovici Brothers of Bacan, worked by a band from a stationary engine, but it is not nearly so good as the felling saws exhibited in the English section by Messrs. Ransome.

The area of State Forest in Roumania is about 4,200 square miles. About half of this area consists of beech or beech mixed either with coniferous trees or with oak and hornbean, a quarter per cent. is oak forest and the rest conifers or white woods with

a small quantity of acacia. The revenue is about £1,600,000, the expenditure about £600,000. Only about one-tenth of the State Forest area is as yet under working-plan. The exports exceed the imports of timber.

18. In the National Pavilion of *Servia* is a fair map of the distribution of the forests, which are, however, mostly private; books on forest administration, and a small collection of forest tree seeds in inverted bottles. The area of forest in Servia is about 8,000 square miles.

19. *Bulgaria* shows chiefly specimens of wood cut so as to show the bark and the transverse, radial and tangential sections. A collection of walking sticks is noticeable also.

20. *Turkey* and *Greece* are not represented, and I have not succeeded in finding information regarding the forest area possessed by them or by Bulgaria.

21. The exhibits of *Russia* are in three chief collections—(1) that of the Ministry of Agriculture shown in the Forest Palace, (2) that of the Imperial Apanages shown in the Siberian Pavilion, and (3) that of Finland in the Finish Pavilion in the Rue des Nations. They are all fine collections and contain objects of the greatest interest. For the study of these objects in the Russian Pavilion, the Jury of Class 49 had the assistance of one of their members, M. Edouard Kern, Director of the Imperial Forest School at St. Petersburg; and for those of the Apanages we had the guidance of M. Honoré Yol, who was most courteous and kind, and who received his visitors in a charming room, reproduction of one at the Kremlin, and allowed them to taste the excellent wines produced on the Imperial Estates in the Caucasus, and drink the health of His Majesty the Emperor.

The collection of the Ministy of Agriculture occupies several bays and on a wall at the beginning is seen the forest map of Russia, the colouring of which is very interesting. From it it appears that the chief forest areas are, as might be expected, in the north. Another map shows the forests of Siberia and Central Asia. There is also a large collection of photographs of different aspects of forest growth and of all kinds of trees. The working of the forests is illustrated by the working-plans of selected areas and the books and orders relating to the subject. Administration and Police are illustrated by tabular statements, books and papers, drawings of uniform, and pictures of the forest houses for all grades. The Forest School is represented by photographs of the buildings, tables and diagrams, manuals, maps, etc., as well as by excellent specimens of the work done by the students.

The collection of wood specimens is probably the most complete and the best arranged in the exhibition. The specimens are large, perhaps 3 feet high, and are cut so as to show the

grain on the various sections and very carefully labelled. As an example, I quote:—

"Larch (*Larix Sibirica*), age 115 years. Height 22 m. Diameter 36 m. Specific weight 0·647. Resistance to compression 787 kilos per cent. square. Composition of Forest: Larch 0·3, spruce and silver fir 0·4, birch 0·2, pine 0·1. Density of growth 0·9. Contents of forest 400 metres cubes per hectare. Soil sandy, fresh."

The forest herbaria exhibited are very good, and among the trees of which specimens are shown, are some of much interest.

The collection of the Imperial Apanages is also an interesting one with another collection of wood specimens and a good show of timber in scantling, the different planks, etc., arranged in a revolving case so as to be easily inspected.

The Muscovite Society of forest working exhibits maps, photographs and models of forest works, and the Forest Society of St. Petersburg their publications. There are several private exhibits, most noticeable among which are the albums and forest products exhibited by M. Poliakov of Taganrog in the province of the Don; the instruments shown by M. Miassoédev and the products shown by Baron Steingel of Koubanskaia.

The exhibition of Finland was also a very interesting one. The forest map shows the great forest resources of the country, but it was explained that the fine timber is chiefly in the south and that towards the north the trees get more and more stunted. As an example, there is exhibited in the Russian Court a section of Scots pine from Lapland 200 years old, but having only a diameter of less than 5 inches. Three beautiful photographs give an idea of the Finnish forests, while other photographs show the tar-industry which seems still to be carried on in a rather primitive fashion. The specimens of woods are well prepared, but naturally not numerous, the spruce, Scots pine, birch and the European and Siberian larches being the principal species. The use of birch-knots and burrs for furniture and ornamental articles is well illustrated.

The Forest School of Evois shows a collection of maps drawn by the students, illustrating the neighbouring forests and their working-plans; while timber transport is illustrated by models of rafts, boats, sledges and other similar works.

I noticed particularly an implement I had not seen before, used for making planting holes. It consists of a strong iron crowbar pointed at the end and surrounded by an iron circle with spikes. It is easily understood that if the crowbar is pushed into the ground far enough, it makes a hole for the tap-root, while the ring of spikes stirs up the surface soil. In soft soils such an implement might be a saving; in hard soils it would hardly work; in either case the labour would probably be nearly as great as that necessary for the use of the spade. There is also a fine exhibit of forest tools and implements, and to conclude, I may

mention the beautiful stuffed birds, especially a magnificent owl, the *Strix lapponica;* and the interesting furniture in the charming Finland Court, which well deserves a long visit, and is one of those in the Avenue des Nations of most interest and best taste.

The vast extent of the forests of Russia, including Finland, may be understood from the fact that they consist of about 618,000 square miles, which is 32 per cent. of the area of the territory. In addition 87,000 square miles are in Finland, and represent about 60 per cent. of the province. In Siberia there is a further very large forest area. Of the Russian area, 64 per cent. belongs to the State; 23 per cent. to private owners; 8 per cent. to communes; 3 per cent. to the Imperial Apanages, and the rest to different public establishments. The chief tree is the spruce, pure forests of which cover enormous areas; next come in order the Scots pine, oak, larch, beech, lime and poplar. In Poland are found the silver fir and beech, while in the Caucasus among the chief trees are the *Abies Nordmanniana* and the *Picea orientalis.* The occurrence of pure forests of the lime in some Governments, especially Kostroma, Viatka, Kazan and Oufa, is remarkable. The wood is much used, as well as the bast, which latter serves for making shoes, baskets and boxes. In the Siberian forests the *Larix Sibirica* and *Abies Sibirica* are notable species.

It is difficult to describe easily the grades of the officers of the forest service, but, so far as I can make out, there are one Director, 2 Sub-Directors, 49 Conservators, 1,144 Inspectors or Foresters, 1,865 Assistant Inspectors of various categories of service, 5,186 Brigadiers, 19,102 Forest Guards and 6,165 Guards of other titles. The Forest School is at St. Petersburg, where the number of students is usually about 500; and there are 30 secondary schools with about 537 students. The preparation of working-plans began in 1840 for Russia, and in 1898 for Siberia, and the work is making great progress.

The revenue of the forests in 1898 came to £6,670,000, the expenditure to £1,270,000; so that the net revenue was about £5,400,000.

I may conclude by mentioning the interesting descriptions of the Apanage forests of Nelengsko-Kokovinskaïa and Krasnostanskaïa, copies of which were distributed to the members of the Jury and to the Forest Congress, and in which the nature of the systems of working employed in Russia may be excellently studied.

22. The forest exhibits of *Sweden* are in the gallery of the Forest Palace, where attention is at once drawn to the diorama of a Swedish pine forest with actual tree trunks and a lovely distant view of a lake and mountains.

Close by is a fine model of a saw-mill on the coast with the transport roads leading from the interior and ships in front

loading up scantlings for export; and alongside is a well arranged exhibit of wood paving blocks arranged to show the marks of the various companies and persons who export. A large map gives a good idea of the extent of forest in Sweden, and there are excellent collections of woods, cones and seeds, wood-pulp, wood-wool, and the products of carbonisation. Among the wood specimens I noted two of nearly the same size, one from a tree 37 years old, the other from a tree 220 years old. They had grown barely 6 feet apart, but in one case the land had been drained, in the other it was still marsh.

The area of Sweden is about 159,000 square miles, and of this area more than 47 per cent. is forest, the Government Forest estate occupying about 28,300 square miles. It is unfortunate that Herr Lundström's account, in the special forest catalogue, gives little or no information regarding the management of this area, but only treats of the utilization of the produce, and states that a good deal of drainage and plantation work is being effected. It does not even say whether any of the forests are under working-plan or not. The chief species of tree are, as is well-known, the Scots pine and spruce.

23. *Norway* is scarcely represented at all as regards its forestry, the only exhibitor in the National Pavilion being Herr Ring of Christiania, who shows a simple system of sledge for the extraction of large pieces of wood in season of snow. The framework is very light, so that it can be carried back by one man. The area of forest in Norway is 26,000 square miles, or 21 per cent. of the country. The imports, of course, are very small in comparison with the exports, but the progress made in forestry to ensure a permanent yield has not yet been very great.

24. *Great Britain* also is not itself represented officially, only British India, Ceylon, Canada and West Australia appearing to represent the Empire. But it is right to draw attention to the excellent saws, the special tree-feller and a cross-cutter exhibited by Messrs. A. Ransome & Co. of Newark-on-Trent. The tree-feller is worked by steam passed through a strong flexible steam metallic hose, which may be as long as 60 feet from the boiler, which is light and easily wheeled about. For felling trees on fairly level ground, where a large exploitation is made and a number of trees felled close together, the use of such a machine is a great saving in cost. The British forest area is, according to M. Mélard, about 4,750 square miles, or 4 per cent. of the surface of the country. The imports are immensely in excess of exports. The area of Government Forest is very small indeed.

25. The collection exhibited by *British India* is shown in the gallery of the Indian Pavilion in the Trocadero Garden. But all the Imperial Court is to some extent a forest exhibit, for it exemplifies the use of the chief Indian woods for carving, decoration and furniture, by means of handsomely carved show-cases and other exhibits. Much of the central trophy, the Travancore show

case, and the grand staircase are of teak wood (*Tectona grandis*), the Madras show-cases and parts of the central trophy, of black-wood (*Dalbergia latifolia*); furniture, most of the tea-court verandah, and one arch of the central trophy, of sissu (*Dalbergia Sissoo*) and other parts or articles of Padauk (*Pterocarpus dalbergioides*), sandal-wood (*Santalum album*), and cedar (*Cedrus Deodara*). Much of the carved work was prepared by officers of the Indian Forest Service under the supervision, often from the designs, of the Inspector-General, Mr. B. Ribbentrop. The Jury was guided over these collections by myself. In the forest collections, the maps of the forest, the working-plans and the various forestry and other works prepared by officers of the department, are the exhibits of most interest in a scientific point of view. There are also models to illustrate the use of elephants and buffaloes in timber extraction; models of forest houses and the houses of native forest tribes; large collections of arms and implements and a fine set of panels representing the chief furniture woods, named and polished. Then there is the excellent collection of articles of minor forest produce, consisting of barks, roots, leaves, flowers, fruit with gums, resins, oils, india-rubber, fibres, etc., and a set of small objects to illustrate small forest industries: this collection was made at and sent from the Imperial Forest School at Dehra Dun. A large trophy illustrates the bamboo and the various uses to which bamboo is put in India; while the important sandal-wood trophy which has specimens of the various qualities of commercial sandal-wood, was sent by the Maharaja of Mysore, whose Conservator of Forests, Mr. J. L. Pigot, is the author of the pamphlet on the subject.

The area of forest, the property of Government, under the Indian Forest Department, is about 120,000 square miles, of which over 80,000 square miles are specially reserved for permanent working. Nearly 30,000 square miles are under working-plan. The staff of the forest consists of one Inspector-General, 19 Conservators, 180 Inspectors and Assistant Inspectors of the Imperial and 112 of the Provincial Service, 437 Rangers, 1,226 Foresters (Brigadiers) and 8,533 Forest Guards. The members of the Imperial Service, almost all European, are recruited from the Forest School at Cooper's Hill in England; those of the provincial staff, partly European, partly native, from the School at Dehra Dun in India, where there is also a Secondary Forest School for the training of Foresters. There is another Secondary School in Burma. The Bombay provincial staff is trained at the College of Science at Poona.

The revenue of the Indian forests is nearly £1,200,000, the expenditure nearly £700,000, so that the net revenue is about £500,000.

The chief timber tree of India is the teak (*Tectona grandis*), the exports of which amount to about four million cubic feet

yearly. "Padauk," a red furniture wood from the Andaman Islands, is also considerably exported, as is the Blackwood or Rosewood of Western India. In Northern India the chief timber for building is the sâl (*Shorea robusta*), while the Himalayan cedar (*Cedrus Deodara*) is universally employed in Public Works, especially for railway sleepers. Ebony, Satinwood, Sandal-wood, Walnut, Boxwood, Red Sanders, Sappanwood, Palmwood, rattans and bamboo are exported to some extent, as are the minor products—india-rubber (*Ficus elastica*), lac, cutch, gum arabic, wild silk, myrabolams (*Terminalia chebula*), gamboge and gutta-percha.

26. *Ceylon* has no exhibits in Class 49, but in Class 50 shows a fine collection of woods, among which the Calamander ebony (*Diospyros quæsita*) is especially noticeable, with the Palmyra and Cocoanut palms, and many other woods of local value. It is from Ceylon that comes a large amount of ordinary ebony and a quantity of the valuable satinwood (*Chloroxylon Swietenia*) so well known for its use in making brush backs and fine furniture. Tanning materials, gamboge and gum resins are also exhibited. All these have been arranged by Mr. W. E. Davidson, whose beautiful catalogue is a model work of much value, but omits an account of the Forest Department. The area of good forest in Ceylon is said by Mr. Davidson to be 12 per cent. of the area of the Island, *i.e.*, about 3,000 square miles. The present Conservator is Mr. A. F. Broun.

27. *Western Australia* also has no exhibit in Class 49, but in Class 50 shows a splendid set of timbers, among which the huge logs of Karri and Jarrah (*Eucalyptus*) are especially noticeable. Nearly all the woodwork of the Court is made of these two timbers which are in considerable use for wood-paving in London and other large towns. Many other valuable woods are shown, and the capabilities of the West Australian forests in respect to furniture woods are exemplified in a fine table made of various species cut so as to show the grain to the best advantage. According to M. Mélard, Australia, as a whole, possesses about 125,000 square miles of forest, *i.e.*, about 4 per cent. of the surface.

28. The forest exhibits of *Canada* are shown in the Forest Palace and are well worthy of study.

The collection of woods is very complete and very well prepared, and rivals that shown by Russia. The account of the "Forest Wealth of Canada," prepared by Mr. James Macoun, the officer in charge, is excellent, and I was glad to read in it that "the various Governments are taking steps towards the reforesting of the denuded areas under their control, and though the actual work so far done in this direction is not great, preliminary investigations are being made, which will enable them to apply the methods best suited to each district."

A remarkable exhibit is a fine series of photographs of Canadian forest trees, each framed in the wood of the tree

represented. These are exhibited by the Geological Survey of Canada and number 86 in all. Some of the trees are represented also by large rounds or big planks, and each species is accompanied by specimens of the articles chiefly made from it. Thus, for example, the sugar maple *(Acer saccharinum)* is represented by "sections of log, square timber, boards, polished panelling, blocks and squares, chair parts, kitchen utensils, butcher's skewers and other specialities."

The chief timber trees of Canada are: White pine (*Pinus Strobus*) better known in Europe as Weymouth pine; white spruce and black spruce *(Picea alba* and *Picea nigra)*; Douglas fir or "Oregon pine" *(Pseudotsuga Douglasii)*; Giant arbor vitæ *(Thuya gigantea)*; Sugar maple *(Acer saccharinum)*; white oak *(Quercus alba)*; and black walnut *(Juglans nigra)*. Mr. Macoun, in his interesting catalogue, gives the following information regarding the value of Canadian timber exports:—

	£
Nova Scotia	556,271
New Brunswick	1,319,939
Quebec	2,455,416
Ontario	2,120,473
British Columbia	153,240

the other colonies as yet producing only timber required for home consumption.

The forest area of Canada is estimated by M. Mélard at about 1,250,000 square miles, or 38 per cent. of the area of the dominion.

29. The Forest exhibition of the *United States* is partly in the gallery of the Forest Palace, partly in a charming log chalet behind. The collection was arranged by Dr. Bean of the Department of Agriculture, to whom I am greatly indebted for much information and kind help in seeing all his interesting exhibits. First in importance comes the collection of photographs and transparencies exhibited by the Ministry of Agriculture in Washington. The transparencies have been very justly admired by all who have seen them; and conspicuous among them are those of the giant trees of the Western States, *Sequoia gigantea* and *Sequoia sempervirens*. With these are also exhibited the many useful Government publications which are well known and which are so well printed and arranged and so liberally distributed; also a great set of transparencies of wood sections giving many more specimens than are published in M. Hough's work. The "forest service of the State of New York" exhibits fine wood specimens, well arranged; and the "Forest Commission of California" a collection of furniture woods prepared to show their capabilities both in block and in veneer.

The "Forest and Stream Publishing Company of New York" exhibits its journal "Forest and Stream," but this journal is really more devoted to sport than to forestry.

The exhibit of the "Southern Railway Company" is in the chalet and consists of a picture of a saw-mill with the streams and railroads serving it, and a collection of photographs of forest scenes. Mr. Romeyn Hough's collection of photographs of type trees and his seven volumes of wood sections known as "American woods," each plate giving as a hand transparency the transverse, radial and tangential sections, was much admired; while his valuable works on Forestry were shown by Dr. F. B. Hough. The "Elements of Forestry" is his best known book. The United States have as yet no regular forest service, but some of the States have begun to make reservations and to introduce methods of economy. According to M. Mélard, the approximate area of forest is rather more than 3 million square miles, being about 25 per cent. of the total area. The value of the timber imports is considerable, being about £1,900,000, while that of exports is about £5,900,000.

30. The exhibits of *Japan* also come in the gallery of the Forest Palace, but chiefly belong to Class 50 rather than to Class 49. In Class 49, however, come some interesting things: there are maps of the forests and photographs: in the chief map it is interesting to see that the country is divided into four zones—(1) the Tropic Zone, characterized by *Ficus Wightiana*, (2) the Warm Temperate Zone, characterized by *Quercus sempervirens*, (3) the Cold Temperate Zone, characterized by *Fagus japonica*, and (4) the Cold Zone, characterized by *Abies Veitchii, Mariesii* and *Sachalinensis*.

Noticeable is a collection of woods arranged in a frame, each species being represented by radial and transverse sections and a slab of bark. A very fine exhibit is one of sections of *Cryptomeria japonica* taken at intervals of 2 metres and arranged in order to show the growth, and the curve of growth for the whole section and for sapwood only. The sections are cut so that one side is the diameter. Besides the *Cryptomeria* several other trees are thus illustrated. Perhaps the most remarkable exhibit is the collection of bamboos, of which 46 varieties are shown, prepared for export by the manufacturer Mr. D. Nagata of Hiogo. They are accompanied by a fine herbarium. The culms are all beautifully blotched and marked, and it is difficult to say how far this has been done naturally or artificially. The largest species is called "Mo-so."

An interesting pamphlet distributed to the members of the Jury, gives an account of the trees of the division in the north of Japan called Hokkaido, which chiefly consists of the island of Yezo. Here the area of forest is about 24,000 square miles, nearly all "Imperial," or "State," the difference between which categories is not explained, but the area is 66 per cent. of the area of the division. The list mentions 50 important species, and describes No. 18 "Sennoki" (*Acanthopanax ricinifolium*) and No. 20 "Yachitamo" (*Fraxinus mandshurica*) as the most useful timbers. It is not surprising to find an ash so well spoken

of, but it *is* so to note that an Araliaceous tree is so valuable. No. 1 "Katsura" (*Cercidophyleum japonicum*) is also said to be important, and among conifers No. 43 "Asunaro" (*Thujopsis dolabrata*), No. 47 "Kuroyezomatsu" (*Piceaicca ajanensis*) and No. 50 "Shikotanmatsu" (*Lerix dahurica*) are recorded as apparently the most valuable. Specimens of all the woods mentioned find place in the panels. Japan has many other exhibits, mostly in Class 50, to which class I regret I am unable to do justice here. According to M. Mélard, Japan imports rather more timber than she exports, the figures being: imports £50,000, exports £36,400; and he thinks that with care her forest resources should suffice for her needs. Japan has already established a good forest administration and good schools, and I can only regret that I cannot add any fuller information regarding them. The forest area is about 46,000 square miles.

31. There are no exhibits from any part of America except the United States, Canada and the French West-Indian Islands. Mexico has some interesting woods, probably in Class 50, and some of the South American countries may have similar exhibits, but none are represented in Class 49. In Asia the chief omission besides Ceylon is Netherlands India, which has a well organised forest service and some very valuable teak plantations. In Africa, the Cape Colony and its Forest Department are not represented, nor are the German Colonies or the Congo. Only the Portuguese Colonies show a few exhibits of wood specimens and minor produce.

Note on the Larva of Eublemma amabalis, Moore, as a Lac Insect-destroyer, in the Damoh Division, C. P.

By D. O. Witt, *I.F.S.*

To those interested in the propagation of lac which in many of our forests is an important article of minor produce, the following notes on the above-mentioned insect may prove of interest.

In the Damoh Division of the Central Provinces lac is a very important item of minor forest produce and is propagated almost entirely on *Zizyphus xylophyra* (vernac., Ghaunt or Katber), though also to a certain extent on *Butea frondosa* (vernac., Chula).

There are two crops of lac each year formed by the young larvæ of *Tachardia lacca*, the first swarming out in July and the second in November. The lac in which the larvæ of *Eublemma amabalis* were found, was that produced by the July brood. I first noticed the attacks on the 26th September and collected some of the larvæ. The larva is white and unmarked, the head only being dark. It appears to feed upon the soft bodies of the lac larvæ, taking up its abode with them beneath their resinous coating and forming a webbed covering connected with the outer air by a silken tube woven together with an admixture of reddish

excreta. Whether the tube is formed just previous to pupation, as a tunnel of escape for the perfect insect, I am not aware. Mr. G. C. Dudgeon, F.E.S. of Palampur, Punjab, to whom I am indebted for the naming of the insect and to whom I sent specimens of the larvæ, perfect insect and a specimen branch of the lac incrustation attacked by the larvæ of *E. amabalis*, is of opinion that these silk tubes are made as a tunnel of escape, as the tubes are all of the same size and therefore presumably formed by larvæ in the same stage of development ; and portions of the pupa shell were found inside the resinous coating just beneath these tubes. On the other hand, I did not notice that these tubes were ruptured by the emergence of the perfect insect.

Six imagos of the larvæ which I collected early in November 1899 emerged between January 12th and 20th, 1900. Three more between January 22nd and 27th and two more on February 17th. It would appear therefore that one generation of the insect lasts about seven months, as the lac incrustation only begins to form in August.

Mr. Dudgeon informs me that so far *E. amabalis* has only been recorded from Ceylon and Sikkim, and now Damoh. It would appear therefore to have a wide distribution and it would be interesting to know whether it affects for instance the lac in Bengal and Assam. I also understand that it adds only the second species to the genus *Eublemma* now known to feed on a species of *Coccidæ*, the other described one being *E. coccidiphaga*, Hampson. It would thus appear that there is considerable room for investigation in this matter both with reference to *E. amabalis* itself and other members of the same genus. Among the more interesting points requiring investigation with regard to *E. amabalis* I may mention the following in the hopes that they may bring forth some information from other quarters :—

1. Does *E. amabalis* attack both crops of lac ? So far I have only found it on the winter crop.)

2. Does it attack lac on trees other than *Zizyphus xylophyra* ?

3. How many generations of the insect are there a year ? (There must surely be more than one because the interval between January when the imagos emerged, and August when the winter crop on which I found the larvæ commences to form, is unaccounted for.)

4. The eggs, their form, colour, etc., and where they are deposited.

Other points will suggest themselves to those interested in the matter, and I therefore need not add to the above.

Owing to my being transferred to another district I have been unable to continue my investigations on this interesting insect, but the above notes may lead to some one filling up the gaps I have mentioned.

II.—CORRESPONDENCE.

The Insect Enemies of Forests.

I have read in the *Indian Forester* for September 1900 "Ghati's" reply to my criticism on his article published in the July Number of our periodical and, whilst wishing to defer in every way to the experience which 30 years will necessarily have given him in the knowledge of forest lore, I must again express my inability to agree with him in the conclusions he has arrived at in this particular branch, *i.e.*, that insects never kill healthy trees or seedlings. I have already admitted that, in a virgin forest untouched by man, it merely becomes a case of the struggle for existence and the tree, under Nature's laws, is given as good a chance as the insect. We, Foresters, are not however concerned with this aspect of the question. The problem we have to study—and it must be studied just as much in the formation and tending of our forests as in their protection—is, what will happen when we step in and interfere with Nature's laws in our endeavour to obtain a bigger crop per acre than she ever, if left to herself, would yield us?

A case in point has recently occurred. Our late Inspector-General, Mr. Ribbentrop, has been studying this summer a bad bark-beetle attack amongst deodar Poles in the Barkahi forests. At his request I am writing an article, compiled from his notes and observations, on the subject, to be published shortly in the *Indian Forester;* but I may state here that Mr. Ribbentrop has no doubt that the poles are dying under the influence of these attacks.

"Ghati" says:—"I have never found healthy seedlings eaten by white-ants, etc." The *et cetera* is rather indefinite, but I conclude it stands for "or other insects" and eaten would seem to mean or include "killed." This statement is remarkable. The instances when the opposite has occurred are numberless. I will give "Ghati" one of my own—the most recent one of all. We have some small rubber plantations in this Division (Chittagong Division, Bengal) which are being enlarged on a small scale yearly, seed being sown every rains. Last April I received a report that the seedlings sprung from the seed sown in the previous year were being attacked and killed. I went up and inspected the nursery and found many seedlings had their stems partially or entirely gnawed through, the work as I discovered of the larvæ of a big cricket. The seedlings were perfectly healthy in other respects and their death was entirely due to the cricket. The insects lived in holes in the ground, either in the nursery or outside, wherever soil loose enough for tumbling purposes was to be found, and issued forth and committed their depredations at night. The attack ceased about the middle of June. Last month (October) I received another report from the nursery stating

that the crickets had again appeared and were continuing their havoc amongst the rubber plants. I again went up and found that the aggressor had appeared this time in the shape of the full grown insect. As in the previous attack the young plants were being both gnawed through and stripped of their leaves, the pieces thus detached being in many cases dragged to the holes and eaten there. I hope to give at a later date in these pages a full description of the life-history of this pest, with the methods I have introduced to combat it, and so will not go further into the matter now as it hardly falls within the scope of the subject under discussion. The death of the rubber seedlings is, however, obviously due to the attacks of the cricket.

In the above two instances there can be no possibility of arriving at any other conclusion, whether hastily made or otherwise, than the correct one, that insects are in both cases responsible for the death of the trees.

In the case of the deodar poles we are responsible for having grown them as a pure pole forest which, not being sufficiently thinned perhaps, contained a number of suppressed and sickly trees. These poles were attacked by the bark-borers which, increasing rapidly in numbers under such favourable conditions, then attacked healthy poles. In the second instance I have given—one that "Ghati" states he has never found and therefore apparently presupposes cannot exist—the insect attacked and killed perfectly healthy young rubber plants and has set me a problem the results of the working out of which I trust shortly to be able to put on record.

E. P. STEBBING.

A Forest Department Gazetteer.

It occurs to me that it would be extremely interesting to all of us, if in your columns you could bring out short articles on the different Divisions of the Circles under Government control in both India and Burma. This might be done by the Conservators of Circles asking their Divisional Officers for reports limited, say, to what would fill a page and-a-half of your paper. I would suggest that they would describe not so much the flora as the conditions of climate, means of transport, fauna and other matters of interest to the Forester. If one Circle could be done each month, we should have at the end of a little over a year a complete and comprehensive record of the conditions of life which our colleagues undergo in various parts of the Indian Empire. We should see what the men we are acquainted with are doing and in case of a transfer from one part of the Empire to another the officer undergoing that transfer would get a good idea of the sort of life he would lead.

I would suggest that each Divisional article be headed with the name of the officer in charge of that Division.

I merely offer this as an idea, the whole account would mean only about half-an-hour's writing for each officer reporting, and it would be interesting to know if this idea finds favour with your readers.

H. G. BILLSON.

[We should be very glad to receive for publication an article from Mr. Billson, as above suggested.—HON. ED.]

III.—OFFICIAL PAPERS AND INTELLIGENCE.

The Eradication of Lantana Scandens.

A good deal has already appeared on this subject in the pages of the *Indian Forester*. The question has, however, been re-opened recently by the Inspector-General of Forests, and the conclusions arrived at during the year may be of interest to our readers.

In May 1900 a suggestion was put forward by the Inspector-General to introduce into the country some well-chosen natural enemies of the Lantana in order to assist in its eradication.

"The *Lantana scandens* invasion of Coorg," wrote Mr. Ribbentrop, "has become a scourge to the country, and is spreading rapidly in other parts of Southern India.

"Originally, I have heard, introduced by the wife of a missionary as a hedge plant, it has taken rapid possession of open places in the forests, occupies grazing grounds, and threatens cultivation by spreading over every fallow area, even at a distance from the original stock, the seed being probably carried by birds.

"The eradication of the plant, when once it has taken possession of the ground, is an expensive business. It forms perfectly impenetrable thickets, in which the sun does not reach the ground and nothing can grow. The *Lantana* takes sole possession. Once such thickets have formed, it is said in Coorg to be more costly to eradicate them than to clear virgin forests. The ryots, looking upon the invasion as an unconquerable pest, do nothing to help themselves and the evil is naturally spreading.

"In Berar the Forest Department took up the eradication of *Lantana* systematically and with considerable success. The Municipalities, and lately, I hear, the ryots, have followed suit.

"The first operations were naturally expensive, costing, however, but Rs.4 per acre, against Rs.30 estimated by the Commissioner of Coorg, where, however, it is to be said, the evil has taken a much longer and greater hold of the country. In Berar we have not succeeded in eradicating the plant, but at a cost of

Rupees 30—50 per square mile, which is decreasing year by year, we keep it under sufficient subjugation to render it practically harmless. A pre-considered plan for the work and a careful and steady adherence to it are, however, a *sine quâ non*.

"Dr. Watt, when in Coorg, was consulted by the Commissioner, and he advised that enquiries should be made in South America (but Mexico I think it is), whence the plant originally come, what its enemies were in its own country and to import them. This plan was considered phantastic and was not acted up to, and I think nothing else was done either. I am of opinion that a possibility of success underlies Dr Watt's plan, and I would advise that in the first instance enquiries in this direction should be made from the Kew authorities, who are in touch with the botanists of the world.

"It may be possible that somebody would have to be deputed to the original home of the *Lantana* to study the question locally, but even that would be but a small matter in comparison with the object in hand.

"That it is feasible, however, to keep the *Lantana* within reasonable bounds, without introducing its enemies into this country, by unremitting attention towards its destruction, at a considerable cost it is true—but nothing compared with the estimate of the Commissioner of Coorg—has been proved in the Ellichpur district in Berar, where the plague assumed the most threatening appearance; and this might be pointed out to the Coorg authorities."

This view of the matter did not, however, recommend itself to Major Prain, the Director of the Botanical Survey of India, who wrote as follows:—

"I am not favourably impressed by the proposal to depute an officer to America to learn what the natural enemies of *Lantana* in its original habitat are. There are two well-known enemies of *Lantana:* both of them, as cures, are worse than the disease.

"One of its enemies is a Sunflower *(Tithonia)*, which is becoming naturalized in many parts of India. It is found in Ceylon, that where this runs wild it kills out and replaces *Lantana*. So different is the point of view that Ceylon planters look upon *Lantana* as a 'blessing' and think nothing has done so much as it has to renovate abandoned coffee land. The Sunflower they find, when re-clearing, to be more difficult to eradicate than *Lantana* is, and they believe that in place of renovating the soil the Sunflower greatly exhausts it.

"The other enemy is fortunately not yet very well known in India. This enemy is a scale-bug *(Orthezia insignis)* originally discovered at Kew, where it was causing damage in the plant houses. It was noticed in Ceylon in 1893 or thereabouts, and was supposed to have been introduced from Kew, because it was first observed in the Royal Gardens at Peradeniya, to which place plants are often sent from Kew. But this is not clear to me,

because the pest is also known, and gives trouble, in Natal. It was first noticed on *Lantana* in June 1898. By August 1898 it had spread, still on *Lantana*, with alarming rapidity, completely destroying, so it is asserted, the patches of *Lantana* it attacked.

"This *Orthezia* is one of the most destructive scale-bugs known. It by no means confines its attention to *Lantana*, but attacks, and is equally destructive to, many other species. When it is known that these include Tea; Coffee, both Arabian and Liberian; Cinchona; the Orange and all the other species of *Citrus;* Capsicums; and the Tomato, it will be seen that the alarm with which its sudden appearance on *Lantana* was viewed in Ceylon was a well-founded alarm, and it will be granted that the Government of Ceylon and the planting community there were justified in immediately taking the most drastic steps to stamp it out.

"Among the enemies of *Lantana* in its native country this or some similar pest may be numbered. It may well be that in its natural environment such a pest may cause no trouble. But remedies of this kind are apt to prove double-edged weapons, because there is no possibility of saying that in the new environment to which they are brought these will not get as completely out of hand as *Lantana* itself.

"As regards the methods detailed in the attached correspondence for dealing with the plant, I have little to say. I note that the cost of clearing land of *Lantana* in Berar is given at Rs 15-8 per acre. This is interesting, because it agrees so well with the estimate given for Ceylon during a controversy that arose there so far back as 1881. It was found in Ceylon that land under *Lantana* for 12 years or more, and therefore as thickly covered with the shrub as it was possible to be, could be cleared by contract, the contractor cutting it down, uprooting every plant and burning the roots and stems, for Rs.15 per acre. I find it stated that at present the plan used in Ceylon is to uproot the *Lantana* by bullock teams, and that the method is easy and effective. Its cost I have not seen noted.

"In Honolulu, where the experience has been exactly that of India and Ceylon, it is usually only the *small* plants that are uprooted. Large plants of *Lantana* have their stems cut across close to the ground and kerosine is then poured on the cut stumps. This is said effectively to prevent any further growth."

As to the steps taken at Chikalda in the Berars, mention of which is made in Major Prain's letter, Mr. Cecil Bagshawe, Conservator of Forests, gives an interesting account.

Lantana (scandens) clearance in the Station of Chikalda and the Melghat Taluq, Ellichpur District, Berar, 1894-95 *to* 1899-1900.

It seems well to describe the position of the Chikalda station and the Melghat hills, where the work was carried out.

1. Chikalda is on a plateau 3,600' above sea-level, with more or less precipitous, dry and rocky slopes to the south, and on the north ravines with easy slopes and good, fairly moist soil, interspersed with steep and precipitous ground. On the north there are perennial streams; to the south torrent beds with waterfalls during the rainy season.

2. The Melghat Taluq (1) includes a southern extension of the Satpura range, is hilly throughout and varies in elevation from 600' to 4,000' above sea-level.

(1) Area 1,650 square miles, and Chikalda, which is in the south-east of the taluq, being about 77·30' E. and 25·30° N.

The Tapti river and many of its tributaries rise in the Melghat and fall into the Indian Ocean, while the source of a main tributary of the Godavery is also within its limits, so that it forms a hilly well-watered part of the backbone of India.

The average rainfall is 78", which falls mainly from June to September; but the south-east and north-east monsoons sometimes give heavy showers in the autumn and winter.

3. *Lantana* was introduced into Chikalda about 1865, and was largely planted out for hedges. It flowers, fruits and the seeds germinate within a period of some five months and the plants grow freely from cuttings. *Lantana* was not recognized as a pest until about 1889, when it had overgrown the ravines, was spreading on the plateaux and even growing on the steep southern slopes.

In 1893, when the health of Chikalda and apparently any reproduction of valuable forest growth in the vicinity was endangered, the general eradication of *Lantana* was decided on.

4. To facilitate systematic working, the infested areas of the taluq were classed as—

(*a*) Very dense growth, including heavy hedges several miles in length and masses of *Lantana* matted into forest growth in the ravines, where it sometimes climbed to the tops of trees 30—40 feet high.

(*b*) Dense growth scattered over extensive areas, but generally more accessible and easily destroyed than the *a* area in and near Chikalda.

(*c*) Scattered plots, dense in places, but easy of removal and in connection with which the chief expenditure was incurred in finding the plots.

5. The method adopted was to cut down (2) and thoroughly root up the plants, haul them to open spaces, and there destroy with fire. Rootlets left in the ground, it was found, did not shoot up, but plants and branches left lying on good soil readily took root.

(2) Mechanical arrangements for hauling out with blocks and tackle were tried, and failed on score of expense.

This operation was called "clearing" and embraced the 1st year's work in each area dealt with.

In the 2nd year the areas were systematically gone over and all seedings, etc., dug up, the operation being called the "1st cleaning." In the case of dense areas cleared, the following rains brought up a most complete crop of seedlings, which by August attained a height of 2—3 feet and flowered.

In the 3rd year seedlings were less plentiful, but the growth from 2nd year seedlings, broken off in the course of extraction in the 2nd year, gave much trouble and another systematic 2nd cleaning was made. In areas of very dense growth a 3rd cleaning was necessary.

Subsequent operations were called "scouring," to carry out which gangs of weeders in lines in open order were taken *rapidly* over the areas, once at the beginning and, if possible, again at the close of the rains.

6. It is evident that the cost of the operations described cannot be correctly given by means of the average cost per acre for the whole area, and it is therefore given by classes:—

	Clearing		1st Cleaning		2nd Cleaning		3rd Cleaning	
	Per acre.	Per sqr. mile.	Per acre.	Per sqr. mile.	Per acre.	Per sqr. mile.	Per acre.	Per sqr. mile.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
(*a*) Areas of very dense growth.	11 6	7,280 0 0	0 10 6	420 0 0	0 2 5	96 10 8	0 2 5	96 10 8
(*b*) Dense but more scattered growth.	0 12 1	483 5 4	0 8	120 0 0	0 0 9	30 0 0	...	...
(*c*) Scattered growth	0 1 10	73 5 4	0 0 9	30 0 0	0 0 9	30 0 0	...	...

The cost of scouring cannot be given per acre, but from 1900-01 about Rs.1,000 a year is being spent in weeding over the whole taluq in areas formerly infested, and in destroying any plots that have been previously overlooked. This charge will fall steadily from year to year, but the work must be continued for many years or until the destruction of *Lantana* at sight has become a custom.

The cost of clearing and cleaning operations may seem high, but it is difficult to vividly describe the labour of digging and removing dense masses of prickly *Lantana* from narrow ravines and wooded hillsides.

7. Taking the whole Melghat (1,650 square miles) into account, Rs.24,896 have been spent during the six years 1894-95 to 1899-1900. Acres 32,155 = 50 square miles, covered with *Lantana*, were cleared at a cost of Rs.8,461, or Rs.169 per square mile, while Rs.16,435 were spent on cleaning and scouring. The average cost of cleaning is put at Rs.54 per square mile, but the

cost of the two operations cannot be given separately. It may be said that the eradication of Lantana has been most successfully carried out; the plant is rare in Chikalda, and has to be searched for in other parts of the taluq. Still watchful care is needed to prevent the scattered plants spreading.

8. When work was started in the Melghat, the extirpation of the plant throughout Berar was also aimed at, and a clearance started with fair success in all districts. It may, however, be said that the growth of Lantana is generally only luxuriant in Berar in hilly districts, 1,400 feet and upwards in elevation, and in places with fair soil and moisture.

IV.—REVIEWS.

The Central Provinces Annual Forest Report, 1899-1900.

Messrs. A. Smythies and E. E. Fernandez, Conservators of Forests, are to be congratulated on having produced a most readable review on the Forest Administration of the Central Provinces for the year 1899-1900. The report is something more than a bare statement of figures, which can only be of interest to the statistician: it contains in addition many remarks on sylviculture, on forest management, and cognate subjects, a great deal of which cannot fail to arrest the attention of readers interested in Forestry.

"The year under report was the most unfavourable that we have ever had. The rains ceased suddenly in August and there was practically no rain in the cold weather, while during the hot weather high winds prevailed, and the next monsoon did not set in until after the beginning of July. Added to this extraordinary mischance of the weather, came the famine, which compelled us to throw open nearly all our areas to the free collection by one and all of dead and fallen firewood, grass and edible products."

Moreover, "the re-appearance of famine, while the country had not yet recovered from the effects of the severe visitation of 1896-97, required the entire energies of the Department to be given to helping the other departments of the Administration in devising and carrying out measures of relief, not only measures involving forest work proper, such as grass-cutting, coupe-felling, the construction of forest-roads, &c.; but even the special famine operations of distributing and supervising village relief and establishing kitchens. Moreover, the Department was depleted below its minimum effective strength by having to supply special Famine Charge Officers. Even the Conservator had to take local charge of operations for the supply of grass to the Bombay Government."

Indeed, one of the chief points which marks the year under report is the utilization for the first time of the Forest Staff as an integral part of the ordinary organization for the relief of the famine. "It is not too much to say that but for the direct aid given by the Department, irrespective of free concessions in relieving the pressure of famine, the Administration would have had to employ a much larger special famine staff than has been found necessary. Even the departmental grass operations were of great assistance, as testified by the Commissioner of the Jubbulpore Division in the following extract from his note on the Annual Report of the Jubbulpore Forest Division :—

"The Forest concessions and grass-cutting operations which have resulted in so large an excess of expenditure over income were of the very greatest benefit in the alleviation of distress. The money spent on cutting grass was of especial benefit, as it gave resources to large numbers of people who would not have been attracted by our relief works and might without this assistance have so seriously deteriorated in condition as to render it very difficult for Government to prevent a high mortality during the present rainy season."

In the Sohagpur tahsil, which was the earliest in the Hoshangabad district to be declared to be under famine, the moment our departmental grass operations were started towards the end of November, the special relief works were all but deserted. These operations were in full swing until May and helped the tahsil to tide over a long and difficult period of the famine.

As regards the famine relief works undertaken by the Department, "beyond the customary free grants of the year, there was an exceptional grant of free concessions on account of the famine. These were sanctioned at different times as occasion arose, and their nature may be summed up as follows :—

(i) Extraction of head-loads of grass and fuel, and collection of fruits, edible roots, leaves, and other minor forest produce, except harra and lac.

(ii) Suspension and remission of commutation dues for timber and grazing in certain districts.

(iii) All the forests, except coupes recently cut, thrown open to free grazing.

(iv) Bamboos and cart-loads of fuel were also given free in certain districts.

The value of these concessions to the poorer people cannot be over-estimated."

In addition to this, extensive operations for the supply of grass to the Bombay Presidency were undertaken by the Department in the Northern Circle, and an interesting account, which is here reproduced, is given by Mr. Fernandez. "The fodder famine in the Bombay Presidency," he writes, "the threatened fodder famine in these Provinces, and the exceptional suitability of grass-cutting as a famine-relief work resulted in extensive operations being undertaken in six out of the eight Divisions. In Narsinghpur and Mandla work was stopped soon

after it had been started: in the former district, because there was no local scarcity of grass and grazing and the lead to the railway for export purposes was too long, in the latter, partly because most of our areas were too far from the railway and partly because the field crops yielded a large quantity of fodder. As was expected, areas that had been long protected from fire not only yielded very little, but also a very poor quality of grass. The best grass came from the fire traces, from areas that had been burnt in the preceding year, and from birs which had been cut over every year. The worst grass of all was obtained from Bori. Everywhere the grass was cut by departmental agency, but in Nimar the expenditure was met wholly, in Betul and Hoshangabad for the most part, and in Saugor to a slight extent, from the famine budget. It is worthy of note that the cost under famine-relief rules was greatly in excess (more than double) of the cost under departmental rules, but that nevertheless the people preferred work under the departmental system, under which, with ordinary exertion, a man could earn very much more than the fixed famine wage.

"Although negotiations for supply of grass to the Bombay Government were opened in September, no definite arrangement was arrived at until the middle of October, when the Conservator, Central Circle, Poona, who was in special charge of the grass supply operations for the entire Presidency, met the writer at Jubbulpore. It was then agreed that this Circle should supply Guzerat as follows:—

	Tons.
From the Jubbulpore Division...	1,700
Do. Hoshangabad do.	5,000
Do. Betul do.	5,300
Total ...	12,000

and that for baling this quantity the Bombay Government should lend us two steam presses (one for Jubbulpore, the other for Sohagpur) and 14 hand presses.

"This programme had to be changed almost as soon as it was made owing to the Deputy Commissioner, Hoshangabad, stating that he could spare no grass from his district. Accordingly, it was resolved to send most of the grass from Saugor, where the available supply was large, and no embargo had been laid on the export of grass out of the district. On the writer visiting Hoshangabad, however, it was found that some grass could be spared from Sohagpur. Thus at the close of November, when the cutting of the grass for Bombay was fairly started, the arrangement was made to send about 2,000 tons each from Jubbulpore, Damoh and Sohagpur, and the whole of the remainder (6,000 tons) from Saugor.

"The presses began to arrive so late and the steam presses broke down so frequently, that it was soon found that 14 hand presses would not suffice for baling all the 12,000 tons before the setting in of the monsoon put a stop to all operations. Moreover, it became further apparent that the Indian Midland Railway could not or would not supply us with anything like the number of wagons we required in the Saugor district. It was thus found necessary to close pressing operations in Saugor and transfer the presses to the neighbourhood of Hoshangabad, especially to stations of the Great Indian Peninsula Railway. Operations were consequently considerably extended at Sohagpur and started at Seoni-Malwa.

"At first the Great Indian Peninsula Railway furnished us with as many wagons as we required, but their supply also began to fail owing to the heavy grain traffic from up-country and to the wagons for Guzerat being lost to them for long periods, so that ultimately we were able to send to Guzerat only the following quantities of grass :—

	Tons.
From the Jubbulpore Division	1,581
Do. Damoh do.	10
Do. Saugor do.	596
Do. Hoshangabad do.	6,783
Do. Betul do.	1,210
Total ...	10,180

"As the Great Indian Peninsula Railway serves the Khandesh and Ahmadnagar Collectorates of the Bombay Presidency, wagons were available in any numbers for consignments to those Collectorates, and we were thus able to send what balance of grass we had along the line to the Bombay Authorities there :—

	Tons.
To Khandesh	1,165
„ Ahmadnagar	267

"Before a call was made on us from these two Collectorates, grass was sold to the Jodhpur and Indore Durbars as under :—

	Tons.
Jodhpur	50
Indore	31

"Of the rest of the grass about 1,500 tons were destroyed by fire and 40,689 tons still remained unsold at depôts in the forests at the end of the year."

In curious contrast to the popularity of the grass operations among the famine-stricken in the Northern districts of the Province as a relief work may be mentioned the apparent dislike to the work in the Southern Circle, though an explanation is practically contained

in Mr. Smythies' report. He writes: "In the Laon Range the grass-cutting coolies who had been drafted into the forests, at some distance from their villages, in order to cut fodder grass and who expected that they would have to remain in the forest until the large quantity of available grass had been all cut, determined to get rid of it by fire, so that they should be sent back to their villages and put on tank work, which they much preferred." Enough, however, has been said to prove conclusively the utility of the forests in times of distress; and, moreover, it is abundantly shown that the Department thoroughly justified their existence in that respect.

In view of the exceptional conditions prevailing throughout the year, it is only to be expected that the purely technical work of the Department must have suffered considerably. The unprecedented drought and the consequent severe famine, the practically unlimited concessions granted to the people, would in themselves sufficiently account for considerable failure, both in the protection of the forests from injury and in operations undertaken for the improvement of the forest growth; as well as for a vast decrease in the yield and outturn of forest produce, and in the financial results. Nevertheless it is most gratifying to find that an enormous amount of excellent forest work was carried out successfully during the year in the face of all adverse circumstances. In fact one of the most remarkable features of the year is the increase of revenue in the Northern Circle, notwithstanding the severest famine that has afflicted these Provinces.

Thus we read—"Eliminating all items pertaining to departmental grass transactions, which were after all mere accidents of the year under report, the most satisfactory feature of the year's administration is, without doubt, the large revenue secured, despite the severe famine and liberal famine concessions granted, which may be valued at Rs.1,17,564. In 1896-97, the year of the previous famine, the revenue dropped suddenly from Rs.4,15,300 to Rs.3,12,900. This year, leaving out Rs.91,844 received from the Bombay Government for value of grass supplied to them, the gross revenue is Rs.4,57,377, which is not only not below the level of that of the previous year (the best year since 1894-95), but even tops it by Rs.13,056. This is a good augury for the future, when prosperity again settles over the land."

It remains now to draw attention to the work carried out by the Department during the year. At the close of the year, 30th June 1900, the Department was in charge of 19,096 square miles of forests, and there was little change to record during the year. The forests are divided into: A.—Class forests, or permanent forest reserve; B.-II.—Class forests, or areas available for cultivation, and to be eventually disforested; and B.-I.—Class forests, or areas which remain to be transferred either to the A. or B.-II. Class. In addition to the above there is a small area of unclassed forests. Curiously enough the total area is exactly divided between

the two circles; and the distribution of this to the different classes may be gathered from the following table:—

Class.	Area on 30th June 1900, in square miles.		
	Southern Circle.	Northern Circle.	Total.
A	7,552	5,615	13,167
B.-II	941	1,677	2,618
B.-I	887	2,242	3,129
Unclassed	168	14	182
Total ...	9,548	9,548	19,096

Demarcation received due attention during the year. In a few of the districts famine labour was utilized for this purpose; but we agree with the Conservator that a good deal more might have been done in this respect. Survey operations were likewise carried out during the year in nine districts, and a good deal of progess is reported. We find that a total area of 16,316 square miles has been mapped, leaving but 2,780 square miles to be taken under survey, an eminently satisfactory result, which must greatly facilitate the revision and control of working-plans.

It is in the matter of working-plans that the Central Provinces show most gratifying results, and the Department is now in a position to point to the fact that almost every acre of its reserves are worked under the provisions of a working-plan. Form No. 50 shows that out of the total area of the Reserves, 19,096 square miles, only 392 square miles in the Southern Circle have still to be taken in hand. In other words, 98 per cent. of the area, for which they are required, possess working-plans. The sylvicultural system adopted is almost without exception that of "Improvement Fellings," and in most cases experience has shown that a single plan will suffice for a whole Division. Mr. Fernandez has some interesting remarks to offer on the subject, and they are here reproduced:—

"Before leaving the subject of working-plans," he writes, "a few remarks seemed to be called for regarding the new principle introduced into the working-plans in this Circle since those for the Narsinghpur and Hoshangabad Divisions were brought into operation two years ago. In these latter all areas on which the demand was insignificant have been considered as unworkable and have accordingly been excluded from the working rules prescribed in the plans. These areas cannot, hence, receive the systematic supervision and tending, without which their requirements are apt to be overlooked. Under the new principle all such

areas are formed into nistar series for the gleaning of dead and fallen wood by adjoining villages and for the supply of any further small quantity of fuel and inferior poles which they may require. The nistar series are also divided into coupes, so that each coupe necessarily comes in its turn under supervision and special management. Should at any time the demand on a nistar series rise to a sufficient extent to call for more intensive treatment, it can be at once converted into a regular felling series, and, *vice versâ*, if the demand on a regular felling series should fall off below the point at which intensive treatment ceases to be practicable, it can be relegated among the nistar series without causing any dislocation of the general provisions of the working-plan. Thus, with the introduction of the nistar series, the working-plan acquires the utmost degree of elasticity, and the mechanism for adapting it to the varying needs of the local and foreign demands becomes, so to say, automatic."

As regards the execution of existing plans, the famine, together with the forest concessions granted for its relief, have necessarily been very serious factors; the result being large uncut balances of coupes remaining at the close of the year in many of the districts.

Another pleasing feature of the year's working in the remarkable success obtained in fire-protection, in spite of the severe and prolonged drought. The total area under systematic protection by fire-lines and a special staff of watchers amounts to 4,756 square miles, and out of this total only 167 square miles were traversed by fire, that is to say, only 4 per cent. of the area attempted was burnt. This result would appear to be sufficiently satisfactory, particularly when it is considered that the fire season actually commenced in the month of August, and fires occurred in September in a great many districts. The Conservator, Southern Circle, however, is by no means favourably impressed, and his remarks are worth reproducing. "Considering the intensely dry character of the year," he writes, "protection was fairly successful throughout, with the exception of Raipur, where 15·4 per cent. of the area attempted was burnt. The state of fire-protection in this Division is most unsatisfactory. In the area under special and partial protection there were no less than 62 separate fires, or an increase of 24 above the figure of the previous year. The Divisional Officer has various explanations to offer respecting these failures. The drought and the consequent inflammable state of the forests, the opening of the forests to free grazing and free removal of fuel and minor produce, the establishment of relief-works in close proximity to the specially protected forests, and finally, a certain number of incendiary fires,—these are the principal causes of the numerous fires in that district."

Communications and buildings are still terribly neglected in the Central Provinces, and operations were even more restricted than during the previous year. Nevertheless roads for opening

out many of the forests are badly wanted; and the construction of suitable buildings for housing the subordinates should receive immediate attention. As the Commissioner, Jubbulpore Division, very correctly remarks, "I think that, considering the life and duties of a forest official, this is a matter of great importance." It is satisfactory to note, however, that this question has not escaped the notice of the Conservators. Mr. Smythies writes, "In most Divisions the accommodation provided for the subordinate staff is ill-devised and insufficient, and there is little doubt that the state of this Circle is backward in this respect, and should the financial position improve, it will be necessary to spend more money on Communications and Buildings. It will be interesting to compare the figures under this head for the Central Provinces and three other Provinces for the year 1898-99, the latest year for which returns are available :—

Amount spent on Communications and Buildings, 1898-99 :—

Province.	Roads.	Buildings.	Other works.	Total.	Gross revenue.	Percentage of gross revenue spent under A.-VII.
	Rs	Rs.	Rs.	Rs.	Rs.	
Central Provinces ...	6,838	17,023	1,145	25,006	15,41,189	1·62
Punjab	7,231	17,671	23,545	48,447	14,46,048	3 35
North-West Provinces and Oudh	40,803	40,515	4,536	85,854	16,30,578	5·26
Bengal	19,230	35,739	2,798	57,767	10,07,254	5·73

It is obvious that in these Provinces we might, with advantage, allot a large percentage of the revenue to the improvement of communications and especially in giving subordinates more substantial dwellings."

Considering the peculiar conditions prevailing throughout the year, little is to be expected in the way of the improvement of the forest growth. The sudden cessation of the rains soon after only half the usual monsoon period was over, the extremely short rainfall, and the prolonged drought extending into July were conditions which rendered successful natural regeneration by seed, extremely scanty as it is even in the most favourable years, an absolute failure, except in the two cases of bamboo and anjan to be presently noticed. Nevertheless the abnormal conditions of the year have not, on the whole, told unfavourably on pre-existing young seedling growth. The long drought which proved so disastrous to natural regeneration by seed, generally resulted in a more extensive and more abundant seeding than even in the preceding year of the *Dendrocalamus stritcus*. Some idea of the prolific character of this seeding may be gathered from the fact that the local population laid by a

sufficient store of seed for two to three months' consumption as food, and people living at considerable distances away came with carts to collect and carry away the seed for their own wants. Similarly, the drought was the immediate cause of the seeding, always gregarious, of the anjan *(Hardwickia binata)*. The seeding was so abundant that the ground under and between the trees was covered with a carpet of seedlings. The effect of the subsequent drought on the seedlings must, however, be left to next year. Remarks regarding the general effect of the drought on the forest vegetation have also been contributed by various divisional officers to this *Magazine*, and they will be found in Volume XXVI., Nos. 7, 10 and 11. One more subject deserves considerable attention. Mr. E. E. Fernandez, the Conservator, Northern Circle, has been studying the question of re-stocking planks by means of the system known in Burma as "taungya," namely, allowing cultivators to crop the area for a season or more, subsequently on abandonment to be sown with tree-seeds. Mr. Fernandez has formed very decided conclusions on the subject and his views deserve every consideration, and will be read with interest by our readers. They are given below *in extenso*:—

"Regarding the commencement made in utilizing the nomadic instincts of our jungle cultivators in regenerating with valuable timber species areas favourable for the creation and growth of full crops of such species, the writer of this report, which will in all probability be his last for these Provinces, ventures to offer a few parting words of advice. That it is the only way of raising such woods (they cannot be called forests, for they will be like islands of less or greater extent in a sea of open more or less worthless scrub fit only to yield firewood) is unquestionable to any one who is acquainted with the history of these forests since they have come under the *régime* of the Department and who has studied their peculiarities. To expect any really tangible results from the natural sowing of the ground under mere protection from grazing and fire is to ignore what has happened during the past 30 years of such protection and of futile waiting for a new stock of valuable and full forest to make its appearance and replace the old open scrub of mostly dwarfed, scraggy, and often unsound trees, few of which belong to marketable species. Compare the stock in those areas, which were at the outset of forest conservation in these Provinces chosen for their special promise and which have ever since been carefully protected from cattle and fire, with adjoining areas under similar conditions of soil and climate, but which have always been open to grazing and under a less stringent system of protection against fire. Having started better in the race, one would expect that the former would have forged further ahead. But what is the fact? The difference of condition between the two classes of areas is actually so slight as to be generally inappreciable, save after close and careful observation. In the former

areas we look in vain for any group of teak or other valuable species which has come up as the result of seed-germination since the commencement of conservation. All that has really happened is that pre-existing young seedling-growth that had been kept back by grazing and annual fires, has, since these two adverse conditions have been suppressed, had a chance of getting away and forming forest. In the early Forest Reports it was usual to describe this growth as recently produced seedlings, although their age was anything from 1 to 15 and even more years. But how and when did these young plants come into existence? It was when the nomadic cultivator had loosened the soil and had thus weakened the hold on it of the grass roots that the parent seeds germinated, and that the resulting seedlings were able to establish themselves before they could be choked to death on the grass re-asserting itself after the migration of the cultivator to new ground. And why are young teak seedlings so rare now in our forest? Simply because the seedlings that spring up cannot get their roots down sufficiently deep into the soil to be able to survive the immediately ensuing long drought. In favourable years germination is of course abundant, but a complete holocaust of the young seedlings inevitably follows between November and June.

"Thus the regeneration of our scrub forests resolves itself exclusively and entirely into a question of getting rid of the grass for a few years, and the only practicable way of attaining such a desirable consummation is to admit the nomadic cultivator as our indispensable helpmate. Sceptics have only to examine the numerous object lessons still afforded by fields abandoned within the last 20 years, many of which are covered with an impenetrable thicket of saplings and young poles of teak, tinsa, &c., than which nothing could be finer.

"The Divisional Forest Officer, Betul, writes despondingly about the suspicion with which our forest villagers receive invitations to come and take up temporary fields under the system. The reason of this is not far to seek. From conversations the writer of this Report has had with some of the men, it is clear that they expect the local forest subordinates to work the system to their own profit. There is reason to fear that even in the forest villages our subordinates claim from the villagers as a right perquisites in the shape of grain, and from this to a share of the crop would, in the opinion of the unsophisticated Gond and Korku, be an easy transition, the field being in the heart of the forest and primarily intended for the growth of the trees. It rests with the Divisional Officer to remove this suspicion once for all by dealing with the villagers *direct*, instead of through his subordinates and suppressing promptly and with a heavy hand any attempt at petty tyranny and extortion. In his Divisional Officer days the writer found no difficulty in obtaining volunteers to take up for temporary cultivation land that it was his professed intention to ultimately put under a full crop of forest seedlings."

Before dismissing the question of artificial reproduction two more matters deserve to be noticed: the one as showing the extreme vitality of teak seed; the other as drawing attention to a new direction in which the energies of the Department might well be turned. Thus we read: "The teak seed dibbled in last year near Sivanjhari in the Moharli Range, in areas where the bamboo seeded gregariously, did not germinate during the year owing to the failure of the rains. When the area was again inspected after the commencement of the regular monsoons in July of the current year, it was found that a number of these germinated, the seeds being dormant throughout the year. The result of the sowing appears to be in every way satisfactory, though it has taken a full year for the seeds to germinate." And again, "The creation of bamboo forest in areas immediately adjoining well-cultivated country, where there is always a large and steady demand for the culms, cannot be too strongly urged on both economic and financial grounds. If the areas are well chosen, the net return from successful plantations will never be less than Rs.6 an acre. Once established a plantation will be able to take care of itself during the entire period of 30 to 40 years, elapsing before a general seeding can supervene. The unfavourable results obtained owing to the very abnormal conditions which have prevailed during the past two years should be only an incentive towards more strenuous efforts in the future."

In conclusion, it remains only to enumerate briefly the results of the work of the year, not already referred to above.

Altogether 5,006 forest offences were reported during the year; 294 cases were taken into Court, 3,873 cases were disposed of under Section 67 of the Indian Forest Act, and 839 cases remained undetected. Considering the widespread distress among the people, many of whom were naturally tempted to eke out a livelihood by stealing timber and selling it at low prices in the local bazars, and to contractors and others erecting famine-relief camps, the figures are very satisfactory.

The following statement shows the area closed and opened to grazing during 1899-1900:—

	Square Miles.
Closed to all animals—	
Whole year	2,085
Part of year	407
Closed to browsers—	
Whole year	6,588
Part of year	10
Open to all animals	10,004
Grand Total for C. P. ...	19,094

In the area open to grazing, 2,469,755 animals were brought to graze; 1,559,118 on payment, and 910,637 animals grazing

free. This represents a grand total of value at full rates of Rs.3,94,720; whereas only Rs.2,65,360 were actually realized, owing to concessions granted by Government.

The total outturn (in cubic feet, solid) of timber and fuel during the year amounts to 18,134,326 cubic feet: and in addition, minor forest products, including bamboos, grazing, grass, myrabolams, lac, mahua (*Bassia latifolia*), hides and horns, mineral products, &c., of the value of Rs.10,74,329 were extracted. On the subject of minor forest products Mr. Fernandez has some interesting remarks to offer.

"As in the preceding year, harra was collected departmentally in Mandla and sent to Jubbulpore, where it was sold by auction under the same conditions as in that year. It was collected departmentally also in Jubbulpore and Narsinghpur, but was again leased in Betul. This year's experience confirms the conclusion arrived at last year, if any confirmation was wanted, that departmental collection is more profitable than leasing. Orders have been issued to all four Divisions with regard to effecting an enumeration of all harra trees and to making periodical forecasts of the yield from the time the first flowering comes.

"The crop would have been a more than record one, but for the early cessation of the rains, which caused a large proportion of the immature fruit of both crops to be shed. Even then it was one of the largest known. The large supply lowered prices, but a part of this fall was due also to a slack demand from Germany. There was a sharp drop at the time certain German ships were seized on suspicion of carrying contraband of war.

"Very good work was done in Damoh in connection with the propagation of lac. 19,975 *Zizyphus xylopyra* trees were pruned at a cost of Rs.49, and lac was sown on 13,551 trees for an outlay of Rs.89. A 5-inch wide ring of a mixture of equal parts of coal tar and *gandhabiroza* painted round the stems of lac-bearing trees has proved most effective in keeping off ants. It is still a question whether departmental exploitation of lac is not better than leasing out. Under the former lease, the lessee broke off all the lac he could get at and did nothing for its propagation.

"The exploitation of mahua requires more attention than has hitherto been given to it. A wealthy Parsi merchant from Bombay dealt largely in the flower this year along the Great Indian Peninsula Railway from Jubbulpore downwards. It is worth while, as an experiment, to reserve for departmental exploitation a few areas and to carefully watch the results. There will be absolutely no expenditure required, as the usual rule is to give the collector part of what he collects. In this way the poor people will obtain their year's supply of mahua and Government will receive the full market value of the crop."

Lastly, the following statement gives the financial results of the Forest year 1899-1900 :—

	Southern Circle.	Northern Circle.	Grand Total for Central Provinces.
	Rs.	Rs.	Rs.
Receipts	3,94,925	5,49,221	9,44,146
Charges	5,15,103	6,22,525	11,37,628
Deficit	1,20,178	73,304	1,93,482

Thus, the Province shows a loss of Rs.1,93,482 on the year's working. In the Northern Circle, the very heavy expenditure of the past year is entirely due to the departmental grass operations which were undertaken with the double object (1) of supplying fodder to the Bombay Government, and (2) of affording congenial remunerative work on a large scale to the famine-stricken in every district.

"As regards (1) it was from the very outset decided that the Bombay Government should pay us only the actual cost of the grass sent to them, which it was estimated would be Rs.1,30,000 for 12,000 tons or at an average rate of Rs.10-13-4 per ton. We did not, however, foresee that although a large quantity of grass might be, as was actually the case, collected in Saugor and Damoh (at a cost of Rs.35,849), only wagons sufficient for sending away not more than 606 tons would be obtained from the Indian Midland Railway, thus causing us, in round numbers, a loss of Rs.24,000. The destruction by fire of 1,500 tons at four different depôts means a further loss of more than Rs.16,000. Again, owing to the fire at the Jubbulpore Depôt, which endangered the safety of the neighbouring houses in the Civil Station, we were not allowed to accumulate at the depôt more grass than could be pressed and baled in one or two days at the most. In consequence, early in May, when work in the fields had to be begun, we found ourselves short of carts, so that more than 600 tons of grass have had to be left in the forests, involving a further loss of about Rs.2,000. An additional loss of something like Rs.10,000 resulted from our having had to dismiss our transport early in May in consequence of receiving a telegram from the Commissioner, Northern Division, Bombay, that he would not accept a single pound of grass after 15th May. Our calculations were based on the expectation that we could send grass up to the 15th June, and actually the unexpected delay in the rains in Guzerat compelled the Commissioner to go on gradually extending the period, during which he was willing to take grass, from 15th May to 15th July. But the carts, once dismissed, dispersed forthwith and could not be got together again, and about 4,000 tons of cut grass, which might otherwise have been exported, have had perforce to be left in the forest. The four items of loss detailed

above aggregate to Rs.52,000. To this figure must be added the loss incurred on grass cut exclusively with a view to giving paid employment to the famine-stricken, a loss that cannot be set down at less than Rs.6,000. The entire total loss of Rs.58,000 is, however, fairly chargeable to famine account, and will in all probability be eventually transferred to that account.

"Thus, excluding the above figure and deducting a further sum of Rs.27,295, which appears in our accounts as payment for machinery, stores, &c., but which will shortly be recovered by book transfer from the Bombay Government, and adding Rs.32,529, the value of the grass delivered to the Bombay authorities during the month of June, but which could not of course be realized until after the close of the year, the apparent deficit of Rs.73,304 becomes transformed into a real surplus of over Rs.44,000." We have already shown that Mr. Fernandez is thoroughly satisfied with the financial results of the year, and accepts them as "a good augury for the future, when prosperity again settles over the Northern Districts of the Province."

Not so, however, in the Southern Circle. Mr. Smythies considers that "the financial outlook of this Circle is not at the present moment brilliant, and the after-effects of the famine resulting in an impoverished condition of the people will be probably felt for some time to come. Nevertheless with careful attention to the expenditure, and by fostering various sources of revenue, such as sales of timber, harra and lac contracts, &c., it is hoped that an improved state of affairs will soon be manifest."

The Conservators are not behind hand in acknowledging the excellent work done by many of the officers during a most trying year. At the same time, they are unable to hide the fact that in many cases the subordinate establishment is sadly inefficient, particularly now that scientific methods of working the forests have been introduced. Thus Mr. Fernandez writes:—"The marked increase in the number of punishments proves closer supervision on the part of superior officers. It is principally in the higher ranks that we have a number of untrustworthy or hopelessly inefficient men, who cannot, however, under existing rules regarding the infliction of punishments, be got rid of. A very large portion of the time and energy of Divisional Officers and of the Conservator is consumed in quasi-judicial enquiries, which with larger powers for dismissal and degradation in the hands of the Conservator would be much more usefully employed in devising and carrying out operations for the improvement of the forests and the raising of the revenue." And Mr. Smythies adds:—"The class of Rangers is slowly improving, but the selection of students sent to the school during the last two years leaves much to be desired, and it must be acknowledged that the staff of Foresters and Forest Guards contains in its ranks some most undesirable elements, the punishments of the year proving that many of its members are lazy, corrupt and untruthful."

Burma.*

By Max Ferrars, Indian Forest Service (Retired).

This is a beautifully illustrated work giving an interesting account of the inhabitants of Burma, a people possessing many peculiar characteristics, owing to their comparative isolation, and whose manners, customs and institutions have undergone but little change in the course of ages. The numerous illustrations, which convey a very graphic idea of the domestic life of the inhabitants of this portion of the Empire, are all from photographs executed in a highly artistic style, and in the selection of the views given great taste and skill are displayed. The scenery of the country of which many examples are shown, is remarkably beautiful, as the vegetation is most luxuriant. The volume is extremely well printed and bound in a very appropriately designed cover. In the appendices are some notes on Burmese music, with a few annotated specimens, showing that the Burmese have made some progress in the art. A useful map of the country and an index are appended. —*Imperial Institute Journal.*

* Burma. By Max and Bertha Ferrars. With 450 Illustrations from Photographs. Sm. 4to., 11 in. × 9 in. ; pp. 237. Price, 30*s.* nett.

V.—SHIKAR, TRAVEL, &c.

Cowardly Elephants.

Everybody who has had any experience with elephants, whether used as baggage beasts, as timber-draggers, or for riding purposes, knows how greatly one individual differs from another in temperament. One is always willing to do an honest day's work, another will only do it at the expense of much goading and abuse from the mahout; one staunch, another variably in its moods; one plucky and another cowardly. We expect variability among weaker animals, but it is strange that it should be so extremely pronounced in such an animal as the elephant, which, in its wild state, fears no enemy that exists in the jungle and to whom, therefore, cowardliness must not be a natural instinct.

Assuming then that a wild elephant is fearless, and I think this may be assumed as a general rule, for although a wild elephant is always on the alert, and can usually be driven without very much difficulty, it is only by unwonted sights and sounds that this is done; the feeling of fear, resulting, subsequently in cowardliness, must be acquired during captivity; but when we come to analyze the different causes that make an elephant show the white feathers, we soon find that we have set ourselves a difficult task.

No elephant, I have ever ridden, has shown itself to be quite happy when the clatter of a pony's hoofs was heard at close

quarters behind it; most elephants are afraid of barking dogs; a railway or a steamer's whistle is a sound that few elephants can hear without bolting or attempting to bolt; some elephants will shy at dark shadows, some will refuse to go through mud six inches deep; some are gun shy, and the smell of blood is too much for others. I remember shooting a green pigeon off the back of a female elephant: as a rule, a thoroughly staunch beast from whose back tigers and bison had been shot, but when the mahout tried to make her pick up with her trunk the pigeon I had shot, no sooner had she touched it, than she trumpeted and bolted about 200 yards. The bird had just fluttered as the elephant touched it, and this movement, together with the smell of the pigeon's blood, had frightened an animal many thousand times its size. It may be added that when the mahout brought the elephant back and tried to enforce his original order, it first crushed the pigeon beneath one of its forefeet and then lifted it up and gave it to the mahout. To explain these various signs of fear, we must remember two things: first, that an elephant's eyesight is extremely poor; and secondly, that it was made captive by man, and since it has been captive it has always been under the control of man, and in man it recognizes its master. It is doubtful whether an elephant can see distinctly an object 15 yards away from it; in its natural condition this weakness of sight-power is practically no infirmity; for its great bodily strength, its keen sense of smell, and—to a somewhat less extent—its acute sense of hearing are quite sufficient to secure for its safety from all possible enemies (if we exclude man), and to enable it to procure an abundant supply of food. But when domesticated, this weakness of eyesight becomes an infirmity. To consider the instance I have given of an elephant bolting at the fluttering of a pigeon. In this case the elephant, directly at the command of its master, and, one must suppose, without in any way using its little brain power, attempted to do a thing which it had done many hundreds of times before with inanimate objects (caps, daos, ankas, &c.), but on touching the object with the extremely sensitive tip of its trunk, something occurred which, in former cases, it had not experienced, and the consequence of the unexpected movement of the object, combined doubtless with the smell of blood, and the absolute ignorance of what the object was, had made the animal afraid. 'A little knowledge is a dangerous thing'; the elephant knew what it was intended to do and how to do it; but the unwonted movement of the object to be picked up was more than its senses could instantly explain, and the consequence of the uncertainty was fear. And so it is with all other causes (with one exception) which induce elephants to show fear; they have become so used to rely upon their mahouts and to obey their orders, that when anything unusual occurs, for which their weak brain power does not at once offer an explanation, they are frightened. It may be the case that an elephant has been trained

and driven by weak mahout in whom it cannot feel confidence although it realizes that it is subject to the man; if this has been the case, exhibition of fear will probably be much more frequent, and the state of fear will be more lasting, as any encouraging words from the mahout will have but little effect.

The one exception, which I have remarked on, to fear being caused by unwonted sights and sounds, is that caused by the presence of a dog. This is not universal, but it certainly is a fact that most elephants dislike dogs. Nature accounts for the dislike, which amounts to fear, by saying that in their wild state, young elephants are sometimes hunted to death by wild dogs; but I have never myself met with, or heard from, an eye-witness of a case in which even a calf-elephant had been killed by wild dogs. I am inclined to think that the smell of a dog is offensive to elephants, and certainly this seems the more probable if there is any truth in the common idea among natives of many parts of India that wild dogs blind their prey by driving the hunted animals along paths upon the shrubs in which they have urinated (the urine containing some irritant capable of temporarily blinding as large an animal as a sambhur), for though an elephant's head is carried so high that it would not fear being blinded, the irritant property in the urine is offensive either to the elephant's sense of touch or smell.

In writing of the cowardliness of elephants, I have not directly referred to their so-called sagacity. Nuttall defines 'sagacious' as 'quick in thought or scent,' and if we accept this definition we must call an elephant sagacious, for no one who has been after wild elephants can deny their keenness of scent. But I do not think this kind of keenness in any animals but dogs is called sagacity, and in dogs it is only when combined with quickness of thought that a high degree of sagacity is obtained.

I do not consider an elephant sagacious as the generally accepted use of the word. It has always appeared to me to be the slowest in thought of all animals that are trained by man, and to be absolutely lacking in reasoning power. Its lack of sagacity, its complete subordination to its master and its cowardliness go hand in hand, and it is only when an elephant has been well trained that its absolute dependency on a good mahout is of advantage to it.

LONG TOM.

VI.—EXTRACTS, NOTES AND QUERIES.

The cause of decay in Plants, and the remedy to give to them new life.

By R. R. Harding, Curator, Botanic Gardens, Toowoomba, Queensland.

The primary object of this paper is to direct attention to the results of unskilful planting of trees. I will endeavour to show that this is very expensive and unsatisfactory in the end. When we consider that it takes only a little time longer to plant trees properly, the only excuse that can be given for not doing so is that the persons who plant trees or shrubs are afraid to separate the roots for fear of killing the plant. It would be, as a matter of fact, much better to kill it then than to be disappointed in after years. Such cases are numerous in this town, and I am often asked by residents here and by others in different parts of the colony, what is the reason for their trees looking so miserable?

Before I give a practical illustration of this, I will go back to the heading of this paper "The cause of decay in Plants." Decay or disease is the antithesis of health, and, as the health of the plant means the correct performance of its functions, disease may be defined to be an incorrect performance of those functions. I believe that of all the various kinds and forms of disease to which plants are liable, none are so general or so fatal as those affecting the roots. In many, perhaps in most cases, it is extremely difficult to say precisely where disease originates, and how it is produced. It is only when we see it in some of its intense forms of development that we are aware of its existence.

On the authority of the wisest of men there is nothing new under the sun. Yet there are constantly presented to us things that appear and are to us essentially new. Take the position of a tree. Its position may be said to be unchangeable; the soil, sub-soils, atmosphere and climate may be so far unvarying as to be also unchangeable. On the other hand, the roots of the tree are constantly year by year altering their position, traversing as it were the whole surrounding area in quest of food. Moisture also performs a very important part in the nourishment of the tree and all strata of soil penetrated by the roots are not equally full of moisture, so that when the roots pass through one stratum the tree is well nourished, and on passing through another it is less liberally supplied. Atmospheric influences also materially affect the tree, and as these vary so the growth varies. Insects, too, do occasional injury to trees by eating or poisoning their foliage, hence, as the foliage is good or healthy, or the reverse so is the growth of the tree, good or bad, for that or for succeeding years. The mellow, withered, or fallen leaf in early or midsummer is not

always a sure indication of a diseased tree; indeed, it is always more satisfactory to find an evergreen tree of any kind shed its leaves freely on agitating the tree than that they should tenaciously hold by the tree after they have become withered. The decay, or the dying of leaves in some instances, evidently depends on a want of vigour or on partial rot in the roots, but in a great majority of cases it is produced by injudicious planting and after cultivation. As an instance of this, I may state that last September I was requested to inspect the avenue of Camphors growing in the Royal Agricultural Show Grounds. For the past two or three years they had looked very sick, each year getting worse, and they would eventually die if something extraordinary were not soon done to them. Various causes have been assigned for the appearance of these trees by those who have expressed their views upon the subject, but there was no difference of opinion as to their highly unsatisfactory state. Like most other places of similar extent in this part of the Downs, it is evident that the land in the area is not all alike in its suitability for the growth of trees; yet, allowing for the difference, those conversant with tree-culture will not have long to seek for the cause of this decay, which has been slowly but surely going on. The decline is not the result of old age, nor of the capability of the soil to grow and maintain the trees in a healthy condition, for a closer inspection of similar trees growing only a few yards away, confirmed my first opinion, which was that want of timely thinning and the want of nourishment at the roots, caused by bad planting, were at the bottom of it all. The questions put to me were—"Could anything be done to the trees to give them new life? Was it advisable to plant young trees between them, and when these had made a start to then take the sick ones out?" The answer I gave was—"Leave them to me, with power to act, and they will be given new life." I remarked at the time these were planted that they would never make anything else but shrubs, and that only for a time. I examined the roots and foliage thoroughly, and found that three parts of the branches were dead or decaying and the foliage scant and yellow-tinted; but on examining the roots I saw at once the cause of all the evil. The trees, in the first instance, had been planted too high, the roots when young had not been spread out; they were simply growing as if they remained in a pot, and those who know the size of these Camphors will be surprised at my saying that the roots had not extended more than 6 feet from the stem of the tree, when they should have spread 12 feet at the least. The roots showed up out of the ground 2 feet from the trunk. They had embraced and interlocked each other and on account of the scant foliage, were exposed to the full rays of the sun, and the remark I made at the time of planting was now justified. My first work was to cut out the dead yellow branches, the centre of which was found to be decayed. Then all the inside branches were taken out, the surface of the soil under each tree was forked over very

shallow, and outside the spread of the foliage a trench was dug all around the tree. Now this, of course, is the proper place to apply the nourishment, at the mouth of any tree, as here are situated the extremities of the roots, and as these feeding-roots spread out beneath the soil pretty nearly to the same extent as the branches above ground, the tree should be fed at the distance of the extremity of the branches above ground from the stem. Here Nature teaches us the lesson: The head of the tree is in the form of a dome, like an umbrella; all around the soil is exposed to the rain. And the water penetrates the earth just where the extremities of the roots are situated to receive it. In addition to this, the greater part of the rain which has washed and refreshed the leaves trickles down from the ends of the branches and reaches the ground in the appropriate spot. In trenching around the trees immediately where the branches extended, the men were surprised to find no roots. This was nothing more than my practical experience expected, because, if there had been roots there would have been no necessity to do anything to the trees; but here was the mischief. The trees were then thoroughly mulched with half-rotten straw and manure, well covering up the large crinkled roots near the stem with a good coating of it. At the extremities, where the feeding-roots should have been in the trench, the richest manure was placed, but none was forked in. On the 17th March, the care-taker being present, we found that at the extremity of the trenching, and right up to within 3 feet of the stem, the young fibrous roots had formed a mat, and it was impossible to lift the mulching without damaging these roots. Now, what I wish to draw particular attention to is this: when the men started to fork over the surface they wanted to start near the stem. This I objected to at once, and made them keep their backs to it, showing them where the mistake is often made by digging underneath any tree or shrub. Each time you turn over the soil, so many rootlets suffer, because as you proceed you keep on doubling the roots over towards the stem, and this is carried on until the work is finished, when the soil is generally raked back again. Now this is against Nature; it is similar to some one doubling your fingers back upon the wrist and leaving them there. The roots are left in that state until the next season, and then the same cruel operation is carried out again, until the roots are diseased by being constantly bruised and broken, when, of course, the tree suffers and begins to decay. The proper way to clean underneath a tree is to start just at the extremity of branches, keeping your face to the opening until finished. You need not disturb the soil near the stem of a large tree, for do what you will there you cannot improve the growth of the tree; because all roots at that place cannot feed, being too large, but you can throw some of the soil from the first remove round the stem. If you want to prevent decay, feed them just as I have explained, that is, at the extremity of the feeding-roots, and that is just where the rain

trickles down from the leaves. A practical man can see immediately what is the matter with any tree that is sickly-looking; if the top of the tree is decaying it is the fault of the tap-root entering the cold wet ground, and the remedy for this is to excavate and cut the tap-root clean off. I say clean, for the least bruise will affect the tree's future growth. If the branches wither and the leaves fall off from the lower branches, it is because the surface-roots have been disturbed and doubled back in the way I have already described. There may be some other cause, but that is the chief one. As all plants in this Colony are surface-rooted, it is advisable not to disturb them by that process. If the rootlets require separating, the best way is to get a pointed pick and work from the stem by continuous drawing; this does no harm, and the few roots that are torn up are of advantage to the tree's growth; it separates the mats of roots and draws all towards the feeding point. There is no necessity to throw any soil back, get some mulching and cover all underneath the tree with a good coating. If you have any manure especially good, I have told you where to put it.

I know of one instance where the owner, wishing to prevent the roots of a Camphor tree from coming into a bed made around the stem, placed bricks and sheet iron close round the bottom with the object of preventing its roots coming through; but very soon they got beyond this confinement; they turned upwards and now the two feet of soil is a mass of fibrous roots, and the tree has splendid foliage.

There is no pursuit wherein so much depends upon the right thing being done at the right time. As in this and in all other pursuits the man of close observation and systematic habits, who is not too proud to learn from any sources, however humble, is the one who will succeed, for there is no better guide than to seek the advice and experience of others, and by following the advice tendered it will be the means of preventing decay, and will also give to the plants new life.—*Queensland Agricultural Journal.*

Ceylon's Surplus Stock of Timber.

Experimental Efforts to Establish Trade with India.

His Excellency the Governor of Ceylon in delivering his annual address the other day, made gratifying allusion to the Forest Department, and added that an officer of the Department was about to sail for the east coast of India in order to ascertain whether a trade in timber and firewood could not be opened with the ports on the Coromandel Coast. Upon enquiry we learn from the Conservator of Forests, Mr. A. F. Broun, that already an officer in the person of Mr. H. F. C. Fyers, the Assistant Conservator of Forests of the North-Western Province, has gone to India, having left on the

11th of this month, with the object, as stated above, of endeavouring to open up a demand for the surplus timber of Ceylon. Mr. Fyers will be away about three weeks, and during that time will visit Madras, Coconada, Negapatam, and other ports along the east coast. The result of the experiment is being awaited by the Department with a great deal of interest. There is, Mr. Broun informed us, always a great demand for timber in India. On the Coromandel Coast the forests are not so extensive as on the Malabar Coast, and this is why the former has been selected. It is hoped to open up a trade both for timber and firewood, the former for use in the Northern parts of India, and the latter chiefly for the Southern Railway, and the southern parts of the Peninsula, whilst it is also hoped that ships bringing cargoes of rice to Colombo will take back to India cargoes of firewood and timber. With regard to

The Resources of Ceylon,

Mr. Broun pointed out that the population of the island is dense only in the Western portion. In the vicinity of the forests themselves there is very little demand for wood, and the Government have enormous areas of timber for which it can find no market locally, and which are now quite ready for the axe. For some years past the Conservator of Forest has had the sanction of H. E. the Governor to make such an experiment as is now being tried, but it was thought advisable to wait until more definite information could be obtained as to the extent of the supplies which Ceylon could put forth. Lately the Department has carried out a great deal of stock-taking, and with this information in its possession, the Department was in a better position to inform others what it had to offer. The question that has to be answered is whether India can obtain her supply cheaper elsewhere, and if the reply is in the negative, the prospects of an extensive trade between India, where the consumption of both timber and firewood is very large, and Ceylon are encouraging. Speaking, with reference to the

Scarcity of firewood in some parts of the hill country,

Mr. Broun pointed out that this was due to the fact that there were no forests near Colombo and the localities referred to. Most of the forests were far away on the other side of the Island, and the cost of shipping or conveyance by train made the cost of firewood prohibitive, unless an enterprising speculator would buy special shiploads of firewood and bring them round to Colombo.

Mr. Fyers hopes to secure the support of the Madras Government, because opposition from that quarter would probably lead to the experiment turning out unsuccessful. Mr. Fyers' commission is an important one, and we hope soon to hear of its success. —*Bombay Gazette.*

Destruction of Game in the C. P.

At the beginning of the present year a correspondent writing to the *Pioneer*, called attention to the extreme distress that was likely to be felt by all wild animals in such arid districts as the highlands of the Central Provinces, for want of water and grass, and appealed to the kinder feelings of all true sportsmen to spare unnecessary slaughter of animals weakened by hunger and driven by thirst from their more inaccessible fastnesses to the haunts of man.

I believe that his letter had a good effect, and certainly the Forest Department made a move in the right direction, by issuing an order with their shooting permits, prohibiting the holders from shooting over water by night. If, therefore, the jungle denizens had only run the risk of being shot by such sportsmen under sporting conditions, the mortality amongst them would have been chiefly confined to a comparatively insignificant number of mature males, who would have been easily replaced by the rising generation. That such a desirable consummation has not been attained, we have to thank the local native *shikaris* and gun-licensed villagers. They are solely responsible for the great diminution of all kinds of game, from the lordly bison to the timid karkur, and unless a radical change is made in the present system and conditions of issuing licenses broad-cast to villagers and native *shikaris*, we may look forward in the near future to find the gaur and sambhur as rare as the American bison, and a decent bag of big game a thing of the past.

Owing to the failure of the last monsoon, the rivers in the hills were nothing but a succession of pools as early as the end of December, and by the end of March these pools had disappeared in all but the deepest places. Towards the middle of June even they had so diminished in number that in the main river beds each pool was from five to ten miles apart. The hill streams were naturally the first to dry up, but before the rains broke the only running water in the district was to be found no nearer than the Nerbudda or Tapti.

Everyone knows what terrible distress the people suffered for want of water and food, and how manfully the Government coped with the difficulty by providing food, clothing and work, sinking wells and building tanks all over the country.

But though man and his working beasts were thus provided for, we do not hear or read of anything being done to alleviate the lot of the wild animals in the jungles. Surely it would have been possible even in the rush of more serious work, to have passed a regulation granting them at least the right to slake their thirst without fear of molestation from man. Unfortunately there was no illustrated paper to print photos of their protruding ribs and staring coats, or to narrate how may a noble stag and gentle doe limped to the muddy pool only to receive a handful of slugs in the side from a murderous fire-lock behind a bush not five yards

away; had there been one, perhaps their case might have received attention. It is hard to give any estimate of the vast number of animals thus slaughtered, but some idea may be formed by one instance which came under my notice in April last. An old licensed *shikari* and his son owned some fields at the foot of the hills, which were bounded on one side by a river containing two or three pools in their neighbourhood. Over these he and his son would sit every moonlight night ostensibly to protect his crops, though they consist by this time chiefly of stones and dead grass. They were only armed with a very ancient gun and a still more antiquated matchlock, but at a few yards range even these were deadly enough weapons. I passed by their hut on two or three occasions on my way to and from camp, and each time I found fresh meat hanging up to dry on the trees, or a crowd of natives eagerly purchasing at the rate of 4 annas a handful. Judging from the skulls and skins I saw, I should think they must have shot not less than a dozen small deer, a couple of nilghai, three or four sambhur, the same number of cheetal and several pig. This was only up to the end of May, and the number must have been considerably swelled during June and July, besides a good many more which I did not hear of. He being a "licensed" man, I could not do anything to prevent his shooting, and the Ranger, who lived five miles off, probably received his share of the skins to keep the Burra Sahibs off the scent. The old man told me that in prosperous times he used to get Rs. 8 or 10 for a good boar's meat in the bazaar, Rs. 8 to 15 for a sambhur, 5 to 10 for a cheetal, and so on, in proportion to size and condition of the animals. Now, however, that the people had little money to spare he had to sell cheaper; but nevertheless he made a lot more by "protecting" bare fields than ever he secured from the sale of his crops. It is the same story all over the C. P., and the number of sambhur, cheetal and bison thus murdered for the sake of the meat, horns and hide every year, is something incredible. I know of one *shikari* in the Kalibeet district who shot three very fine bull-bison besides several cows last hot weather, and yet there are scores of sportsmen who have hunted high and low throughout India and spent large sums of money in *shikar* and yet have never been able to get a shot at a bison. The game in Kashmere has been strictly preserved and only just in time. Surely the Indian Government would do well to follow a similar course in the C. P., or at least put a stop to this promiscuous issue of licenses to natives, and make it illegal for them to own fire-arms, with a heavy penalty if found in their possession. The idea of granting licenses to villagers for the protection of their fields from the ravages of wild beasts is anything but effective in practice, whatever it may be in theory. Anyone who has had experience of big game will understand that there is but little chance of sambhur, bison, or in fact any wild animal approaching to graze in fields well guarded by a

wakeful man on a *machan*. A gun is really only required to frighten wild pig, and might as well contain a blank charge for all the execution done by their slugs. While several *shikaris* have told me of their narrow escapes from being ripped up by a wounded boar when thus protecting their fields. The majority of villagers in the plains now-a-days get a sporting sahib from the nearest town with a Martini to come and do the work for them. But I have never heard of any sambhur, cheetal or bison being shot actually inside their town fields, unless a neighbouring water-hole in the river is to be included as a part of the area under protection. It would be useless to try and prevent the natives shooting females and young by written regulations or to expect them observe the close seasons as printed on the back of their licenses, any more than to expect that they will discontinue to shoot over water as long as they are allowed by the Sircar to possess guns. A man whom I found continually selling sambhur meat to the relief-work coolies, when I pointed out the risk he ran of getting into trouble by shooting in Government forests, even though he had a license, informed me that he would not get caught so long as he gave the skins to the nearest Forest Guard or Ranger. How is it possible, therefore, for our Conservators and Deputy Conservators to preserve the game when their own underlings are often hand-in-glove with the miscreants. Even if they all followed the example of one of our energetic D. C.'s and confiscated the guns of all their rangers and forest guards, it would not deter the local *shikaris* from carrying on their nefarious trade. Drastic measures must be taken and without delay, unless sportsmen will be content in the near future to spend their thousands in hunting jackals, and their evenings round the camp fire listening to the tale of how "Kalaram, the Kurku, shot three bison in one night at the pool where you shot the hare to-day, Sahib," and similar stories of the good old days.—*Asian.*

Ficus elastica and Castilloa elastica.

Two Rubber-yielding Trees Compared.

Dr. Axel Preyer, in the German *Tropenpflanzer*, makes a comparison between *Ficus elastica* and *Castilloa elastica* grown for rubber side by side near Subang in Java. The plantation visited by Dr. Preyer consists of 40 hectares (100 acres) of *Ficus* dating from 1864, but exploited since 1881. On an average of seven years, this plantation, aged 35 years, gives a mean yield of 600 grammes of solid rubber per tree per year. The yield from year to year, however, varies enormously. In 1899 the total production of the plantation was 3,060 kilogs.; in 1895 about 3,520 kilogs.; in 1896 about 1,670 kilogs.; 1897 about 3,270 kilogs. A kilogramme equals 2⅕lbs. Avoirdupois. At the same time there are astonishing variations between the trees themselves; from 100

grammes to 12 kilogs. The latter phenomenal yield was obtained one year, without apparent reason, from a tree tapped exactly in the same manner as the others. For some years past *Castilloa* has been put down, especially on the path borders, in the cultivation of Liberian coffee. Judging from the short experience of the plantation, says Dr. Preyer, the mean production of *Castilloa*, aged 8 years, would be 200 grammes of solid rubber per tree year; at the same time there has appeared the exceptional yield of 2 kilogs. As there are 400 *Castilloa* trees to the hectare and only 125 *Ficus*, the yield for the former at 200 grammes equals 80 kilogs. to the hectare and for the second at 600 grammes only 75 kilogs.; therefore even at present, despite the difference of age, there is an advantage of 5 kilogs. in favour of *Castilloa*. The rubber from the latter also fetches a higher price. In 1899 it was sold at Amsterdam at 5·20 florins per kilog. against 5 florins for *Ficus* rubber. Dr. Preyer, however, is of opinion that a plantation devoted to rubber on a large scale with European supervision would not prove remunerative even at present prices. Rubber seems to him to be an enterprise specially suited to be pursued as an accessory in other cultivations where the general expenses are already provided or otherwise.—*Indian Gardening and Planting.*

Rubber from leaves.

Dr. Axel Preyer treats in the German *Tropenpflanzer* of the practicability of extracting rubber from the leaves of rubber-bearing trees. He describes certain quantitative experiments made with the leaves of the *Hevea Brasiliensis*. In the first experiment the tree was aged 22 years; 500 leaves were treated; the latex was expressed from the leaves by manual pressure and coagulated with citric acid. Result, 0·325 gramme (about 5 grains) of utilisable caoutchouc. In the second, the plant was aged 18 months, same number of leaves and same process. Result, 0·27 gramme (about 4 grains) utilisable caoutchouc. Dr. Preyer makes the following calculation with regard to cultivation on a commercial scale. *Hevea* plants of 18 months require but 10 centimetres (4 inches) of space between them; each plant carries 40 to 60 leaves, on an average 50, which answers to ·027 gramme caoutchouc: there would then be in a hectare (2½ acres) 1,000,000 plants giving 27 kilogrammes (59½lbs. Avoirdupois) of caoutchouc, even admitting that the yield could be doubled by mechanical extraction, which is doubtful. Dr. Preyer considers that it would remain too insignificant for remunerative culture.—*Indian Gardening and Planting.*

Elephants in Burma.

The year 1899 was a most disastrous one for the Government elephants in Burma, numbers of which died from an outbreak of a disease believed to be anthrax; contractors and others suffered

similarly, and elephants to replace losses cannot now be easily purchased. Several officers have therefore suggested instituting Keddah operations in Burma and the Local Government is now in correspondence on the matter with the Superintendent of Keddah Operations in India. It seems clear, however, that operations in Burma will not be easy to arrange as there is no chance of success, unless trained men are employed on the work and money liberally spent.

The Forest Officer in charge of the Mu Division writes :—

"The Bombay-Burma Trading Corporation, Limited, increased their stock of elephants in the division to almost 100 beasts. Contractors and licensees, however, are unprovided with these useful beasts, and cannot always pay Rs.3,500 for a tusker and Rs.2,500 for a cow, which are the present prices. Advances might do something in improving extraction, but one looks with longing at the three or four herds of from 40 to 80 beasts each which roam over the division, and which are rapidly being shot down by Burman hunters for the sake of a few rupees worth of flesh. Kheddah work, too, would be especially easy in this division, as for instance in the Thaw basin, where heavy forest is not continuous and the herds are often restricted to small isolated areas."—*Forest Administration in Burma for the year* 1898-99.

VII.—TIMBER AND PRODUCE TRADE.

Punjab Rates and Prices during 1899-1900.

Jhelam and Chenab.—The average rates per cubic foot realized for different kinds of timber sold at the main sale depôts during the year 1899-1900 as compared with the preceding year, are given below :—

Class of Timber.	Jhelam Depôt.				Wazirabad (Chenab Depôt).			
	Marked Timber.		Unmarked Timber.		Marked Timber.		Unmarked Timber.	
	1898-99.	1899-1900.	1898-99.	1899-1900.	1898-99.	1899-190 .	1898-99.	1899-1900.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Deodar logs, 1st class, per c. ft.	0 14 3·3	0 14 4·75	1 1 10·1	0 12 6	0 13 1	0 13 2	...	...
,, ,, 2nd ,, ,,	0 9 6·71	0 9 1·88	0 9 5·03	0 14 5·56	0 9 9	0 9 10	0 6 11	0 7 8
,, ,, 3rd ,, ,,	...	0 5 7·05	...	0 9 3	0 7 10	...	0 6 0	...
Pine logs, 1st ,, ,,	0 6 10·36	0 7 7·63	0 5 0	...	0 7 5	0 8 11	...	...
,, ,, 2nd ,, ,,	0 4 9·76	0 4 9·80	0 1 5·4	0 3 1·89	0 5 6	0 6 7	0 3 5	0 5 6
Deodar sleepers, 1st class, each.	3 4 0	3 4 0	...	...	3 4 0	3 4 0	...	...
,, ,, 2nd ,, ,, ...	...	2 2 0·54	...	...	2 15 0	...	...	...
,, ,, 3rd ,, ,, ...	...	2 1 2·65	...	...	2 7 0	2 4 0	1 15 9	...
,, ,, 4th ,, ,, ...	1 11 7·7	1 7 10	...	...	1 11 9	1 12 0	...	...
Deodar gattus ,, ...	...	...	...	...	2 10 3	2 10 9	1 14 1	1 10 6
,, scantlings ,, ...	1 11 0·95	1 5 8·46	...	...	1 8 8	1 9 6	...	2 8 0
,, sleeper pieces ,, ...	0 14 6·2	0 10 6 43	...	0 9 6	0 12 10	0 15 6	0 11 11	0 10 0
,, scraps ,, ...	...	...	...	...	0 5 1	0 6 6	0 4 1	0 4 4

Chamba.—On 10,720 c. ft. of deodar logs sold during the year in the Lower Ravi Depôt as compared with 21,343 c. ft. sold in 1898-99, the average rate realized per cubic foot for 1st class logs was 14·03 annas and for 2nd class logs 6·36 annas, against 13·43 and 8·38 annas respectively, in the previous year. 1st class pine logs sold at last year's rates, *viz.*, 8 annas per cubic foot and 2nd class pine and fir logs at 3·45 annas and 3·04 annas as compared with 4·55 annas and 2·84 annas respectively, in 1898-99. In all 277,213 c. ft. of deodar scantlings, including pieces, were sold at an average price of 12·58 annas as compared with 238,945 c. ft. in 1898-99 at 12·29 annas; 52,954 sleepers were sold to the N.-W. Railway at 14·43 annas per cubic foot against 37,186 sleepers at 14·33 annas per cubic foot in 1898-99; 7,443 c. ft of blue-pine and fir scantlings were sold at Shahdrah, the average price being 9·44 annas as compared with 7·39 annas in 1898-99. The average rate realized at Kalatop for deodar scantlings was 15·5 annas per cubic foot, and for fir 9·68 annas.

Kangra.—The following average rates were realized for timber:—

Description of Timber.	Wazir Bhular.		Naushehra.	
	1898-99.	1899-1900.	1898-99.	1899-1900.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Deodar logs ... ... per c. ft.	0 11·4 0	0 10 2 14	...	0 5 7·36
Blue-pine logs ... „	0 4 0	0 5 0	...	0 4 0
Deodar sleepers ... each	2 7 0	...	0 13 0	0 10 10·98
„ *gattús*, 2nd class, per c. ft.	0 12 0	0 5 3·02	...	...
„ scantlings ... „	0 11·4 0	...	0 7 0	0 6 4·84
„ sleeper pieces ... „	0 9·1 0	...	0 6·7 0	...
„ „ 1st class „	...	0 14 11·79	...	...
„ „ 2nd „ „	...	0 13 6·33	...	...
„ „ serviceable „	...	0 11 2·76	...	...
„ „ rejected „	...	0 7 4·90	...	...
„ *gattús*, 1st class 5' to 10' long ... per c. ft.	...	0 7 3·81 to 0 7 8·21		
„ *karries*, 6' to 10'... per c. ft.	...	0 7 0·53 to 0 8 6·26		
Pine sleepers... ... „	0 7 0	0 8 0·82	0 7 4	0 15 0
„ scantlings ... „	0 8 0	0 7 9·45	0 5 0	0 6 0·87

Bashahr.—The all-round rates realized per cubic foot on deodar timber sold in logs from the Doraha Depôt was 10·09 annas against 10·09 in 1898-99, and for blue-pine timber 5·01 annas as compared with 4·59 in the previous year. At Phillour the average price per cubic foot fell from 9·89 to 8·95 annas for deodar, and rose from 3·74 to 3·93 annas for blue-pine.

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A new Assam Timber Tree.

By D. Prain, I.M.S., F.L.S., &c.

In October 1886, Mr. Barker, of the Forest Department, called attention to the existence of a tree which he was unable to identify, occurring at the foot of the hills in the North Lakhimpur district and known to the Assamese as the "Sia Nahor." He had submitted specimens for identification to the Forest School at Dehra Dun, but having received no definite reply he sent a flowering example to the Calcutta Herbarium. Mr. Barker's specimen was not a very good one; it sufficed, however, to show that while "Sia Nahor" belongs to the same natural order as the "Nahor" proper (*Guttiferæ*), it is not like "Nahor," a *Mesua* but a *Kayea*. The specimen sent was, as a matter of fact, tentatively referred to *Kayea floribunda*, a not uncommon tree in the lower hill forests of Sikkim, Bhootan, Khasia, Cachar and Lushai, known in Cachar and Sylhet as "Kurun" (*Wallich*) or "Kurul" (*G. Mann*). The flowers of Mr. Barker's specimen were, however, so much smaller than those of *Kayea floribunda*, that it was clear from the first that "Sia Nahor" was at least a distinct variety of "Kurul."

Nothing further was heard at Calcutta of Sia Nahor for thirteen years when, in December 1899, Mr. Young, Deputy Conservator, sent a set of specimens, this time in fruit, for identification. Mr. Young writes as follows:—"The tree is to be found on "the north bank only, and is most plentiful immediately under the "hills in the North Lakhimpur sub-division. This fact probably "accounts for its absence from Peal's list of Assam Timber trees, as "I understand his collection was confined to the south bank of "the Brahmaputra.

"The tree is large, with a straight bole 60 feet and more to "the first branches, bark grey, wood close-grained, hard and very "heavy. It is said to be very good for structural purposes, but "decays rapidly in contact with the soil."

An examination of Mr. Young's fruiting specimens made it clear that the Sia Nahor was not *Kayea floribunda*, but before preparing a formal description, fuller material was desirable. Mr. Young was accordingly asked to send flowering specimens to correspond with the fruiting ones already sent. With this request, Mr. Young very courteously complied in June 1900. These plainly showed that in "Sia Nahor" we have to deal with a hitherto undescribed species of *Kayea*. To make this absolutely certain, the material now available was submitted to Sir George King, who has kindly compared the specimens with those in the collection at Kew, and in confirming the view that the species has not before been described, has kindly undertaken the joint responsibility as to its name. A formal description of the tree is given below.

KAYEA ASSAMICA, *King and Prain*. A tall handsome glabrous tree, bark grey, wood hard, close-grained; young branches pale, slender, cylindric. *Leaves* opposite, firmly coriaceous, entire, ovate-lanceolate, base cuneate, apex shortly caudate-acuminate, nerves numerous, equal, slender, one-eighth of an inch apart, not prominent on either surface, upper surface somewhat shining, lower dull; length, 3·5—4·5 in.; width, 1·35--1·75 in.; petiole slender ·4 in. long. *Flowers*, in slender, terminal and axillary panicles, 3—6 in. long, branches of panicle short, slender glabrous, pedicels in flower very slender ·2 in. long, in fruit elongated and thickened, bracts and bracteoles at base of branchlets and pedicels 2 opposite small caducous. *Sepals* 4, imbricate, outer pair orbicular ·15 in. long, much enlarged in fruit, inner wide spathulate, apex rounded. *Petals* 4, shorter than sepals, suborbicular, ·1 in. long, thin, white. *Stamens* many, filaments free, capillary, longer than sepals; anthers globose. *Fruit* globose; covered by the thick accrescent calyx, tipped by the remains of the style, ·85 in. across. *Seed* solitary.

ASSAM; North Lakhimpur, near the foot of the hills, common, *Barker! Young!*

The species is most nearly allied to *Kayea floribunda* which, however, differs markedly in its much longer leaves, narrower for their width, with fewer more arching nerves which are much more prominent beneath; in its more copious racemes with larger flowers and in its much larger fruit which is 1·5—1·75 in. across.

Damage to Deodar Seedlings by the "cut-worm" (Agrotis ypsilon).

BY B. O. COVENTRY, I.F.S.

During the summer months of 1900, it was noticed that a considerable number of deodar seedlings from seed sown in December 1900, had withered in the nurseries at Gora Gali in the Rawalpindi Division. It was found that the withered seedlings had been cut through close to the ground and the upper portion

Earthen cocoon.

dragged down into the soil. By searching under the damaged seedlings an earth-coloured larva was found and identified as the "cut-worm" or *Agrotis ypsilon*, which is described and figured in Stebbing's book on the "Injurious Insects of Indian Forests."

A careful watch was kept over the nurseries, and as soon as a seedling was seen to have withered, search was made in the soil below it for the larva, and by collecting and destroying the larvæ in this manner, the damage in the nurseries was practically stopped. There is little doubt that had the larvæ not been caught and destroyed, a much larger number of seedlings would have been killed.

The larvæ pupate in the soil, forming a cocoon of fine particles of soil firmly cemented together. The pupa is about half an inch long and of a yellowish-red colour, the eyes and antennæ of the moth being distinctly prominent through the pupal case. Pupæ were obtained during the middle of July and a moth emerged in the middle of October.

The Burma Forest Bill, 1900.

By F. G.

The *Burma Gazette* of November 10th contains the draft of a new Forest Bill to supersede the Upper and Lower Burma Forest laws at present in force, and to cover the Shan States and the Chin Hills. The Bill differs considerably in its framing from the Indian Forest Act and from the Acts to be now superseded, but the treatment of the subject is in the main very similar. Some of the chief points of difference are indicated below.

Leave to introduce the Bill was to have been moved for on the 13th December 1900.

The Bill refers primarily to "Reserved Forests." There are no Protected Forests, the place of which is taken by *land at the disposal of Government* and by *public Forest land*. The former is defined as land over which no person has acquired rights, either permanently or by grant or lease. The latter is "land at the disposal of Government and not included in a reserved forest," and is a new invention. To a person unacquainted with Burma both definitions appear bad. Either there is no difference between "land at the disposal of Government" and "public forest land"; or "land at the disposal of Government" includes "reserved forest." But one great object of the Bill is to create reserves and unreserves, so that the term "land at the disposal of Government" requires the addition of the words "not included in a reserved forest." Again, it is understood that in the Burma "reserved forests" there are "rights created by grant or lease," as well as those created by "use," so that "reserved forests" may or may not be "land at the disposal of Government." To an outsider the two definitions are confused and unsatisfactory.

The Bill contains no provision for "Village forests," as it is stated that the experiment has been tried and failed badly in Thayetmyo and elsewhere. Another new definition is that of '*super-marking*,' which is "the unauthorised impression of a mark on timber already bearing an authorised mark legally affixed." The need for such a definition is not apparent. The question whether a fraudulent mark is placed on a log previously marked or not, appears to possess no practical interest whatever. The term "classification mark" is also new, and means "a mark placed on timber to denote its origin or the agency by which it has been handled." The term "property mark" again is new, and means "a mark placed on timber to denote that it belongs, or will, after all purchase-money or royalties due to Government shall have been paid, belong to the owner of the mark." It appears that the single term "timber mark" could equally well be made to cover both of these.

The constitution of reserved forests takes place much in the same way as provided in the Indian Forest Act. There is no Forest Settlement Court, but a Forest Officer may be appointed to assist the Forest Settlement Officer with his opinion. With respect to shifting cultivation, the Indian Act provides that the Forest Settlement Officer shall report on it separately and embody the orders of Government in his report. The Burma Bill allows him to settle the claim as he would any other claim, without a special reference. Although the Bill seems careful to call shifting cultivation no more than a *practice* which may be *permitted*, it omits to specifically deny that it is a *right*, and the word *right* is used in the marginal title to section 22. The Forest Settlement Officer is also given a new power, *viz.*, that of revising and altering his own awards at any time within a period of three months and prior to the final notification, provided that he goes through the procedure again, and provided that he cannot go behind anything that has received the sanction of Government, or has been carried into effect.

Shifting cultivation, unless expressly stated otherwise, may only be exercised by persons specially mentioned in the award. The Indian Act does not state what is to be done in the case of claims to a right of way or watercourse, beyond merely recording them. The Burma Bill enables the Forest Settlement Officer to decide on the merits of such claims, and distinguishes between "water" and "watercourse." He is not allowed to complete any transaction under the Land Acquisition Act without previous sanction, either as regards taking possession or making compensation. Both Acts allow Government the right to revise the proceedings of the Forest Settlement Officer before issuing a final notification.

The Burma Bill further enables Government within five years from the issue of any final notification, to re-open the whole matter or any part of it. The Indian Act allows nothing of the sort, but it has frequently happened that many years after a forest has been duly settled under section 34, a Government has taken upon itself

to say that the proceedings were not satisfactory, and ordered a new settlement. Such a course is probably illegal, but as the object has always been to increase privileges or rights, it has never been disputed. The Burma Bill further provides that Government may withdraw from any proposed reservation by notification in the *Gazette*, and thereby void the prohibition against clearing land, &c., which is entailed by the preliminary notification. The translation of a final notification, which, in India is published by the Forest Officer, is in Burma to be published by the Deputy Commissioner. The Bill further provides that rights to shifting cultivation, to pasture, or to produce, which are disused for five consecutive years, *may* be notified as extinct. Considering the pernicious nature of rights as compared with privileges, it is a pity that the extinction is merely permissive. The diversion of rights of way is allowed, provided that another suitable way already exists or has been provided *by the Forest Officer*. Why it cannot legally be provided by any other officer or landowner is a mystery, but the Indian Act is the same. The poisoning of water is forbidden by the Bill itself, but dynamiting is left to the possible rules.

Chapter III. is not very satisfactory. It apparently refers to unreserved forests, but the heading is "General protection, &c., of Forests and Forest produce." The marginal title of section 30 is '*Reserved trees in unsettled tracts*,' but the clause itself provides that all teak trees, *wherever situated*, &c., are royal trees, and that other kinds may be declared royal. Section 31 protects reserved trees. Section 32 declares that all manufactured catechu, timber, charcoal, &c., &c., whether from Government lands or *from other lands* may be made subject to royalty dues. Section 33 provides that *any person may use* the forest produce on "public forest land," except as may be reserved. It is hoped that this wording will diminish the opportunities of forest guards, but considering that no man may approach a Commissioner or a Tahsildar, or exercise any of his common rights without the usual douceur, the hope is sanguine. Nevertheless the wording is clear and good. Stone and lime are omitted from forest produce in these lands, and considered a revenue perquisite, which is an unnecessary complication considering that the forest suffers. The transit rules are modelled on those of India, but drift and waif is considered to be "in transit." There are to be "rafting stations" on the rivers, and all timber afloat below such station, unless in rafts under control, is "adrift." Apparently there can be no drift-wood above a rafting station, and none in a river without rafting stations, unless Government has notified the area. It is laid down that any suit following a Forest Officer's award as to drift-wood must be subject to the provisions of Section 424, Civil Procedure Code.

The arrest of forest offenders is only allowed if the offender refuses his name and address, or gives a false one, or is likely to abscond, as in Madras. Consequently offenders will have a good

time. An attachment mark may be placed on the *receptacle* of property attached. A convicted offender no longer shall be punish*ed*, but punish*able*, in various degrees; for trespassing, damaging by negligence, poisoning water, or breach of *Shikar* rules, up to Rs.50 or double, if the damage is more than Rs.25; for more serious offences, the Indian penalties. Section 57 provides that when fires are caused, &c., *by persons having rights*, the rights may be curtailed, but the recognition of common responsibility for common rights is absent. The refusal of assistance by persons bound to render it is made a forest offence punishable with one month or Rs.50 fine. The *stated* object of this is to do away with the need for recourse to the Indian Penal Code, so that the forest guard may be able there and then to arrest the person refusing and so convince the others of the expediency of rendering aid promptly. But it has been forgotten that such person can protect himself from arrest by simply mentioning his name and address. The offence certainly does become compoundable.

In both the Indian Act and the new Bill, the release of property under attachment when an offence is compounded is ill-provided for. Both laws allow property seized to be released only "on payment of the value thereof as estimated by such officer." If a guard seizes a cart and pair of bullocks employed to carry off a small log, the Forest Officer can compound the offence for, say, Rs 5, but he cannot legally release the cart and animals, unless he deliberately and falsely values them at a few annas which the offender must pay in addition. It cannot be the intention of the law, either that an officer should have to resort to such a subterfuge, or that a five-rupee offence should carry a hundred-rupee subsidiary penalty.

Section 65 provides that a convicting Court may not only punish the offender and order him to pay compensation in addition (as in the Indian Act), but fixes a limit of Rs.10 per tree or log. It goes further, and provides that unless the offender's employer can satisfy the Court of his non-complicity, the employer shall pay the compensation instead of the offender. The principle is good, it remains to be seen how the Courts will work it. A Forest Officer duly empowered may release property seized only if it is *not the property of Government.*

It may not be out of place here to draw attention to a serious flaw in the Indian Act. The *only* action which is an offence under the *law itself* (as distinguished from *Rules* which are seldom made) in a Protected Forest, is *setting fire to such forest*, the most serious offence possible (section 32 *d*). Yet section 63 forbids *any* arrest in Protected Forest, except for a contravention of some prohibition under section 29 *c*. Now section 29 *c*. allows Government to prohibit the removal of produce, the clearing of land, &c., but makes no mention of incendiarism. Consequently an incendiary can in nine cases out of ten set fire to a protected forest and laugh at the Forest Guard who catches him.

The Burma Bill makes no reference to the management of forests partly owned by Government (Section 79, Indian Forest Act), nor does it allow private owners to place their forests under State management (Section 38, Indian Forest Act), nor does it make any provision for the protection of mountains, river sources, &c., against erosion and disforestment (Sections 35 and 36, Indian Forest Act).

A Note on the Forests of Arrakan.

By E. P. Stebbing, I.F.S., F.E.S.

Reasons for visiting Arrakan.—Having experienced considerable difficulty in working the Rules for the extraction of Forest produce in the Chittagong Division owing to the importation of unmarked timber and boats from the Arrakan forests, I last year paid a visit to the Deputy Commissioner of the Akyab District in Arrakan (Burma) in order to confer with him on the subject. The Akyab district adjoins the Chittagong one on its southern and south-eastern boundary.

I went down to Akyab by sea from Chittagong, returning by the inland route, and it was during this return journey and a trip up the Kolandyne River that I was able to make a few observations on the Arrakan Forests. Having to return to my own Division with all despatch, I had but three days at my disposal, and it is due to this and to the fact that I was unable to leave the main water channels and roads that my notes are far from being as complete as I should have liked. I am of opinion, however, that the following short history of these forests with which I have incorporated my own observations will not improbably prove interesting and may be the means of redirecting attention to their possibilities.

Previous Reports on the Arrakan Forests.—I was aware, previous to my visit, that there was no proper Forest conservancy in Arrakan, and my enquiries on the subject brought to my notice the fact that two reports had been written on the Arrakan Forests. The first was a Report on the Pyinkado Forests of Arrakan by Dr. Schlich, C.I.E., 1869, and the second a Report by Mr. Nisbet.* I propose to first glance at the reasons which led to these reports being written and then to summarise briefly the chief facts with which they deal.

Report on the Pyinkado Forests of Arrakan by Dr. Schlich.—The question of the desirability of taking some care of these Arrakan Forests had been under consideration so far back as 1856, in which year the Commissioner of Arrakan addressed the Principal Assistant to the Commissioner of Sandoway with reference

* A copy of this Report has not been forthcoming although several attempts have been made to procure one.

to an endeavour to prevent unauthorized fellings by private purchasers of the ironwood (Pyinkado) trees. This led (apparently) to the drawing up of a set of rules (dated 18th August 1863), which received the Government of India's approval. In August 1865, an amended set of rules was published. Trees under 4½ feet girth were prohibited from being felled. Permits for felling were issued by the Deputy Commissioner, the price paid being Re.1 per tree. As an incentive to catch offenders half the fines realised from contravention of these rules were paid to informers.

These rules in their amended form were also passed by the Government of India.

In April 1868, the Conservator of Forests, British Burma, was informed that the Chief Commissioner had under his consideration the advisability of enquiring into the state of the Arrakan Forests, and Dr. Schlich, at that time Special Assistant Conservator, was deputed for the purpose and went down to Akyab, the capital town of Arrakan, to take up the work. The report that was the outcome of this enquiry refers chiefly to the Ironwood Forests of Arrakan and was compiled after a tour of inspection in the forests from the beginning of January to beginning of April 1869. The forests visited during this period were those situated between the Kolandyne River on the north and the Khwa khyoung to the south. The Pyinkado forests, however, mainly exist between the An khyoung River on the north and the Sandoway River on the south.

The report is divided into five sections :—

1*st*.—Description of Forests in Arrakan generally.

2*nd*.—Description of the Ironwood Forests.

3*rd*.—Present management.

4*th* —Proposed management.

5*th*.—Remarks on trees other than Ironwood.

These sections are chiefly summarised below :—

1*st*: *Description of Forests in Arrakan generally*.—Arrakan for topographical purposes may be divided into three belts, consisting of—

(*a*) The low lands bordering the seaboard and intersected with numerous creeks.

(*b*) A belt of rising land covered by the "dry forests."

(*c*) The hills (Arrakan Yoma) which are covered with evergreen forests.

(*a*) *The Mangrove Forests*.—In the seaboard belt grow in great profusion mangrove forests with other trees interspersed. It is also the seat of the paddy cultivation.

(*b*) *The Pyinkado or Ironwood Forests*.—The centre belt (*b*) is the one in which the Pyinkado or Ironwood forests chiefly flourish, although trees have been met with up to 1,000 feet elevation. In addition many other kinds of trees are found in this belt.

(c) *The Evergreen Forests of the Arrakan Yoma.*—In the mountain belt grow other varieties of trees, and Dr. Schlich mentions the curious fact that 'Eng' trees which in Pegu grow in the driest ground are here found in the midst of dense evergreen jungles. The forests in this belt include a most luxuriant growth of bamboos which is stated to extend over thousands of square miles.

2*nd: Description of the Ironwood Forests.*—The great mass of the Forests occupy a central position in the Province of Arrakan, which lies about north to south. This position may be roughly defined by a stream called the An khyoung on the north and the Sandoway River on the south. The length of the belt may be taken roughly at about 80 miles with a mean breadth of about 10 miles. North of the An khyoung up to the east bank of the Kolandyne, the trees rapidly diminish and are only met with in small patches. Dr. Schlich did not examine the country north of the Kolandyne (in which my own trip was made), but believed the forests there were similar to those on the eastern bank: south of the Sandoway River the forests rapidly disappear, though trees are met with at the Khwa khyoung, the southern boundary of the Province. Pyinkado is also found on the islands west of the seaboard.

As a whole, these forests were considered to produce timber of an inferior character, the shape and height of the trees not being good when compared to those of the Pegu Forests. In addition more hollow trees were found in the north than in the southern part of the tract. Their powers of reproduction are good, and they are not injured by jungle fires. Their great enemy was said to be the Toungya cultivation, and Dr. Schlich advised that this method of cultivating should be put a stop to. The timber was said to be limited in use, but in the five years, 1864—1868, 70,000 sleepers were exported for the East Indian Railway and 2,399 for the Eastern Bengal Railway. Dr. Schlich considered that in a few years it would be possible to export 50,000 sleepers annually. With reference to this estimate I have only been able to obtain information of the following export of sleepers from Arrakan since Dr. Schlich's Report was written. In 1876-77, Major Seaton reported that 10,000 sleepers from Arrakan sold in Calcutta at Rs.5 each whilst in 1884-85, 17,631 were sold at Rs.2-1-0 each. Further, I discovered that 60 tons of sleepers, valued at Rs.3,600 in the Customs returns, were imported into Chittagong from Akyab during 1899-1900. It would be most interesting to ascertain in how far this export of sleepers continues, and if it does so, the number exported annually and the revenue credited to Government on the transaction.

3*rd: Present Management.*—I have above mentioned that Rules were framed in 1866 for the extraction of Pyinkado,

Dr. Schlich states that the annual number of trees cut between 1864-65 and 1867-68 was only 3,624 exclusive of trees felled without authority. This he considered to be far below the natural capabilities of the forests, he having roughly estimated that there were four million Pyinkado trees in the Arrakan forests with a girth above 3 feet. Apparently the number of trees cut with authority at the present day is not very large, but an inspection of the area is necessary to show whether it is not probable (as, from what I saw taking place in the north of the Kolandyne River, I more than suspect to be the case) that the forests are being worked nearer to their capabilities than is imagined, and that merely to put money into the pockets of traders.

Dr. Schlich mentions that 'Thugyis' or native revenue collectors were placed in charge of the forests, and considered that such an arrangement was a faulty one. At the present day native township officers are in charge north of the Kolandyne and probably this is also the case in the forests to which Dr. Schlich alludes. As will be shown later on, this plan would not appear to be a successful one.

4th: Proposed Management.—Dr. Schlich, whilst being adverse to the reservation of the Arrakan Forests for the *present* (*i.e.*, 1869), advocated the following protective measures being introduced and enforced, an establishment being entertained for the purpose:—

1. Forests to be protected from unlawful cutting. This rule is certainly not enforced in the Forests to the north of the Kolandyne at the present day, and the Deputy Commissioner at Akyab himself told me that he considered a Forest Officer at Akyab would be useful to enable illicit cutting to be stopped and better supervision exercised.
2. From injury (wilful).
3. From Taungya cultivation.
4. From the granting away of waste lands in the forests.
5. From conflagration. I am not aware if this protection was extended to, and put in force in, the southern forests, but it is not exercised over the northern ones. In the latter part of March 1899, fires were to be seen both crowning the heights and encircling the hill sides, a sight which the Forest Officer knows well spells ruin to these forests. The establishment proposed to enforce the working of the Rules, consisted of—

1 Officer (a Senior Deputy Conservator).
2 Orderly peons.
2 Forest peons.
1 Office Clerk.
1 Office peon.
1 Depôt Clerk.
1 Burmese writer.
10 Goungways.

It was never entertained.

5th : Remarks on Trees other than Ironwood.—Little is said in the Report about trees other than Pyinkado. Dr. Schlich proposed that samples of various woods should be sent to Calcutta on trial.

I have extracted from the Report and given in Appendix A the list of trees noticed by Dr. Schlich as appearing in the forests he inspected.

Summarising Dr. Schlich's Report, it was held (in the Local Government Resolution thereon) that, on the whole, it did not appear that any special case had been made out for conserving the Arrakan Forests or for placing them under the Forest Department. I will take the reasons on which this conclusion was based in detail later on and will attempt to show how conditions have materially changed since this opinion was formed in 1870, thirty years ago. Personally I am of opinion that the change is so great as to warrant the deputation of a Forest Officer to examine the forests and reconsider the decisions arrived at in 1870.

(To be continued.)

II.—CORRESPONDENCE.

Isolation of the Cells of Plant-Tissues.

It is sometimes desired to isolate the individual cells of which plant-structures consist. For this purpose the means hitherto employed have been caustic potash on the one hand, and various strongly acid re-agents on the other, such as nitric acid and chlorate of potass. Professor Oswald Richter has now discovered (or at any rate published some observations on) the use of strong ammonia water for the same purpose. He claims that concentrated ammonia separates the cells quickly and attacks their walls or contents less than other re-agents. The result is obtained, in a cold solution, after 2 to 15 days. At about 40° C., it requires about 8 hours to 4 days. At boiling heat, 1 to 30 minutes suffice. The tissue is first cut into thick slices with a knife. Hard tissues, such as wood, epidermis, &c., may require teazing out with needles, but ordinarily a gentle pressure with the finger suffices to break down the tissue into its elements.

G.

The Planting of Mango Groves.

The following brief account of the method employed in Thana, Bombay Presidency, for the planting up of open spaces with mango grafts, may interest some of your readers, who have not had experience in such planting.

Pits 4' × 4' are dug and left open for three or four days. Grass and dead leaves are then placed in the pits and burnt so

as to destroy the roots of any other trees that may happen to be there.

Fresh earth from the margin and bed of dried-up tanks, and from cultivated rice-fields is brought and the pits are then filled up, each with an alternate layer of tank-earth and field-earth. The sites of the pits are well watered daily for about 8 or 9 days.

The mango grafts are brought growing in earthenware pots. Holes 1 to 1½ feet deep are prepared in the sites of the old pits and in them the grafts are inserted. But before insertion a little fresh earth from the spoil bank above is thrown into the holes to render them shallower and a layer of cowdung ashes is spread over this. It is needless, perhaps, to remark that the earthenware pots in which the grafts exist are broken and that the resulting ball of earth surrounding the roots is inserted in the holes.

More earth is then thrown into the holes and carefully arranged with the hands around the ball of earth surrounding the roots. Then a second layer of cowdung ashes is applied, and over this another layer of earth. When the holes are completely filled, a third layer of cowdung ashes is placed at the surface surrounding the stem, and the ground is well watered.

The graft is now established and the grafted portion of the plant is on a level with the surface soil. In order to induce the plant to grow erect, a bamboo support is tied to it.

One month or 1½ months after planting the stock is pruned near the summit, and six or eight months after it is cut off almost down to the point of the graft.

The three layers of cowdung ashes are applied to prevent the roots being attacked by white-ants, etc.

Mr. Jagannath Damajee, an expert in planting mango grafts for he has established over 2,000 plants successfully in Thana informs me that when the plants are 3 to 5 years old, a layer of salt, about an inch or two deep, should be placed round the stem, commencing at a radius of about 1½ feet from it—to further protect the plants from insects' attacks.

He forms mounds of earth round the stems during the rains at this age of the plants and removes them (the mounds) in the hot weather.

G. M. R.

Attacks of Hyblœa puera on Teak Trees.

Under this title a note by Mr. L. S. Osmaston appeared in the October Number of the *Indian Forester* on the subject of the defoliation of teak seedings in a forest nursery near Poona.

In an Editorial note the name of the moth is given, and I wish to point out that there is a discrepancy between the description of the habits of the defoliating larva as described by Mr. Osmaston and the identification of the moth as determined by Mr. W. H. Peal of the Indian Museum.

Mr. Osmaston states, "Pupation is carried out in the rolled-up end or edge of a teak leaf." The moths sent by Mr. Osmaston have been determined by Mr. Peal as *Hyblœa puera*, Cram. Now *Hyblœa puera* is a noctuid moth and its larva pupates in quite a different manner. When full fed, it lets itself down from the leaves of the teak by silken threads and pupates on the ground. The pupa is formed in a flimsy cocoon which is often attached to dead leaves on the ground. It never pupates in the rolled-up edges of the teak leaves. It follows that the larva observed by Mr. Osmaston cannot have changed into the moths sent by him for identification. The discrepancy is, however, I think, easily explainable, when it is remembered that a noctuid larva is fond of concealing himself during the day, coming out to feed at night.

In both Burma and Berar, it has been noticed that *Hyblœa puera* works in couples, so to speak, and is almost invariably accompanied by a small moth, named *Paliga damastesalis*, belonging to the family *Pyralidæ*, the habits of whose larva are identical with that described by Mr. Osmaston. His description of the colour of the caterpillar, as far as it goes (he makes mention of no markings which makes comparison difficult) varies, but I am of opinion that it will not improbably prove to be *Paliga damastesalis*. The larva of this insect (see "Injurious Insects," page 120) changes to the pupal state within the rolled-up leaf or edge of a leaf, this stage lasting 8 to 11 days. Its length is about half inch to one inch long. This tallies with Mr. Osmaston. But the colouring of the Burma insect, as given by Colonel Bingham, Conservator of Forests, is as follows:—

"Colour pale, sap green: two lines of purplish spots along middle of back, head yellow, a few pale erect hairs scattered over each segment. Larva strips teak of all foliage."

The larva in its different stages of moulting before it becomes full-grown, would of course vary in colour. The moth, however, is a pearly white insect, with numerous tiny red spots and cross-bands on its wings. It is figured on page 120 of my book, and perhaps Mr. Osmaston would kindly let us know whether it was noticed on the wing in the nursery. The insect is known as the "Teak leaf-roller."

I have described in "Injurious Insects" what we at present know of the life-histories of these two pests. We have yet to find out definitely:

(1) The number of broods each has in the year. It would appear to be two, but the point has not as yet, I think, been finally settled by close observation.

(2) The stage of their metamorphosis in which the insects pass through the winter, and where. This is important, as it determines to a certain extent the steps to be taken to counteract their attack.

Mr. Osmaston asks for any methods to prevent the latter. I would recommend the following for trial in a nursery if possible, but it will not improbably be found that the insects will be more easily dealt with in the winter stage when we have discovered where it is passed.

For Hyblæa puera.—We know the insect has at least two broods in the year. When the larvæ have left the leaves and dropped to the ground and pupated there amongst the fallen leaves, collect them off the nursery-beds and burn them. Numbers of moths who would later on appear and lay eggs will thus be got rid of, and at the same time the danger of an accidental fire running through the young teak plants will be obviated.

For Paliga damastesalis.—The larva pupates in the ends of the rolled-up teak leaves. Go over your plants and snip off the rolled-up ends of the leaves and burn them. The work can be done by the nursery *malis* and would not entail extra expense or very little, and it will minimise the danger from the second brood, which will appear later on in the year.

E. P. STEBBING.

The Origin of Forest Fires.

It is so often stated that forest fires are generally the result of accident or arise from natural causes that it may be of interest to mention two experiences which befell me during last fire season in a district where "accidental" fires are an every-day occurrence.

On the first occasion I was returning from my morning inspection of a forest, which was everywhere as dry as tinder, when I observed a small column of smoke arising at the side of the path, a little way ahead of me. On going up to see what it meant, I found a small pile of cowdung surrounded by a heap of dry grass. Still closer investigation revealed that some dry dung had been set well alight and covered over with fresh dung which would keep up a smouldering fire for some time before blazing up and setting fire to the surrounding pile of dry grass.

On the other occasion I found a piece of thoroughly dry fibre rope, about 5 feet in length, lighted at one end and burning away slowly; the other end of the rope was stuck in a heap of dry leaves and grass.

Both expedients appeared to me admirably suited to causing "accidental" fires and to giving the ignorant originator ample time to make himself scarce before the fire became visible.

I have now ceased to believe in fires, "accidental" or "natural."

M. R. RY.

III.—OFFICIAL PAPERS AND INTELLIGENCE.

Burmese Rubber-yielding Plants.

The following table of rubber-yielding plants found in Burma has been prepared by Mr. F. B. Manson, Conservator of Forests. It should be found useful as a table of reference. Very little is known regarding the commercial value of the produce obtained from many of the plants; but the collection of latex of various kinds has been taken in hand and will be sent to Professor Dunstan for analysis.

No.	Botanical name in "Flora of British India" and in Kurz's "Forest Flora of British Burma."	Burmese or English name.	Habitat.	Degree of frequency.	Value of the produce as far as known. References, &c.
	Sapotaceæ.				To the *Sapotaceæ* belong trees with milky juice. (*Kurz II., 116*). Gutta-percha is produced by Sapotaceous plants principally.
1	Chrysophyllum Roxburghii, *G. Don.*	Thankya, Thangya. (The star apple.)	Tropical forests of Pegu...	Rather rare ...	Not known. Trial suggested by Dr. Prain in his letter No. 95M., dated 13th March 1899.
2	Sideroxylon grandifolium, *Wall.*	Taw-tha-pwot, Thuttabat, Taw-thabut.	Martaban hills between Bilin and Sittang rivers.	Not stated ...	Ditto ditto
3	Sideroxylon ferrugineum, *Hk. and Arn.* (Syn.—attenuatum, *A. DC.*)	.....	Malay Peninsula, Mergui to Singapore.	Do. ...	Ditto ditto
4	Sideroxylon tomentosum, *Roxb.*	Thitcho ...	In the dry *eng* forests of Prome district.	Not unfrequent ..	Ditto ditto
			Pegu, Irrawaddy Zone ...	Rare.	
5	Achras Sapota, *Linn* ...	Twot-ta-pat, Tut-da-bat, Thutta-pat.	Cultivated in Rangoon Tavoy and other stations (*See Fl. Br. Ind.*, 534.)	Frequent ...	The Australian gutta is the produce of A. australis. "*Le Caoutchouc et la gutta-percha*" *par E. Chapel, Paris*, 1892, *page* 543.
6	Dichopsis polyantha, *Benth.* (*Syn.* Isonandra polyantha, *Kz.*)	.....	Koladyne district, Arrakan	Rather rare ...	Yields a good quality of gutta-percha, in large quantity, probably little inferior to that of Singapore (*Dict. Econ. Prod. D.*, 393). Contains about equal percentage of gutta and resin (*Cantor Lectures, Dr. Obach, page* 22).
7	Dichopis obovata, *Clarke.* (*Syn.* Isonandra obovata, *Kz.*)	.....	Tropical forests of Tenasserim, Moulmein, *Dr. Falconer.*	Said to occur in considerable numbers.	A fair sort of gutta-percha (*Kurz*). Almost valueless, very brittle. (*Kew Bulletin*, 1892, *page* 215.

					Dr. Obach, Cantor Lectures on gutta-percha, page 50, says that the gum of Dichopsis obovata, *Teysmann*, is quite useless as a substitute, as it has neither strength nor tenacity. It is almost completely soluble in cold ether, and does not contain any appreciable amount of true gutta.
8	Dichopsis Helferi, *Clarke*. (This species is closely allied to the last.)	.....	Tenasserim, Tavoy ...	Not stated ...	Is reported to yield a good quality of gutta-percha. (*Dict. Econ. Prod. D.*, 388,389).
	Dichopsis elliptica, *Benth.*	The Indian gutta-percha, Pala gum Panchoti pala, *Tam.*	Malabar	Common ...	See report by Mr. David Hooper, F.C.S., F.I.C., in *Kew Bulletin*, 1892, page 296. *Gamble, Man. Ind. Timbs., page* 242, says, it affords an inferior description of gutta-percha. This tree as well as Dichopsis oblongifolia (*Burck*) and Dichopsis Gutta (*Benth.*), the true gutta-percha, may be found in Tenasserim and could probably be cultivated without difficulty. (*See Dict. Econ. Prod. D.*, 384.) *Note.*—Dichopsis Gutta, at Penang, grows best on hillsides.
9	Bassia longifolia, *Linn.* (?)	Kanzaw Kanzo (*Aplin*) Mèzè (Upper Burma) Kbanskwa (Karen).	Forests at headwaters of Yè and Kaleinaung rivers, *i.e.*, in north of Tavoy district on the borders of evergreen forest. Also found in the south of Mergui district and in Upper Burma.	Do. ...	Unknown.
10	Bassia Lobbii, *Clarke*. (Possibly a Payena.)	.....	Amherst district, banks of Ataran river.	Not stated ...	Unknown.
11	Bassia caloneura, *Kz.* (*Syn.* Isonandra caloneura, *Kz.*)	.....	In tropical forests of south Andaman. (May probably be found in Mergui district.)	Frequent ...	Unknown. "A very obscure plant." (*Fl. Br. Ind.*, 546.)

No.	Botanical name in "Flora of British India" and in Kurz's "Forest Flora of British Burma."	Burmese or English name.	Habitat.	Degree of frequency.	Value of the produce, as far as known. References, &c.
12	Payena paralleloneura, *Ks.*	.....	In tropical forests of Martaban and Tenasserim, Mergui, *Helfer.*	Frequent ...	Unknown. (*See Dic. Econ. Prod. D.*, 387, *No.* 10), Gutta sundek, the second best commercial form of gutta-percha, is at present unidentified. "It may prove a species of Payena." Citons entre autres le Payena Leerii qui produit la gutta sundek. (*Le Caoutchouc et la Gutta-percha par. E. Chapel, Paris*, 1892, *page* 532.) Payena Maingayi (*Clarke*) "abounds in gutta-percha (Maingayi)." (*Fl. Br. Ind.*, 547.)
13	Mimusops littoralis, *Kurz.* [Allied to Mimusops Kauki, may prove to be a new genus (*Fl. Br. Ind.*, 549.)]	Kappa-lee, Kappali, Katpali. (Andaman Bullet wood).	Tropical forests along the coasts of the Andamans; also in Upper Tenasserim, forming nearly pure forests on the level lands, behind the beach and in the mangrove swamps.	Common ...	The genus *Mimusops* contains trees abounding in milky juice (*Kurz's For. Fl. II.*, 122, 123) cf. M. Balata. (*Dict. Econ. Prod., D., No.* 18.)
14	——Elengi, *Linn.* ...	Khaya, Chaya, Kaya.	In tropical forests of the Andamans; also Martaban and Tenasserim; frequently cultivated in other parts of Burma.	Do. ...	Yields the pagoda (pogada) gum of Madras, regarding the composition and properties of which no information is available. (*Dict. Econ. Prod. M.*, 571.)
15	——Kauki, *Linn.* ...	.....	Burma, at Amherst, *Wallich.* (*Fl. Br. Ind.*, 549.)	Not stated ...	Yields a gum resembling Balata. (*Dict. Econ. Prod. M.*, 591 *and* 593.) Venezuela gutta is the produce of M. globosa, *Gærtn.* "*Le Caoutchouc et la Gutta-percha*" *par E. Chapel, Paris*, 1892, *page* 542.

	Apocynaceæ.				
16	Willoughbeia edulis, *Roxb. Syn.*—martabanica, *Wall.*	Thitkyouk-nway, Thitchauk nwè. Possibly Talaingnô.	Pegu, Martaban, Malacca	Common ...	"Mr. W. T. Thistleton-Dyer read a paper * * * before the Linnean Society, Proceedings, June 1882, page 35, in which he discussed the *Apocynaceous* India-rubber plants of the Malaya and tropical Africa. He pointed to the interesting fact that these all belong to the tribe *Carisseæ*." * (*Dict. Econ. Prod. I.*, 55, *page* 340.) Caoutchouc, or a substance similar to it, is supplied by several of the climbing members of this family, and that of *Chavannesia esculenta* and *Urceola elastica* is said to be equal to the genuine one." (*Kurz For. Fl. II.*, 162.) "Yields much caoutchouc" (*Fl. Br. Ind., III.*, 624.) "All the species of *Willoughbeia* are supposed to yield caoutchouc" (*Fl., Br. Ind., III.*, 623). "Yields an inferior sort of caoutchouc" (*Kurz II.*, 165). "The Malaya or Borneo rubber" (*Dict. Econ. Prod., W.* 88). The table given in the Dict. of Econ. Prod. I., 55, page 341, shows that the imports of *Willoughbeia* rubber were more important than any, except *Hevea* and *Landolphia* (with *Vahea*). "The exports for last year (1897) from Penang were, "Gutta Rambong" (*Ficus elastica*), 4,650 piculs; "Gutta-gusu" (Willoughbeia), 830 piculs." (*Cantor Lectures, Dr. Morris, loc cit., page* 790.) Kurz's opinion of the product of *W. edulis* agrees with recent experience, and the valuation of the

* NOTE.—This is not now exactly the case. *Urceola* and *Parameria* belong to a different tribe as do *Kickxia* (Lagos silk rubber), and the Guiana or Jamaica rubber which is yielded by species of Forsteronia. (*See Cantor Lectures on "Sources of Commercial India Rubber" by Dr. D. Morris, M.A., C.M.G., published in the Journal of the Society of Arts of the 29th July 1898, page 750.*)

No.	Botanical name in "Flora of British India" and in Kurz's "Forest Flora of British Burma."	Burmese or English name.	Habitat.	Degree of frequency.	Value of the produces, as far as known. References, &c.
					Talaingnô gutta; but it seems probable, that some other species of *Willoughbeia* may have been collected. *Willoughbeia firma* Blume, of Singapore, Sumatra and Borneo, which yields *gutta singarip* (*Fl. Br. Ind.*, *page* 625), may possibly be found in South Tenasserim, and may prove to be a source of Burma rubber. This is the "Manungan pulan" (Manungan proper) of Borneo "yielding some of the best rubber in the Malay Peninsula and Sumatra." (*Dr. Morris, Cantor Lectures:—Sources of Commercial India Rubber, Journal Soc. of Arts of 29th July* 1898, *page* 793.) Messrs. Geo. Henderson furnished a report by Messrs. Jackson and Tells on a sample of the product of a Talaing milk creeper, which was probably a species of Willoughbeia. It was described as an inferior gutta-percha; very unsaleable; head low white; value nominal, 3*d.* to 4*d.*, dated London, the 2nd October 1886. (*Secretariat files.—Subject, Talaing milk creepers?*) "*Willoughbeia Burbidgei* of Singapore yields the rubber known to commerce as *Gutta-Singgarip*" (*Dict. Econ. Prod. I.*, 78).

					"There are to be found growing in the forests of the State (Perak), besides the well-known *Ficus elastica*, a tree which attains immense dimensions, several creepers belonging to or nearly allied to the genus *Willoughbeia*, which produce India-rubber of excellent quality (*The Singapore and Straits Directory*, 1896, *page* 193). "Willoughbeia edulis, a large climber, with long tendrils, native of India and the Malay Archipelago, is sometimes cultivated for the sake of its berry, outwardly resembling a mango. The plant yields a pure white viscid juice, which is changed by exposure into an indifferent kind of India-rubber. *W. Zeylanica* of Ceylon, with a large handsome fruit—a favourite food of monkeys—yields a "putty-like substance, with scarcely any elasticity." (*Dr. Morris Cantor Lectures loc. cit., page* 788. Cf. page 793, concluding remarks regarding Borneo rubber.) "The *latex* is fluid and nearly white." (*Le Caoutchouc et la gutta-percha, par E. Chapel, Paris*, 1892, *page* 244.) "It is reported that in tapping these Landolphias, the rubber is spoiled if the cut be made too deep, as the milk obtains an injurious gum." (*Dict. Econ. Prod., I.*, 94, *page* 373.)
17	Landolphia Kirkii, other species.	"Accra rubber" (*Dict Econ. Prod, I.*, 93).	West, East and Central Africa. Has recently been tried at Magavi in the Rangoon Division of Pegu Circle. "In 1883, the Landolphias in the Ceylon Botanic Gardens flowered." (*Dict. Econ. Prod., I.*, 94, 95, 96, 97, *page* 374.)	Cultivated ...	
18	Carissa (several species) Carissa Carandas, *Linn.* Carissa diffusa, *Roxb.* ...	... Kan	..... Prome ... ... Along coast of South Andamans.	..... Very frequent. Not stated.	Unknown.

No.	Botanical name in "Flora of British India" and in Kurz's "Forest Flora of British Burma."	Burmese or English name.	Habitat.	Degree of frequency.	Value of the produce, as far as known. References, &c.
	(Syn.—spinarum, *A. DC.*)	...	.....	.....	
	Syn.———hirsuta, *Roth.* A variety of C. spinarum.	...	Ava, along the Irrawaddy	Apparently frequent.	
	Melodinus monogynus, *Roxb.* Other species, *e.g.*, M. orientalis, *Bl.* and M. (?) micranthus, *Hk. f.* are found in Penang and Malacca.	Sadul Kok. (Sylhet)	A tall milky climber of the Sikkim, Himalaya, Assam, Sylhet and Khasia mountains, ascending to altitudes of 4,000 feet. *(Dict. Econ. Prod. M.*, 435.*)*	.....	Unknown. Merits investigation. "Un beau melodinus ou pommier grimpant, connu sous le nom de *Sadal Kowa* qui fournit un suc laiteux de même nature" (as that of Willoughbeia). *Le Caoutchouc et la gutta-percha, par E. Chapel, Paris*, 1892, *page* 274. Quoted from *Roxb. Fl. Ind.*)
19	Rauwolfia peguana *Hkf.* & ———serpentina, *Benth.*	Patala gandhi——Bong maiza (Burm.) garuda (Tel.) Chuvanna-avil pori (Malay).	Pegu (*Kz.*) In the mixed and open forests all over Pegu and Martaban down to Tenasserim.	Very frequent ...	Recommended for trial in Dr. Prain's letter No. 95M., dated the 13th March 1899.
20	Alyxia odorata, *Wall.* Kurz refers this to Alyxia stellata (Gynopogon stellatum, *Labill, For. Fl. II.*, 176).	...	Tenasserim, between Chappedong and Amherst. Along the rocky shores of Tenasserim and the Andamans.	Not stated ...	
21	Plumeria acutifolia, *Poiert.*	(The pagoda tree) Tayop saga, Tayôk saga.	Of American origin; now very frequently seen in gardens and villages all over Burma.	Cultivated or almost naturalized.	Attempts have been made to make caoutchouc of the milk, but without success. (*Brandis' For. Fl.* and *Dict. Econ. Prod.*, *page* 990.)
22	Alstonia scholaris, *R. Br.*	Let-tope, Let-tôk, Taungsaga, Taung meôk, Taunma-yoben.	The leaf shedding, especially the open and dry forests, from Prome and Martaban down to Tenasserim.	Not unfrequent ...	A large tree with bitter milky juice. (*Brandis' For. Fl.*, 325). It yields an inferior quality of caoutchouc or gutta-percha. "The gutta-pulei of Singapore" (*Dict, Econ, Prod. A.*, 872; *I.*, 55, *Table*

				on page 341 *and D.* 387, *page* 105, *No.* 2). In 1884, Dr. Ondaatje forwarded from Ceylon a large sheet of a substance obtained from the milk of *Alstonia scholaris*. He described it as a good substitute for gutta-percha, being very plastic, soluble in chloroform, and precipitated by alcohol, also resistant to acids. * * * The specimen is still in the Kew Museum." (*Dr. Morris loc. cit., page* 788.) "Some latices, such as that of *Alstonia scholaris*, dry to a gutta-like mass and suggest that perhaps a member of the Apocynaceæ, or Asclepiadeæ may be found to afford a useful gutta." (*Mr. J. Parkin, M.A., in Circular of Royal Botanic Gardens, Ceylon, Nos.* 12, 13, 14 *of June* 1899, *page* 110.)
Dyera species, Dyera costulata *Hk. f.*, and Dyera laxifiora *Hk. f.*	...	Malay Peninsula ...	Not known ...	[*Dict. Econ. Prod. D.*, 387, *Nos.* 11 *and* 12.] All the species yield the Gutta Jelatong or telutong (*Dr. Morris loc. cit., page* 789). Three species are described from the Malay Peninsula and should be sought for in South Tenasserim.
Urceola elastica, *Roxb.*...	...	Malacca and Penang (may be discovered in Mergui).	Ditto ...	"Probably Howison's discovery of rubber in Asia in 1719 was the rubber of *Willoughbeia*, and not Urceola. (*Dict. Econ. Prod., I.*, 74.) "On le rencontre dans toute la Malaisie. Il est la principale source du caoutchouc Borneo" ["*Le caoutchouc, et la gutta-percha*," *par E. Chapels, Paris*, 1892, *page* 288.] *Cf. Dr. Morris, Cantor Lectures, loc. cit., page* 793, where it is stated that 'there is no evidence that *Urceola elastica* has been found in a wild state in Borneo.'

No.	Botanical name in "Flora of British India" and in Kurz's "Forest Flora of British Burma."	Burmese or English name.	Habitat.	Degree of frequency.	Value of the produce, as far as known. References, &c.
23	Urceola esculenta, *Benth.* (*Syn.* Chavannesia esculenta, *A.DC.*)	Kyetpaung, *Burm.* Tophet. *Karen.*	Tenasserim (Kurz). All over Pegu (*The late Mr. G. W. Strettell*). Grows wild over most parts of Pegu and Tenasserim; used to be brought by the Karens from the forests drained by the Shwegyin stream and its tributaries (*Mr. J. Nisbet*). Mintha Forest, South Tenasserim (*Mr. Hearsey*). Also Siam and Malacca...	Common ... Very plentiful ...	Gutta or Gettah gietan of Benkulen Sumatra. Used to be commonly sold in the Shwegyin bazaar 20 years ago (*Mr. J. Nisbet*). [*See Dict. Econ. Prod., I.*, 75, *No.* 12, *I.* 76.] Is one of the sources of Penang rubber ["*Le caoutchouc et la gutta-percha,*" *par E. Chapel, page* 283]. Probable value :—Foul to good and clean 8*d.* to 3*s.* "A promising species" (*Dr. Morris, Cantor Lectures, loc. cit., page* 789. See also page 792). "This is a climbing plant. The specimen growing at Henaratgoda has its main stem of about 9 inches in girth. On wounding it the white *latex* trickles out in fair abundance and moulds into good rubber free of stickiness. The *latex* from the thin stem, such as bear the leaves or have recently shed them, forms a sticky substance when moulded between the finger and thumb. The plant resembles Castilloa in this respect. The *latex*, both from the pith and the cortex of the young stem, is sticky; hence it looks as if the true caoutchouc is only formed in the secondary bast." (*Mr. J. Parkin, in Circular of Royal Botanic Gardens, Ceylon, Nos.* 12, 13, 14 *of June* 1899, *page* 162.)

24	Parameria glandulifera, *Benth.*	Talaingzôk [*Dict. Econ. Prod. I.*, 67 *and I.*, 73.] At Mergui a gutta-percha-like substance is derived from the Talaingnô-nwè. See remarks under *Willoughbeia edulis*, No. 16 above.	Martaban on the borders of tidal forests (*Kurz*). In the Mintha forest of South Tenasserim (*Mr. W. A. Hearsey in diary of 29th March* 1899.)	Not unfrequent ... Very plentiful ..	Recommended for trial by Dr. Prain in his letter No. 95M., dated the 13th March 1899. A sample of this rubber, supposed to be that of *Willoughbeia edulis*, Talaingnô, was sent to Messrs. George Henderson, by the Conservator of Forests, Pegu Circle, in 1886, and valued at 1*s.* 3*d.* to 1*s.* 4*d.* per lb., as equal to African in price, but resembling Borneo rubber, and it was classed as "Bastard Borneo." Messrs. Jackson and Tells reported at the same time on a sample of gutta percha, the produce of the *Talaingnô* creeper. It is probable that the rubber was the produce of *Parameria glandulifera*, Benth, Cf. *Dr. Morris, Cantor Lectures, loc. cit., page* 791. Under name "Talineno-thee." " Mr. Pierre, le savant directeur du jardin Botanique de Saigon, a découvert dans les forêts de la Cochinchine, un arbre magnifique, le *Parameria*, qui fournit en abondance, un caoutchouc d'excellente qualité." [" *Le Caoutchouc et la gutta-percha*," *par E. Chapel, page* 284.] It is a stout climber, with smooth leaves and a large panicle of small sub-campanulate flowers. The follicles (fruit) resemble those of Urceola according to M. Pierre (who first drew attention to the economic value of the plant in Saigon), the method of extracting the caoutchouc is exceedingly simple. The milk, obtained either from incisions or by cutting the stem into short lengths, is poured into a basin filled with

No.	Botanical name in "Flora of British India" and in Kurz's "Forest Flora of British Burma."	Burmese or English name.	Habitat.	Degree of frequency.	Value of the produce, as far as known. References, &c.
					water at a temperature of 104°–122° Fahr. On agitating the mixture with a stick, the milk immediately coagulates into a pure caoutchouc of excellent quality. The plant may be propagated by cuttings with great facility. Dr Trimen in 1884 supplied the following further information on the subject:—"The attention of the Indian Government was called to this rubber plant in 1883 by the Deputy Commissioner of Mergui, British Burma; the Talaing milk creeper of that district, according to Dr. King's identification of very inadequate specimens being the same species. The reports as to its yield there are somewhat conflicting: the Deputy Commissioner states that he obtained about half-a-pound of rubber from a piece of stem 80 feet long and 8½ inches circumference by extracting all its juice, but according to the Director of Agriculture of British Burma, this is not a fair estimate, as 'a bottle full of milk' was obtained from 'a few feet of the creeper.' Dr. Romanis, Chemical Examiner, states that 'one pint of juice yielded 13½ oz. of caoutchouc' which appears a very high proportion. The specimen of rubber received by Dr. King, he describes as 'externally considerably

						discoloured and almost black from being partially oxidized. When cut into it is white and porous, presenting a honeycombed appearance, the spaces containing a dirty brown watery fluid. It is tough and elastic, and appears to be of excellent quality." (*Dr. Morris, Cantor Lectures, loc. cit., pages* 791, 792.)
25	Chonemorpha macrophylla, *G.Don.* (*Syn.* Echites macrophylla, *Roxb.*)	.....	Moist forests throughout India to * * * Malacca (*Fl. Br. Ind.*) In the tropical forests along streams of the Andamans (*Kurz For. Fl.*)	Common ...		Recommended for trial by Dr. Prain in his letter No. 95M., dated the 13th March 1899.
				Frequent ...		According to the Rev. Mr. Parish, this yields a considerable quantity of caoutchouc [(*Dr. Mason's Burma and its People, page* 523). *Dict. Econ. Prod. I.*, 60, and I. 76, *page* 362, *line* 7.]
						The Chonemorpha is a vigorous climber, native of India and the Malay Islands. It was raised from seeds received from the Royal Botanic Gardens, Calcutta, in 1884. The stem when cut yields a milky fluid, which Mr. Gamble considers a good sort of caoutchouc. (*Kew Bulletin*, 1896, *page* 186.)
	Asclepiadeæ.					
26	Calotropis gigantea, *R. Br.*	Mayopin, Mayo ..	Agrarian lands, especially fallow fields, and along river banks of Prome and Pegu, Upper Tenasserim; also cultivated for medicinal purposes.	Frequent ...		Caoutchouc of inferior quality [*Kurz For. Fl. II.*, 195. *See also Dict. Econ. Prod. D.* 387, *No.* 4.] In Borneo and in India, caoutchouc is said to be derived from this plant. ["*Le caoutchouc et la gutta-percha*" *par E. Chapel, pages* 274 *and* 288.
27	Calotropis procera, *R. Br.*	Ditto ...	In waste places, agrarian lands and river banks all over Ava and Prome districts.	Ditto ...		[*See Dict. Econ. Prod. D.* 387 *No.* 5.] This plant has been naturalized in Venezuela and is there valued for its rubber. "Elle donne un bon caoutchouc"; also

No.	Botanical name in "Flora of British India" and in Kurz's "Forest Flora of British Burma."	Burmese or English name.	Habitat.	Degree of frequency	Value of the produce, as far as known. References, &c.
					found in Senegal and the French Soudan. ["*Le Caoutchouc et la Gutta-percha, par E. Chapel, page* 159 *et page* 181.]
	Cynanchum ovalifolium, *Wight.*	.....	Penang, Malacca ...	.....	On trouve aussi dans l'ile de Penang une asclepiadacée, le Cynanchum ovalifolium (*Wight*), qui selon le Dr. Wallich, fournit du caoutchouc. ["*Le Caoutchouc et la Gutta-percha*," *par E. Chapel, page* 283] "Produces an excellent caoutchouc" (Wallich) [*Fl. Br. Ind., IV.*, 23.]
	Euphorbiaceæ.				
28	Hevea brasiliensis, *Müll. Arg.* There are many other species of Hevea, *e.g.*, H. discolor, H. membranacea, H. pauciflora, H. Benthamiana, H. lutea, H. rigidifolia, H. apiculata, &c.	Para rubber ...	Brazil and Bolivia ...	Successfully cultivated and naturalised at Mergui and Tavoy.	Reproduces itself naturally from seed at Mergui. Has lately been raised at Rangoon from seed obtained from Mergui, by Major J. A. Wyllie, I.S.C., and is now being planted on a small scale on the rifle range at Kokine. Very favourable valuations of the Mergui rubber have been received. *See* Professor Dunstan's Report, dated the 9th January 1899, enclosure letter No. 383-32, dated the 8th February 1899, from the Reporter on Economic Products to the Government of India, to the Conservator of Forests, Tenasserim Circle. Two valuations were given, one at 3*s.* 8½*d.* per lb., the other at 2*s.* to 2*s.* 9*d.* per lb. for an inferior parcel which contained some partially decomposed "sticky" rubber. This could no doubt be remedied if the rubber were smoked

					and properly prepared, as it would be if systematically collected. A separate valuation by Messrs. Hecht, Lœvis and Kahn, dated the 25th March 1899, furnished to the Royal Gardens, Kew, and communicated to this office by the Director of the Imperial Forest School, Dehra Dun, under endorsement No. 135, dated the 9th May 1899, says :—"We have examined the sample of rubber and find it to be of good quality, but a little bit soft and sticky. The rubber, however, seems to be pure and its value ought to be between 3*s*. 8*d*. and 3*s*. 9*d*. per lb., perhaps even a shade more." A small sample sent in June 1896 as valued for the Imperial Institute, at 2*s*. 5*d*. per lb. The average price of Hevea seeds in Ceylon in 1898 was Rs.27 per thousand. The yield of Hevea seed of the Mergui Plantation was leased for three years, as already reported, for an absurdly small sum.
29	Manihot Glaziovii, *Müll. Arg.*	Ceara rubber. Scrap rubber.	Ceara or Fortaleza, Brazil, on the sea coast some degrees south of the Equator.	Cultivated at Mergui, Tavoy and Rangoon (Cantonment gardens).	Professor Dunstan's report, dated the 9th January 1899, quoted above, includes a report from the same experts on a sample of Ceara rubber from Madras (No. 10178), grown in Coimbatore, Madras. "Both experts state that this sample is of inferior quality; that it has been badly prepared, containing a good deal of dirt and sand, and that it has apparently been heated. On account of these defects they do not think it would fetch more than 1*s*. 4*d*. to 1*s*. 6*d*. per lb. in the

No.	Botanical name in "Flora of British India" and in Kurz's "Forest Flora of British Burma."	Burmese and English name.	Habitat.	Degree of frequency.	Value of the produce, as far as known. References, &c.
					market." The tough outer bark is an obstacle to easy tapping. The number of trees at Mergui is not great and they are mostly small. The root tubers are eaten by pigs and porcupines, and several trees have been uprooted and killed in this way at Mergui. At Nilambur (Madras) pigs "grub up the tubers of the Ceara rubber, but do little material damage." According to Mr. Cross this tree is adapted to withstand drought and to grow on rocky ground. In such situations uprooting would not be easy, as he found when collecting seedlings near Ceara. The tree is liable to damage by wind, it requires shelter but not cover. I do not recommend that it should be planted or sown in rocky soil in Burma. *Cf. Dr. Morris, Cantor Lectures, loc. cit., pages* 765 *to* 770 *and page* 796. A small sample from the Mergui Garden, collected from a single tree, by one incision only, made at 9 A.M., on the 23rd May 1896, was valued for the Imperial Institute at 2*s.* per lb. (*See A. R. Imperial Institute, Indian Section*, 1896-97, *page* 88.)
30	Euphorbia neriifolia, *Linn.*	Shasaung, Shayaonmina, Shazaung.	It is cultivated and according to Kurz is also found wild in Burma.	Frequently cultivated.	It yields a gum or gutta-percha-like substance on boiling (*Dict. Econ. Prod. E.*, 521.)

31	——Nivulia, *Ham.* ...	Shasaung, Shazaung.	Found especially along streams in the dry and drier upper mixed forests of the Prome and Pegu Yomah.	Frequent ...	Yields a sort of Euphorbium (*Kurz*). "The milk has properties similar to those of E. neriifolia" (*Dict. Econ. Prod. E.*, 528.)
32	——antiquorum, *Linn.*	Shasaungpya that, Shanzaun g p y a-that.	In the dry and upper mixed forests all over Burma from Ava and Pegu down to Arrakan and the Andamans up 2,000 feet elevation.	Frequent. Often cultivated for hedges, &c.	"The copious milky juice of this and other arboreous species, hardens into euphorbium." (*Kurz*). "True euphorbium is not a product of India." (*Dict. Econ. Prod. E.*, 497.)
	——Tirucalli, *Linn.* ...	Shasaunglekhmyo, Shazaungletmyo, *Burma*. Tirukalli, Kolkalli, *Malay*.	Prome district ...	Cultivated around *khyoungs*.	The copious milky juice yields a sort of euphorbium. (*Kurz*). "The milk, when it hardens after boiling, becomes brittle; whilst warm it is as ductile as mudar gutta-percha." (*Dr. Riddel, in Dict. Econ. Prod. E.*, 554.)
	Pedilanthus tithtimaloides, *Poit.*	...	A West Indian succulent shrub allied to euphorbia. Found chiefly in the Prome district. (*Kurz, II., 418-419.*)	Much cultivated in native gardens and planted in hedges.	This plant is mentioned at pages 534 of Chapel's "Le caoutchouc et la Gutta-percha," together with severa species of Euphorbia; and it is stated that the natives mix the various gums without thought or care as to whether a gum of passable quality may not be spoiled by such practices.
	Urticaceæ.				
33	Castilloa elastica, *Cerv.* ...	Central America, Panama or Nicaragua rubber.	Central America from the level of the sea to 1,500 on the Pacific Coast. On the western slopes of the Cordillera (*Andes*).	Cultivated on a small scale.	Cultivated at Mergui under wrong conditions, namely, in swampy ground. The tree has done better in Ceylon, but it appears to be rather difficult to propagate. The Director of the Royal Botanic Gardens, Peradeniya, writes (21st October 1898): "It has not been a success in Asia"; whilst the Dictionary of Economic Products, under I, 83, records satisfactory results in growing and propagating the tree at the Barliyar Gardens,

No.	Botanical name in "Flora of British India" and in Kurz's "Forest Flora of British Burma."	Burmese or English name.	Habitat.	Degree of frequency	Value of the produce, as far as known. References, &c.
					also at Nilambur and near Calicut, *i.e.*, on the Malabar Coast, with a western exposure. It should be tried on hillsides at western aspects in Tenasserim. The milk is somewhat watery and lends itself to the process of 'separation' or churning. (*References, Dict. Econ. Prod. I.*, 79 *to* I., 83. *Dr. Morris, Cantor Lectures, loc. cit.*, 761 *to* 765. *Circular of Royal Botanic Gardens, Ceylon, Series I.—No.* 11 *of April* 1898, *pages* 96—104.)
34	Artocarpus Chaplasha, *Roxb.*	Taungpeingnai; Taung-peinne.	Assam to Tenasserim and the Andaman Islands *(Fl. Br. Ind.)* In the tropical forests of Chittagong and Martaban down to Tenasserim and the Andamans *(Kurz).*	Common ...	Yields a tenacious milky caoutchouc (Kurz). Recommended by Dr. Prain for trial in his letter No. 95M., dated 13th March 1899. (*References, Dict. Econ. Prod. I.*, 67, *&c., Imperial Institute Series, Hand-books of Commercial Products, No.* 25 (1893). *Commercial Circulars* 3 *and* 12 *of* 1896; 1, 3 *and* 8 *of* 1897. *Dr. Morris, Cantor Lectures, loc. cit., pages* 788, 796 *and* 85, *&c.*)
35	Ficus elastica, *Roxb.* ...	Bawdi, Nyaungbawdi, Nyaungkyetpaung, Upper Burma or Rangoon rubber.	In damp forests at the base of the Sikkim Himalaya, eastwards. The Khasia Hills, Assam, Burma and Perak district, Malayan Archipelago *(Fl. Br. Ind.).*	Frequent ...	The India-rubber of this tree is sufficiently well known. The points to be attended to are the preservation and reproduction of the trees; careful tapping and the collection of pure unmixed rubber. The Annual Report of Imperial Institute, Indian Section, for 1897-98 (pages 61,

			In Upper Burma whole forests of this species are said to exist in the valley of Hookhoom (Hukong) — *Kurz. See* Report on the Hukong Valley and Upper Namkong basin by Mr. H. N. Thompson, Assistant Conservator of Forests, Burma, 1896, and the previous report by Mr. O'Bryen in 1892.	64, 67 and 75) contains several valuations of Assam and Rangoon rubber, too long to quote here. The present market value in Rangoon in from Rs. 645 to Rs.725 per 100 viss (10th July 1899). In London Fair to good and clean 2*s.* 9*d.* to 3*s.* 2*d.* per lb. Common to fair, 1*s.* to 2*s.* 4*d* per lb. The *Kew Bulletin* of November 1898, page 317, quoting the *Indian Forester*, gives particulars of, "The oldest India-rubber plantation in the world," of this species, in the Province of Kranong in the west of Java. It is said that the net yield per acre per annum during 23 years from 1872 till 1895 (1875 printed by mistake) amounted to £1 12*s.* 10*d.* At Mergui I was informed by the Customs clerk that *tarupoza* is the Malay name of a tree yielding a most valuable rubber, and that the tree also grows in Tenasserim. Extract from the diary of the Divisional Forest Officer, Tavoy, for the week ending the 5th June 1899. * * * "Saw some dried *Ficus elastica* leaves collected at Ranaung ; was informed that these sell for 4 to 5 dollars a pikul at Penang. A pikul is 133⅓lbs. Large quantities of India-rubber is still manufactured at Bôkpyin, but it is mixed with gutta. The Chinaman buys it at Rs.2-14-0 per viss and sells it at Singapore at Rs.5 to Rs.7 per viss. Have written to the Deputy Commissioner to

No.	Botanical name in "Flora of British India" and in Kurz's "Forest Flora of British Burma."	Burmese or English name.	Habitat.	Degree of frequency.	Value of the produce, as far as known. References, &c.
	Urticaceæ—continued.				ask the Township Officer for the necessary information. I have an idea that Bôkpyin and Lenya produce some 2,000 viss per annum." *N.B.*—It seems possible that Mr. Hearsey may have mistaken 'gutta' leaves for those of *Ficus elastica*. Cf. *Kew Bulletin* for 1897, page 200, *re* extraction of gutta-percha from leaves. I extract the following: "Most of the trees are overcut at Singapore, and there are no more leaves left, I hear. The leaves and twigs cost four dollars and-a-half a pikul (133lbs.) * * * *
	Ficus elastica, *Roxb.* ..	Bawdi, Nyaung-bawdi. Nyaung Kyetpaung. "Karet" rubber of West Java (*Dr Morris, Cantor Lectures, loc. cit., page* 790.) Changing 'r' into 'y' we get the Burmese name.	.....	.....	"It is really a very curious little manufactory. I do not know how long it will last, on account of the difficulty of procuring leaves, which must, I think, sooner or later stop the trade." This sounds the note of alarm. A tree cannot thrive if all its growing leaves are repeatedly removed. If the old or fallen leaves only were used the process would be an excellent one. It is absolutely essential that the source of supply should be husbanded, and its maintenance ensured against the greed of the speculators of the moment.* This can, I consider, only be undertaken by the State in the case of

					forest trees which require a considerable number of years to come into bearing. The manufacturing processes can be left to private enterprise, but the exploitation of the forests must be under Government control ; otherwise the destruction of the trees is certain. "Judging by the character of the Malay rubber, as received in this country, there is little doubt that some of it is obtained from *Ficus elastica*. The commercial article is known locally as "Gutta Rambong" (*See No.* 16 *of this table.*) "The tree is apparently found in the interior forests in districts visited only by natives" (*Dr. Morris, Cantor Lectures, loc. cit., page* 789.) In Tenasserim we should look for it inland and not near the sea.
36	Ficus altissima *Blume* (*Syn.*—laccifera, *Roxb*).	Nyaungpen ...	Tropical Himalaya, from Nepal to Bhootan. and in the plains and lower hills of the Deccan Peninsula and from Assam to Burma the Malay Peninsula and the Andaman Islands. Common in Ceylon district. Malay Islands. (*Fl. Br. Ind.*)	.....	Yields rubber in Siam and Malacca, Java and Sumatra (*Le Caoutchouc et la Gutta-percha par E. Chapel, pages* 282 *and* 286).
			In the tropical forests of the eastern and southern slopes of the Pegu Yomah and Martaban	Frequent ...	Yields a very good sort of caoutchouc equal to that of *Ficus elastica (Kurz).* A large epiphytic tree giving India-rubber, but more sparingly and of not such good

* The Director of the Gardens and Forest Department, Straits Settlements, writes : —" Sèrullas has gone back to Paris with endless patents of different kinds.

No.	Botanical name in "Flora of British India" and in Kurz's Forest Flora of British Burma."	Burmese or English name.	Habitat.	Degree of frequency.	Value of the produce as far as known. References, &c.
			hills down to Tenasserim and the Andamans *Kurz.*)		quality as that of F. elastica (*Gamble Man. Ind. Timb.*, 332).
37	Ficus indica, *Linn.* ...	.....	In tropical and moister upper mixed forests of Pegu Yomah.	Rather rare ...	Yields rubber in Borneo (*Le Caoutchouc et la Gutta-percha par E. Chapel, page* 294).
38	Ficus obtusifolia, *Roxb.*	Nyaunggyat; Nyaungkyap.	In the tropical forests from Chittagong and Ava down to Tenasserim.	Frequent ...	Exudes a rather good quality of caoutchouc (*Kurz, II.*, 443).
39	Ficus annulata, *Blume* ...	.....	In the tropical forests of the eastern slopes of the Pegu Yomah and from Martaban down to Tenasserim.	Do. ...	'Yields a rather good quality of caoutchouc' (*Kurz For. Fl. II.*, 443).
40	Ficus religiosa, *Linn.* ...	Nyaungbawdi; Nyaungbawdi.	In the moister upper mixed forests along streams in the Pegu Yomah.	Rare; sometimes cultivated in villages.	"The bark gives a tenacious milky juice which hardens into a substance resembling gutta-percha" (*Gamble Man. Ind. Timb.*, 335).
	Ficus macrophylla, *Desfontains* (?)	The Moreton Bay Fig-Tree.	East Australia ...	About a dozen trees planted in the Mergui Experimental Garden.	A small sample of the rubber collected from a single incision, made at 9 A.M. on the 23rd May 1896, was valued for the Imperial Institute. Indian section (*See Annual Report*, 1896-97, *page.* 88) at 1*s.* 6*d.* per lb. The sample was soft and sticky.

Spike, a new Sandal Disease.

Mr. C. D'Arcy McCarthy, I.F.S., Deputy Conservator of Forests, Coorg, draws attention to a new disease, which he has discovered doing much damage to sandal. Mr. McCarthy writes as follows:—

"It is also noticeable that 'spike' has spread in an alarming manner. A short time ago the damage being done round Fraserpet by this disease, was pointed out to the Acting Commissioner, Mr. Couchman, who was struck by the unfavourable prospect for sandal in the neighbourhood. At present it is confined to the lantana area, and it is remarkable that trees in hedges or surrounded by lantana and brushwood suffer the most, whilst isolated plants are seldom attacked. Specimens were collected and despatched to Dr. A. Lehmann of the Mysore Service, with whom I had an interview at Bangalore, with as full an account as possible of the appearance and progress of the disease. Dr. Lehmann replied, that from a cursory inspection 'spike' is undoubtedly a disease, but whether bactereological or fungoid in its origin, he would attempt to ascertain at more closer examination. His further opinion is awaited, and I have to gratefully acknowledge the great interest Dr. Lehmann is taking in the subject."

[We hope Mr. McCarthy will give our readers more information regarding this disease.—HON. ED.]

IV.—REVIEWS.

Ceylon Forest Administration Report for 1899.

The report for the year 1899 shows forest administration in Ceylon to be still in a very backward condition. Settlement and demarcation are very far from complete, no surveys have yet been made of most of the reserves, and no working-plans have been prepared.

During the year the area of "reserved forests" rose from 160 to 201 square miles. The area of proposed reserves likewise received considerable additions, but the details cannot be ascertained from Form 1, owing to its being incorrectly prepared. The total area which may eventually come within the scope of the Department would appear to stand as follows, though it is difficult to arrive at any correct understanding of the figures given in the report:—

	Square Miles.
I.—Reserved Forests	201·33
II.—Proposed Reserves	2,739·82
III.—Other Forests	6,396·76
Total ...	9,338

A very considerable amount of demarcation work was done during the year; but it appears that in many localities demarcation is preceding the topographical survey of the Provinces, and in consequence the demarcation is found to be incorrect when the survey is made, and it has to be re-done.

There are no working-plans. An attempt was made to introduce some sort of system into the annual fellings by marking for sale all exploitable trees over an area of one-fortieth of the area containing valuable forest. Even this makeshift, however, was a failure "owing partly to the smallness of the establishment available for stamping trees, and partly to want of purchasers in places where trees were stamped." Enumeration surveys were made over an area of 8,462 acres, and several new sample plots were selected and measured in order to determine the rate of growth of some of the principal species. But the neglect during the year of the sample plots selected in former years is to be deplored.

No systematic fire-protection appears to have been attempted, though mention is made of considerable damage having been caused by fires to teak and other plantations. In Ceylon fire-protection ought not to be a difficult matter, and if it is thought desirable to grow artificial teak, it is most assuredly desirable to incur some expense in protecting the plantations from fire.

Natural reproduction in Ceylon is generally good, and little artificial reproduction is necessary. Various experiments were made with Grevillea, several sorts of Eucalyptus, and with Para rubber. The latter has generally done well, though no mention is made of any attempt at tapping.

The work done on communications was unimportant, consisting chiefly of repairs to existing export tracks. Nor was much done under the head of "Buildings." The Ceylon Government apparently does not wish to encourage luxuriousness among its Forest Officers, and seems to consider any shanty good enough for them to live in—a fatal policy in an unhealthy climate. Mr. Broun's remarks on the subject are worth quoting. He writes:—"The only head-quarters Bungalow provided for Assistant Conservators this year is one at Hambantota, where the old Courthouse was converted by the Public Works Department into a residence for the Assistant Conservator. Applications to build houses at Kurunegala, Vavuniya, and Trincomalee were refused by Government, and Assistant Conservators have to pay high rents for houses in places where much better-paid officials in other services have houses provided for them at a moderate rent. At Vavuniya, where there were absolutely no houses to let, the Assistant Conservator was provided with one of the Clerks' quarters, such as clerks pay for from Rs.4 to Rs.5 per mensem as rent. A so-called improvement was provided in the shape of a room with mud-walls 3 feet high and a cadjan roof. The house is small with low walls, ill-ventilated, unprovided with bath-rooms and stables,

and in my opinion altogether unsuited for a European to live in, especially in a climate like Vavuniya's, where the sun strikes with great force."

Altogether the report is a disappointing one, and shows that lack of appreciation and encouragement is having a very palpable effect on the work of the Department. At the same time in quoting the Conservator's introductory remarks to his report, we are glad to be able to concur in the opinion that steps are at length apparently being taken to place forest conservancy in Ceylon on a more satisfactory footing. "During the year under report," writes Mr. Broun, "the Department has made a new start and a vigorous one. The proposals of the Forest Re-organization Committee having been approved of by Government, no time was lost in carrying them into effect. Fellings, instead of being made, as hitherto, here, there, and everywhere, were concentrated in specified localities according to market centres, trees were stamped for sale, and enumerations of growing stock were made to ascertain the potential capabilities of our forests. At the same time, demarcation lines were cut round proclaimed reserves, 10 feet broad, round other forests 6 feet broad and compartment lines were cleared, the total length of lines cleared and re-opened aggregating to about 1,084 miles. Notwithstanding the expenditure on these works, the surplus revenue of the Department increased very considerably, as can be seen by reference to Chapter V., and, generally speaking, the Department can congratulate itself on the progress made."

The Federated Malay States. *

During last rains the present Inspector-General to the Government of India, Mr. H. C. Hill, I.F.S., made a very interesting tour in the above States, and has written a Report thereon. It appears that these States differ radically from India by the fact, that about $\frac{4}{5}$ths of the whole area is unalienated forest or jungle. Consequently there is ample scope for any reasonable amount of reservations. It is recommended that the whole of these lands, whether reserved or unreserved, should be managed as forest and kept distinct from land revenue till such time as it may be expedient to alienate those portions not required for permanent reserves. There are no rights, unless, perhaps, those of way and water, and of fruit-collection. The land enactment of 1897 requires that the land shall be reserved for some public purpose, and provides that forest conservancy is a public purpose. The first thing necessary is therefore a Forest Law, and the Inspector-General recommends the enactment of one on the lines of the Upper Burma Regulation which is very like the Indian Act, but

*Report on the present system of Forest Administration in the federated Malay States, with suggestions for the future management of the forests of those States, by H. C. Hill, Conservator of Forests, Her Majesty's Indian Forest Service. Printed at the Selangor Government Printing Office, 1900.

might be curtailed in some directions not specified. Only those areas which proper examination shows to be suitable for permanent forests should be reserved, otherwise there will subsequently be wholesale revisions and no finality. In the remaining unreserved forests the better kinds of trees should be protected. The following considerations are set forth as governing the question of reservation:—

(*a*) Certain hill-lands must be reserved irrespective of the kind or quality of forest on them, so that they may not be denuded by shifting cultivation or rainfall, &c.

(*b*) The mangrove swamps are immense and of great importance, but they are being worked up to or beyond their legitimate yield.

(*c*) Gutta-percha trees are a very important reason for reserving.

(*d*) Areas containing other valuable trees (*i.e.*, ordinary forest), perhaps, even now over-worked, must be reserved.

In the unreserved forests, the following trees are suggested as royal trees:—

Taban	...	*Palaquium* all species (gutta).
Rambong	...	*Ficus elastica* (rubber).
Chengal and Penak		*Balanocarpus*, all species.
Merbau	...	*Afzelia palembanica.*
Damara laut	...	*Shorea utilis.*
Kulim	...	*Scorodocarpus borneensis.*
Meranti	...	*Shorea* and *Hopea*, all species.

Possibly also the following:—

Balan	...	*Parinarium oblongifolium.*
Tembusu	...	*Fagræa fragrans.*
Tampinis	...	*Slætia sideroxylon.*
Petaling	...	*Ochanostachys amentacea.*

The mangrove (bakan) forests contain principally:—

Bakau hitam	...	*Rhizophora conjugata.*
Blukap	...	*R. mucronata.*
Bakau puteh	...	*Bruguieria caryophylloides.*
Tumu	...	*B. gymnorhiza.*
Lenggadai	...	*B. parviflora,*
Tengah	...	*Ceriops candolleana.*
Nirch	...	*Carapa moluccensis* and *obovata.*
Perpat	...	*Sonneratia acida.*
Api-api	...	*Lumnitzera coccinea* and *Avicennia officinalis.*

Except the last, they all yield excellent fuel, some of them are good for fishing stakes and house-building.

The present outturn of mangrove is somewhat as follows:—

Perak	...	640,000 piculs = 16,000,000 billets.
Selangor	...	268,000 „ = 6,700,000 „

The treatment proposed for these mangrove forests is that of high forest exploitable at twenty years. Mangrove has been called a slow-growing species, but it appears capable of producing serviceable firewood at 7 to 15 years of age. There will thus be 20 coupes, in which the whole crop, except 10 to 15 seed-bearers, will be cut as a seed-felling; these seed-bearers being cut four or five years later, or whenever a dense young crop of seedlings may be

established. It is also proposed that the fellings shall proceed by alternate coupes on the ground.

The treatment of the gutta-percha forests cannot be definitely prescribed for want of sufficient knowledge. At present the natives simply cut down and destroy the trees. It is proposed to divide each working circle into from 5 to 10 blocks, so that operations come round every five to ten years. At each visit an improvement felling is to be made by freeing the crowns of all *Palaquium* trees so as to place them in the best possible conditions of growth. Bleeding the trees is to be tried in place of felling them, experiment being made with different styles of bleeding at different seasons. If no satisfactory system is evolved, then it may be necessary to coppice them. The existing system is so pernicious, that it is rare to find a gutta tree of more than 1½ feet girth.

The general protection of the forests is not a difficult matter, since forest fires do not occur and cattle are few. But the protection of gutta trees has hitherto failed entirely. It is very difficult to get about the forests, for there are few roads, no reliable transport, and little labour available. The indigenous tribes and parties of seasonal immigrants, Dyaks from Borneo have it, therefore, all their own way. Prohibitions are of no effect as they cannot be enforced. It is now proposed to constitute reserves, to collect by Government agency, and to prohibit absolutely all other sale or export. The introduction of teak or other exotics is not advised. This is the home of gutta, which is limited to a zone of 6 degrees from the equator, and ascends to 2,500 feet. The indigenous trees reproduce themselves plentifully by seed, but *Palaquium* seedlings are not so common, owing to the havoc played with the trees. It will be advisable to obtain all the young plants and seed possible, and plant up from the forest or from nurseries on a large scale, so that all suitable areas may carry fairly dense crops of *Palaquium* instead of scattered trees. Good gutta is worth 500 dollars a picul (133⅓lbs.) at Singapore. There are several species of *Palaquium* (*Sapotaceæ*) yielding different quantities and qualities of gutta in different localities, but little definite is known either about them or about some other genera which yield inferior gutta worth perhaps 150 dollars per picul. All should therefore be propagated wherever found, until sufficient precise knowledge is obtained. Para rubber (*Hevea braziliensis*) grows freely, but as it has been taken up by private enterprise, there is no reason for Government entering into competition with the planters.

At present the export of Chengal timber is prohibited in Perak, and exports of timber generally are discouraged by duties, even on mangrove. The Inspector-General recommends the abolition of these duties and the development of the trade, but considering the actual admitted over-working of mangrove and other accessible forests, the recommendation appears decidedly premature. When the opening up of the country by means of roads, and the safeguarding of the forests from abusive cutting have been fully

provided for, it will be time enough to think of encouraging trade in a surplus supply which does not at present appear to be properly available. Chengal is the best wood for sleepers, but jarrah is being imported into Perak and Selangor, which fact of itself ought to militate against the idea of present exports abroad. There is a great deal too much encouragement of trade elsewhere. The Cape and Australia have both ruined their forests by trade-greed and even in Burma, the Bombay-Burma Corporation's lease is not an unmixed blessing to the country. Comparatively recently they showed themselves powerful enough to escape paying an adequate penalty for certain malpractices which caused public discussion at the time. It was rumoured that the Corporation had a very handsome surplus in hand from those proceedings after paying the penalty, but the true figures have probably not been published. It is notorious that all leases and permit systems result in ruin to the forests to a greater or less extent, and it is to be hoped that the Malay States will insist on proper working-plans being drawn up before allowing any system of authorised *loot*. At present the forests are worked on a system of royalty by means of licenses issued to the cutters at a fixed rate per man per month, which naturally leads to waste. The Inspector-General recommends that the licenses, instead of being per month, should specify the kind and quantity of timber which they cover, with a minimum girth of 6 feet. There is a lavish use of iron in the States, the telegraph posts, bridge railings, &c., being all of iron, even when running through miles of excellent forest. This is due partly to an unwarranted prejudice against local timbers, and partly to the scarcity and high price of labour for forest work, the tin mines taking up most of the available labour at good pay, but neither of these reasons ought to prevent local timber being available at fair prices. Miners appear at present (though not always in the past) to be allowed to help themselves gratis. The States are warned that this practice, if continued, may develop into prescriptive rights of a burdensome nature and quite unnecessarily so, as the mines can well afford to pay.

The Inspector-General recommends the organisation of a properly-trained Forest Department, including Dehra Dun rangers of European or Malay extraction and officers deputed from Burma for periods of three years, the whole to be under the District Officer as in India. In a country free from burdensome grazing privileges, and nothing but a little shifting cultivation and few wood rights, it ought surely to be possible for Government to run its Forest Department through the proper head thereof. The continual interference of District Officers can only result in endless correspondence and friction, while the encouragement of continual appeals from Peter to Paul is subversive of all respect for the Forest Administration as a whole.

The report is accompanied by a series of excellent maps.

G.

Forest Administration in the Punjab for 1899-1900.

At the close of the year, the area under the control of the Forest Department was 7,615 square miles classified as follows :—

	Square Miles.
Reserved Forests	2,891
Protected do.	2,605
Unclassed do.	2,119
Total ...	7,615

This shows an increase of 131 square miles on the previous year, mainly accounted for by the transfer in Multan district of over a million acres of rakhs from civil to forest administration, the area now being included in Unclassed Forests. As the Department is said to be very much under-manned in the Punjab, it will not be easy to do much with these new areas, unless both the controlling and the executive staff are augmented.

No fresh working-plans were taken in hand in any Division during the year; but the Punjab has already got working-plans in force for nearly 70 per cent. of its reserved and protected forests, and in this respect it compares most favourably with any other Province or Presidency. The want of progress during the year is attributed to the absence of a special Working Plans Branch due to the short-handedness of the Department. Indeed, this fact makes itself severely felt in all the transactions of the Department.

As regards existing working-plans, as a rule, the prescriptions were carried out, but the fellings at Changa-Manga have once more fallen into arrears, owing to slackness in the demand for fuel.

The prescriptions of the working-plans were mostly carried out by means of selection, improvement and coppice fellings; but there was also a very considerable amount of unregulated fellings, carried out mainly in order to meet the requirements of right-holders and free-grantees. That those requirements are no negligible quantity in the Punjab may be surmised from the fact that, in the Bashahr Division alone, right-holders and free-grantees during the year removed 184 deodar trees, 199 deodar poles, 2,820 blue-pine trees, 20,423 blue-pine poles, 215 trees and 1,998 poles of mixed species, and these figures again show a decrease of 69,140 on the amount removed during the previous year.

During the year there was a very considerable increase in the amount of produce transported by water and the operations appear to have been effected without that friction with the Canal authorities which was an unpleasant feature of the previous year's work. In the Simla Division, 35,000 cubic feet of sâl were rafted down to Delhi, realising 4 annas a maund; but the transaction was financially a failure, as the expenses exceeded the receipts by Rs.177-1-0. It appears that Delhi can never be a very profitable source of consumption of fuel from the Simla Division, and as the rafting can

only be conducted under great difficulties, it does not appear worth while continuing the experiment.

In the case of the Changa-Manga plantations much of the work of extraction was done during the year under report by means of carts, as owing to the prevailing scarcity, labour was both plentiful and cheap. The cost of carriage by cart of 100 cubic feet solid per mile was Re.0-2-9, while the cost by tramway was as much as Re.0-12-2. At first sight it would appear advisable to abandon the tramway, but at Changa-Manga it is frequently impossible to obtain carts and labour, and without the tramway the whole of the produce could not be extracted.

Owing to the prevalence of famine many of the closed forests were thrown open to grazing, and doubtless this step was the means of diminishing the mortality among cattle. In the matter of removal of grass and grazing by right-holders, the Punjab seems to have been very heavily burdened at the time of settlement. For instance, during the year right-holders are estimated to have enjoyed free-grazing and removal of grass to the value of Rs.2,96,705. The settlement of rights has been very differently treated in different parts of India. In the case of the Punjab, the preparations of working-plans and the systematic working of the forests have been rendered matters of considerable difficulty owing to the admission of those grazing and timber rights when settlement was in progress. In other parts of India, the Madras Presidency, for instance, no such rights were recognized. Many were claimed, but it was always held that the land had been in the possession of Government and no right had accrued, although Government had made no objection to the enjoyment of free-grazing and removal of timber. As a result of this procedure settlement was greatly simplified and the preparation of working-plans will not be hampered by the necessity of considering the admitted rights.

The prevalence of famine has the customary effect of diminishing the damage done by fires. This is not the first occasion on which it has been observed that in times of scarcity and drought the villagers are averse to burning the little old grass that is left to them in the absence of any prospect of young grass springing up, and no better proof than this could be wanted that the majority of forest fires are the result of incendiarism. In the present instance the number of fires fell from 311 to 227 and the percentage burnt was only 0·2 as compared with 0·7 in the previous year. The total area burnt was 14,466 acres against 31,859 in 1898-99. Scarcity likewise had its effect on the number of forest offences which rose from 3,267 to 4,427 in spite of the fact that no notice was taken in the case of minor offences when the culprits were manifestly in want.

Much attention was given to experiments mainly with pines: but the results were frequently unsatisfactory owing to the drought. Moreover, "although the experiments were in most cases

conducted with care and at a considerable outlay, yet the outcome of the attempts is so disappointing, that one may venture to question the utility of such experiments apart from their æsthetic value ; for even if any of these pines should establish themselves, the produce would not be utilizable to any extent, seeing that only a very small fraction of the indigenous pine already growing in the forests can be sold."

The experiment in utilising Chil pine resin has been continued on an extended scale. New buildings were erected and fresh plant put up capable of dealing with a very large quantity of resin. As much as 3,108 maunds of resin were obtained from 60,500 blazes, and it is estimated that 100 maunds of resin will yield 170 gallons of turpentine and 70 maunds of colophony. The turpentine, it is hoped, will be taken by the Railway and the colophony is in great demand for bangle-making. It is expected that a profit of Rs.2-8 will be realised on each maund of resin treated. So far the experiment has met with much success and is very creditable to the Department, but it is hoped that those concerned will not lose sight of the fact that the duty of the Department will be fully performed when the success of the experiment has been thoroughly demonstrated. This having been effected, the manufacture should be left to private enterprise.

The Conservator predicted in last year's report that the Forest revenue in the Punjab had reached its zenith and would henceforth decline; but it will be observed that during the present year, in spite of famine, the gross revenue reached Rs.14,05,538 or only Rs.40,000 less than the previous year. The surplus of Rs.2,05,079 is less than that of last year by Rs.2,40,000, but this is solely due to an extraordinary payment of 2 lakhs to the Raja of Chamba and to the opening of reserves to free-grazing.

The Department is to be congratulated on a most successful year's work.

Les Forets.

A NEW FRENCH FORESTRY TEXT-BOOK.

Les Forêts, traité pratique de sylviculture, par L. Boppe et Ant. Jolyet, In 12, 488 *p. avec* 95 *photogravures intercalies dans le texte. Paris, Lib. J.-B. Baillière et fils ; Prix,* 8 *francs.*

The following review of this important new work on Sylviculture is translated from the *Revue des Eaux et Forêts :—*

"M. M. Boppe and Jolyet have published a book bearing the title, 'Forests, a Practical Treatise on Sylviculture.'

"Having been repeatedly urged from all sides," writes Mr. Boppe, "to publish the course of lectures, which I have so long delivered at the National Forestry School, I have deemed it my duty to render the volume as practical as possible, with the object of bringing it within the scope of every one connected with forests, both private owners and State officials. To aid me in this task,

I have had the good fortune to receive the co-operation of M. l' Inspecteur Adjoint, Antoine Jolyet, a most devoted co-adjutor, whose erudition has brought me up to date on all matters relating to the natural sciences. The text has, wherever necessary, been amplified by the introduction of illustrations of forest scenes."

It was, indeed, a happy inspiration that led our late Director of the Forest School to issue a resumé of his lectures in the form of a book, available to all: and, we can but hope that this is not to be his last venture in this line. A perusal of his work leaves one with the desire to read much more from his pen.

The present text-book passes the following eight subjects under review in as many chapters, illustrated by 95 photo-gravures:—

The tree.
The species.
The crop.
The forest.
The treatment of forests in general.
The different sylvicultural systems.
Exploitation and protection of forests.
Artificial creation and regeneration of forests.

The book in fact is a compendium of sylviculture, in which well-known facts are set forth in an instructive manner, and from many different points of view even though there may be nothing altogether new. Indeed, the authors are careful to support their conclusion by reference to accepted facts. On this account the arguments set forth appear to be most conclusive, although, as a matter of fact, many of the theories may be open to discussion. There is no one who will not profit by a study of the work, and many will find particular subjects to give them more than a passing interest.

As far as French forestry is concerned, a new study has been introduced in a chapter on *the protection of forests*, though it is a subject on which great stress is laid in Germany and a large literature has sprung up around it. Thus, the action of man, attacks of insects and other animals, attacks of parasitic or epiphytic plants, damage caused by climatic influences occupy 64 pages of the book, and are full of interest. Moreover, the perusal of these pages leads one to the inevitable conclusion, that the wisest course to pursue is to interfere as little as possible, never pruning, or draining; but closing to grazing and to the collection of dead leaves; without breeding game, or destroying birds; but leaving all natural woods untouched. In fact, it is exactly what is understood in France by *the conservation of forests*, when the word is used in its widest sense.

With the exception of a few passages in which we can but recognize the original work of M. A. Jolyet, the co-author appears to have confined himself to piecing together, re-arranging and serving up the work of his master. We shall look forward, no doubt,

to seeing at some future date the whole work re-written by this young author, accompanied by many new facts, derived from his own observations. Meanwhile he has done his work well and has taken much pains. He deserves all praise."

The work has also been reviewed in *Nature* by Mr. W. R. Fisher, I.F.S. (Retired), and Professor of Forestry at Cooper's Hill. Mr. Fisher's article will be read with interest by Indian Foresters, and is here reproduced in full.

"Within the last ten years the course of instruction at Nancy has been considerably modified. The school is attended by some foreign students who, as well as a few occasional private French students, are admitted without any regular Examination. Formerly, students intended for service in the State and Communal Forests of France, passed a preliminary Competitive Examination in the subjects usually taught at a Lycée, including Physics and Chemistry. A knowledge of Botany, Entomology and Geology, however, was not required of them. These subjects being taught *ab inito* at Nancy; in those days the marks obtained for Forestry unduly overshadowed those given for Natural History, and only a few devoted naturalists were to be found among French Forest Officers. Forestry teaching at Nancy also was much too dogmatic and not sufficiently based on experimental results.

At present French Forest students, who are intended for the service of the State, come from the *Institut National Agronomique*, and must obtain a diploma there before being admitted to Nancy. About 80 students enter the *Institut Agronomique* annually, while the number of State students at Nancy is limited to 12 per annum, the last 12 men admitted to Nancy standing 1, 3, 6, 7, 9, 10, 15, 21, 24, 26, 39 and 48 at the Final Examination of the *Institut Agronomique*. Nancy students thus at present possess a considerable knowledge of Agriculture and Experimental Natural Science; they also get pecuniary allowances from the State. So that admission to the French Forest Service is open to a wide field of French citizens and is not confined, as are some of our own public departments, to a restricted class of men, who have sufficient means to pay the high cost of training involved, this restriction injuriously affecting the intellectual standard of the departments.

Forestry teaching at Nancy has responded admirably to the higher attainments of the present class of students, and it is a real pleasure for one who studied there nearly thirty years ago to note the excellence of this new text-book of Sylviculture.

In it a forest is described as a complex organic whole, composed of a porous and friable humus soil, covered with dead leaves and moss, wherever the shade is too great for vegetation other than saprophytes; where, however, the mature crop of trees has been thinned or cleared with a view to natural regeneration, the soil is soon overgrown with grasses or other herbaceous plants, as well as brambles, bushes and shrubs, which, together with the

young plants of the valuable forest species, form a complex mass from which saplings, poles and trees gradually emerge, and compose a new crop either as coppice or high forest. This evolution of a new crop from an old one requires considerable skill on the part of a Forester, and it is only by carefully observing and following Nature that success is obtained. Each forest species makes different demands on soil and climate, and requires in its young state various degrees of protection against hostile meteoric influences, injurious plants and animals.

In France, natural regeneration by seed or by coppice shoots, is the chief means of reproducing a forest, and human interference with the growing forces of Nature is reduced to a minimum. The chief classes of French indigenous high forests, reproduced by seed, consist of oak, beech or silver-fir; maritime pine in Gascony; larch and spruce in the Alps, the latter also growing in the Jura with beech and silver-fir; *Pinus sylvestris* (for which our name of Scotch pine is far too local, and as a substitute for which I would suggest the name red pine) is indigenous in France only in mountainous regions, but has been extensively planted on poor sandy soils in the low lands. There are extensive coppices of mixed underwood with oak and other standards and of holm oak with Aleppo pine standards, in Provence. The holm oak (*Quercus ilex*) prefers calcareous soils, and is replaced in the South of France on siliceous soils by the two very valuable cork oaks (*Quercus suber* and *Q. occidentalis*). The latter differing from the former by its habitat near the Bay of Biscay, and by its taking two years to mature its acorns. Both these oaks are usually grown isolated in vineyards for their cork. *Quercus Tozza* is restricted to the south-west of France, where extensive coppices of it are grown for fuel. Hornbeam is abundant in the north-east, chiefly in coppice-with-standards, its abundance in Epping Forest probably dates from the time when England was connected by land with the Continent. Other species of forest trees, such as ash, alder, sweet chesnut, sycamore, willows, poplars, birch, lime, elms, etc., are either confined to special soils over small areas, or disseminated in forests of the principal species that have been already mentioned. Maps are given in the text-book showing the geographical distribution of the principal trees.

There is an excellent chapter on the nature of the forest soil, and the necessity of preserving the dead leaves to form humus is strongly insisted on. It has been proved by Grandeau and Henry, two of the Nancy Professors, that besides serving as food for earthworms and other organisms, the activity of which keeps the soil porous, friable and superficially rich in nutritive mineral matter, dead leaves fix atmospheric nitrogen to the extent of 12 to 20lbs. per acre annually. To deprive the forest of its dead leaves is like robbing a farm of its dung.

The evolution of a crop of trees by natural regeneration is well described, the account of coppice-with-standards being

probably more complete than in any other text-book. The cultural methods to be followed when once the new crop is established, are also well explained and chiefly consist of cleanings and thinnings. The authors are strongly opposed to the pruning of forest trees and consider that drainage is very rarely required. Their remarks on these points should be read.

Among sylvicultural systems yielding even-aged high forest (*futaie regulièré*), the clear-cutting system (procédé par coupe unique), which is so extensively followed in parts of Germany for crops of spruce or red pine, is employed in France only for Maritime and Aleppo pines. The cones of the pine trees adjoining a clearing produce abundance of seed which at once stock the ground, provided the felled material is rapidly removed, and the seedlings of these trees are so vigorous and hardy against drought, that they soon dominate the mass of bushes and weeds springing up around them.

The system under which a mature crop is gradually removed (procédé par coupe successive), termed by Dr. Schlich Shelterwood, Compartment system is that commonly employed in French high forests. It gives admirable results in oak and beech woods, but its application to silver-fir is not so successful, as silver-fir grows better when the larger trees are surrounded by an irregular undergrowth of beech and silver-fir.

The selection system (jardinage) similar to that employed in the Chiltern Hills for beech, is much used in France for silver-fir, chiefly in communal and private forests, and in State forests in mountainous districts, where it affords the best protection against denudation of the slopes.

About 70 pages of the book are devoted to an account of possible injuries to the forest by men, animals, plants and meteoric influences. This really constitutes the subject of Forest protection, and is usually dealt with apart from sylviculture in German and English forestry text-books. One hundred and sixty pages at the end of the book treats of artificial reproduction and resemble the account of sowing and planting usually given in other good sylvicultural works. This part of the book terminates with an account of exotic trees, the introduction of which is not viewed in France with nearly so much interest as with us, although the subject is very judiciously treated with the present volume.

The book is profusely illustrated by reproductions of photographs chiefly taken by Nancy students during their summer tour; it forms a highly valuable contribution to forestry literature, and is certainly the best account of French sylviculture that has yet appeared. There is a good table of contents, but no index, the omission of which is to be regretted."

V.—SHIKAR AND TRAVELS.

Adventures with a Bison.

I had often heard stories of people being charged by bison; but as so many men say it has never happened to them, and that really the bison is a most harmless creature, I thought the stories were "yarns"; but now I am wiser.

About a week ago, C. and I. started forth to try and slay a bull, of which there are a goodly number in the forests which I had to look after. I had been after them a great many times, but had only been able to get one, rather a poor one. Well, the first day, we came up to a herd, and after a lot of crawling (and this is not easy when you have to crawl with a double 8-bore, weighing 18lbs.) managed to see that there was a good bull in the herd. Here let me digress for a minute, to tell you that it is easy enough to shoot a bison, but to get a good bull out of a herd, requires an awful lot of stalking, as the confounded cows and young bulls always promenade about and offer such easy shots, at the same time getting right between you and the bull. Perhaps he, being boss of the show, gives them instructions to do it! Anyhow, it is very annoying of them, and in this particular instance they carried out my lord's orders to perfection, and C., whose shot it was, could not get more than a glimpse of him. After about half-an-hour's waiting, during which the cows—who saw, or smelt, that something was wrong—kept walking about and snorting at us: there was a loud snort and away they went. Well, I fear that I am not getting on very well with my yarn, but I am not used to "writing to the papers." Suffice it to say, that two people trudged most of that day without food or drink and never saw the bison again. But next day made up for the disappointment of the first.

We started off at some unearthly hour (about 3 A.M. I should think), and when we got out to the swamp, which is a favourite feeding-ground both of bison and elephants, we came on the tracks of a solitary bull. It was my shot this time, and after a very short track, one of the trusty jungle-men spotted master bison lying down about 5 yards off. I went up to the place, but could see nothing, for those confounded Kurumbers (jungle-men) can see in the dark, and while I was "fooling around," up he got; I caught sight of a great black mountain rushing away across my front; he was so near (about 6 yards) that I could not resist the temptation, and let drive. Snap-shooting when you have, the above-named 8-bore, loaded with 12 drams of powder, is foolishness, but by a lucky chance I hit the beast and knocked him over. In a minute he got up and went off. We waited a bit to give him time to die, as the track was covered with blood on both sides, which made us think he was very badly hit, and then we cautiously went after him, mounted on my *shikar* elephant, I in front

and C. behind. After about half-a-mile we came to a place where he had lain down, so making the Kurumbers walk behind the elephant, we went on. I suddenly caught sight of an ear moving behind a bush about 20 yards in front, and told the *mahout* to stop the elephant, as I wanted to put in a shot where I calculated his shoulder to be. One can't talk out loud to the elephant on these occasions, so the *mahout* touched him on the head. The idiot of an elephant (and really wasn't he an idiot not to see the bison, if I could see it?) stopped and, imagining, I suppose, that we wanted to get off, promptly sat down. This proceeding was a bit too much for our friend the bison, who came charging out like an express train straight for us. You bet, the elephant got up sharp enough, and as soon as this operation was finished, I let drive as best I could. No effect; the bison came on and went full tilt into the elephant's forehead; what with the smoke and the elephant's swaying up and down, I could not see to shoot again at once. The bison naturally recoiled somewhat (most people would if they had charged an elephant), but he was not going to be put off, and promptly closed again. This time I was able to lean over the elephant's head, and pour the contents of the second barrel into the broad back of the bull. He subsided gracefully, and then (and thank goodness it wasn't sooner) the elephant turned tail, and bolted. It was a nasty place with a lot of dead bamboos sticking up, and one of these caught C. in the back and knocked him off, rifle, hat, and all. I was too much occupied with looking out for bamboos and trees, to pay much attention to C., but I knew he must have fallen rather nearer to the bull than was nice. Well, we managed to stop the elephant, and I ran back (nothing would induce the elephant to go back) expecting to find the bull executing a war-dance on the top of C., but luckily I found him and the Kurumbers all safe and sound. What was to be done now? That was rather a ticklish question. We could hear the bull lying groaning where he had fallen, but I confess we both decidedly considered discretion the better part, as the beast was lying in the middle of a lot of fallen bamboos and long grass, and if he had tackled us at close quarters—well, we might be there now. However, he got up and moved slowly off. We followed at a respectful distance, and though I saw him again I could not get in a shot, and as it was getting pretty late, we decided to leave him to himself for the night. Next day, as we thought he must be dead, we sent the men to see, but far from being dead, he charged them twice, they skidding up trees.

Next day I came up to him, but he bolted before I got a shot, and it was only on the fourth day that I found him standing in some thick jungle, and was able to kill him.

Poor beast, he must have had a bad time of it for those four days, as he had eaten nothing and must have been in great pain, and I was real glad, both for his own sake and mine, that I managed to kill him.

He was a very big bull, standing 5 feet 11 inches at the shoulder (measure an ordinary English bull and see what that means), but he had not got a very big head. His horns measured 36 inches across the sweep, and were 19 inches round at the base. The points were very much worn; he had lost 3 teeth, and his hoofs were almost worn down to the bone, so he must have been a veteran, and no doubt a very grumpy old chap, too.

I am afraid I have spun this yarn out much longer than it ought to have been, and if it is very dry reading, well, you need not publish it.

Let me, however, give a small parting word of advice, and that is, that anyone who is likely to get any bison shooting when he comes out here, should not use a pop-gun. I believe if I had not had an 8-bore on this occasion, and that loaded with 12 drams of powder, I should not be inflicting this interminable yarn on the patience of your readers.

PHOREST DHOREY,

In the Cooper's Hill Magazine.

VI.—EXTRACTS, NOTES AND QUERIES.

A Glimpse of Forestry in the Himalayas.

If one can picture to himself a country something like the mountains of North Carolina, but with a forest growth more like that of the Adirondacks, and then place a glorious range of giant snow-peaks in the background, one can form a very good idea of the Himalayan foothills; at least of that part known as the "Jaunsar" * Division of the Dehra-Dun Conservancy, to which this very brief and rough account refers.

Strip the southern slopes of all tree growth, and the picture is still better; when the monsoon breaks in June of each year, the snows are quickly melted away, and the soil is left at once to the mercies of an Indian sun, which has remarkable powers of drying what little earth the snows and floods have left. The northerly slopes, however, are fairly well covered with conifers and broad-leaf species, both in pure and mixed woods, the trees running up to ten and twelve thousand feet in altitude.

Above and beyond the tree line lie the grand old snows, those snows from which the sacred rivers—Ganges, Jumna and Indus spring, in whose waters countless numbers of good Brahmans wash their sins away each day, and down whose streams a very business-like Forest Department floats its logs.

Here the summer climate is most delightful and the winter not at all severe. In fact, on the coldest days the sun has a way of being very tricky, and if you step out of the bungalow without a hat you will certainly pay for your carelessness in a very painful way.

* Jaunsar Division, School Circle, N.-W. P. and Oudh.

The forest organization is a most admirable one, the higher officers being men trained in the schools of Germany and France, while the subordinate positions are occupied by natives who have graduated or studied at the Royal Forest School in Dehra Dun. It must be said, however, that the majority of "natives" do not take to life in the jungle, but prefer positions in the towns and large cities; so that at times it is difficult to obtain good men.

Some Government forests are "reserved," that is held without any hindering "rights" or privileges of any kind, while others are "protected," or subject to grazing-rights and other ancient usages of the villagers.

As for the forests themselves, they consist principally of deodar, spruce, fir and pine. Among the conifers and various species of oak, both mixed with the former and forming pine woods in certain localities, by far the most valuable of all the timber trees is the deodar, which has a wood very much resembling our own cedar and which is used for many purposes, the chief use being that of railroad ties. On account of the remarkable powers of endurance which this wood possesses (due to the oil it contains), it is very valuable when a wood is required which must be placed in contact with the soil for a period of years.

Sylviculturally considered, the deodar is an easy tree to regenerate naturally, but each different locality must be treated in a different manner to insure success. On moist northerly slopes the species grow flourishingly under any condition of shade; but on the dry southerly slopes it almost invariably requires a nurse of some kind during youth. Blue pine fills this position most admirably, although, if not looked after, it will gradually suppress the deodar; but this danger is avoided by girdling the pine over large areas, whenever it has served its purpose, and threatens to kill out the more valuable species. It is an open question as to whether or not this girdling had been carried too far; in certain cases it certainly appears so; but if moderately applied, it is without doubt a great help to the forest's future value. All over the sunny southern slopes, little groups of deodar can be seen taking advantage of the shade of spruce, pine, oak, and even rhododendron, although the mother deodar may be a hundred yards away.

The oaks are found at almost all altitudes running up to nine thousand feet, and they can be naturally regenerated if the ground is not covered with a pestiferous little plant called "Strobilanthes," which, with its very dense and compact root system, entirely prevents the acorns from reaching the mineral soil. No oak is cut for timber, but the whole supply is used as firewood by the neighbouring garrisons; this is carried down the mountain trail on little hill ponies, each one of which is so loaded down that you see nothing but a pile of wood moving through the forest.

In all localities where grazing-rights prevail, the Forester is of course somewhat handicapped; this is especially true in forests

kept simply for "protection," such as those on steep slopes, which are preserved to prevent the *débris* of the hillside from being washed down on the fields of the valleys. Of course, if the seedlings are constantly destroyed by the cattle, the forest gradually thins out, and the rains rush down unimpeded over the hard trampled ground. In many places a very good system prevails of closing a certain area to grazing whenever regeneration is attempted; and as the natives are careful to obey the rules, the result is successful.

All along the foot of the hills one sees a vast amount of territory covered by so-called "raus," which are broad and very rocky stream beds, filled with water during the monsoons only; these eat their way, little by little each year, into the surrounding fields, and are gradually stealing away the farms.

In such an article as this, the subject of working-plans is somewhat too deep to touch upon, and it will be enough to say that the forests are managed on the selection system, only the annual growth being cut each year. This is arranged according to diameter classes and areas, all trees down to a fixed diameter standing on a certain number of acres being felled annually. Consideration is always given to the sylvicultural demands, however, and where these clash with question of present financial returns, preference is given to the former.

Working-plans are sanctioned for a period of twenty years and new ones are constantly being made. In this particular part of the Himalayas, extensive blocks, sometimes covering a whole slope, are taken in hand and every marketable tree down to a certain diameter is calipered, the area is determined from the excellent maps available and the necessary calculations follow. A splendid system of well-made trails covers the mountains, and wood is also taken out very economically and in great quantities by log railways, steep cables, dry shoots and flumes.

As in every other part of the world the great danger here to the forest crop is that of fire. Although the country is an exceedingly difficult one to handle, owing both to its configuration and the character and religious scruples of its inhabitants, such a system of fire protection has been gradually built up, that losses have been greatly reduced in late years. An officer in charge of a range looks upon it as a disgrace to himself if fire gets the best of him, and the forest is splendidly provided with a net-work of fire lines. These are cleared and burned over each year (sometimes two or three times a year), and during the dangerous season, from February to May, additional men are put to work in the woods in order to be on hand in case of emergencies. Villagers can be summoned at any time by the Forest Officer in charge. A most valuable thing, in case of an extensive fire, is a sketch map, showing simply the formation of the country, giving all streams, ridges, fire lines, roads, trails, clearings, houses, and in fact showing accurately all points of vantage from which a fire line can be fought.

A Forest Officer's life in the Himalayas is certainly a most interesting one; and, provided he is a hunter or botanist, a most enjoyable one. In this corner of the world he must be content to live a life of solitude, as he is often off for many weeks together and sees no single white face. But this does not infer that he is uncomfortable; for an army of servants is always by him, and he lives in comparative luxury the year through. Besides, the hills, the trees, the tigers and deer are very good companions after all.—F. E. OLMSTED in *The Forester*.

The Briar-root Industry in Italy.

The wood from which briar pipes are made is the root of the large heath, known in botany as the *Erica arborea*. Our "briar" is but a corruption of the French bruyère. The British Vice-Consul at Leghorn states, that the briar-root industry has had a somewhat curious history. First begun in the Pyrenees some fifty years ago, it travelled along the French Riviera and the Ligurian Coast (taking Corsica by the way), to the Tuscan Maremma, and has now reached Calabria, in the south, which is at present its most flourishing centre. By the very nature of the business, when a certain district has been exhausted of all its roots, the industry must come to an end there, and the opinion has been expressed that the Italian branch of it cannot last much more than another ten years. Leghorn has always been the centre of the export of Tuscan briar-root since the Maremma industry came into existence, but as the South Italian briar is of admittedly superior quality, a large quantity of the Calabrian root is also imported into Leghorn for selection and subsequent export. The total export from Leghorn is estimated at 50,000 cuts a year, valued at £28,000. Fully one-half the export is Calabrian root. All the root that comes into Leghorn has already been fashioned on the spot into the shape in which it is exported to the pipe-manufacturing centres, which are principally—at least as regards Italian briar—St. Claude in France, Nuremberg in Bavaria, and various towns in Rhenish Prussia and Thuringia. The roots, which are sometimes of a circumference of 2 feet or more, are cut into blocks and then boiled. If there is any defect in the root which has not been discovered before the boiling process, the blocks are bound to split sooner or later. Briar-root blocks are cut into about 25 different sizes and 3 principal shapes. The shapes are—"Marseillaise," "Relevé" and "Belgian." The first two are the more usual shapes; from the "Marseillaise" blocks are cut, the ordinary briar pipes which have bowl and stem at right angles; "Relevé" blocks are cut into a shape for converting into hanging pipes, and "Belgian" blocks, for which there is but small demand, are shaped to fashion into pipes which have bowl and stem at an obtuse angle. The minimum size of "Marseillaise" blocks is about 3 inches in

length, two inches in depth and 1½ inches in width. The Calabrian blocks, selected at Leghorn and exported thence, seem to be in favour with the trade, for the reason that they remain so long on the dealer's hands that they will be almost certain to split before export if they were defective. A Leghorn dealer, who does his own cutting in Calabria, has first to have the roots sent by wagon to his workshops, where they are boiled and cut, thence again by wagon to the sea-coast, where they are placed in lighters for shipment to Leghorn. At Leghorn, they are once more transferred to lighters and placed in carts for transport to the warehouses, where they are unpacked for selection. They are then re-packed in bales and carted to the Goods station for conveyance abroad; but a considerable time must elapse before they leave the hands of a merchant who does his own cutting in Calabria. A considerable quantity of blocks is sent to the United States, but apparently none to the United Kingdom.—*The Scientific American.*

Malaria and its Prevention.

Experiments in the Roman Campagna.

England has now proved for herself that malaria is due, not to the air, earth, and water, as has been asserted at various times, but to the bite of a certain mosquito, under certain circumstances, and to that alone.

Last spring the British Colonial Office, under the advice of the well-known physician, Dr. Manson, determined to try an experiment which would be conclusive, that is, send a Mission to the Campagna Romana, to live there during the malaria season, taking no precautions other than that of not being bitten by mosquitos.

Dr. Sambon, Professor in the School of Tropical Medicine, and Dr. Low, of Edinburgh, a student at the same, were chosen for the enterprise from London, while they were joined in Italy by an Italian artist, Signor Terzi, and a manservant. On arriving in Rome, Dr. Sambon at once made inquiries about the marshes in the Campagna, and having heard that the most deadly malarial spot was at Ostia, on Royal property, he obtained permission from King Humbert to settle the Mission at Castel Fusano, the late King's favourite hunting lodge. Here they raised a small and compact wooden house, what the Americans would call "cute," brought from England, with every piece perfect, and nothing to do but to put it together. There was only one door, which, together with all the windows, was protected by wire-netting against the mosquitos, while the beds and door were also hung with mosquito curtains.

The malaria mosquito (anopheles) bites by preference at sundown and sunrise, and also during the night hours, but seldom during the day, especially under the rays of the sun. So the members of the Mission were enabled to go about their

several avocations in the day, shutting themselves up at sundown, and not going out until after sunrise.

The peasants of the district, all afflicted with malaria in the most distressing way, with discoloured flesh, fixed, dull eyes, and distended, swollen bodies, laughed their new neighbours to scorn, predicting for them a fate like their own. As time went on, and the "Inglesi" (as they called them) not only throve, but waxed stronger and more vigorous, they began to find reasons for the miracle. "It is because you live a life of ease," they said at first; so the doctors went and worked like day-labourers, getting soaked with swamp water and dried and baked by the sun. When they still had no fever, the peasants continued: "It is because the earth about is not broken"; so all round the house was immediately dug up, producing no result, but the finding of an interesting Roman tomb, containing a female skeleton which had a piece of money in its jaws to pay its way over the River Styx. Then it was because they did not taste the water, whereupon Dr. Sambon drank some, and when it was seen that they slept with all the windows open and did not wish to be bitten by the mosquitos, the Mission was declared "mad," which, of course, explained everything.

The net results of the experiment are important in the extreme, *i.e.*, malaria comes from the bite of a certain kind of mosquito, and from no other cause, and the way to fight it is to protect man from the infected mosquito. Many studies have been made to find means to destroy the dangerous insect, but without result, so all efforts will now be turned towards getting rid of the infection.

The anopheles mosquito is harmless, unless infected with malaria, which it only takes from man; so isolate the man who suffers from the disease until cured, and there will be no more malaria.

The process of development of the malaria parasite is infinitely interesting. The parasite injected into the blood of man by the anopheles attacks the red globules, develops, and is multiplied into many tiny bodies after having destroyed the globules in which it found refuge. The new small bodies attack other globules, and so on, each multiplication producing a fresh access of fever in the man. The male and female of these parasites, so long as they rest in the blood, do not unite, and here comes in the mosquito. It bites the patient and draws in the parasites. The male and female unite in the stomach of the mosquito and produce a tiny living particle, which attaches itself to the lining of the stomach, grows, containing minute living particles sometimes to the number of 10,000, which are called sporoids. When the time is ripe, the parasite bursts, setting free the sporoids, which are gathered into the saliva glands of the mosquito, and as the latter often contains many parasites, the glands are the depository of millions of sporoids. The mosquito then bites a human being and injects the infection, and so the cycle is complete.

The English Mission, besides the real experiment of living protected in the marshes, provided the means for a most interesting one in London. Anopheles mosquitos were infected at the Santo Spirito Hospital in Rome, through biting a man suffering from tertian malaria fever, and were then sent at once to London. There Dr. Manson's son, himself a physician, in the best of health, and who had never had malaria, was bitten several times.

At last, five days after the last bite, he was attacked with headache, bone-ache, lassitude, and loss of appetite, with a rise of temperature to 102 degrees. Two days later, there was an intermission, when high fever set in, followed by a temperature of 104 degrees and delirium, which was relieved during the night by profuse perspiration. A clear case of tertian malaria.

By the time the Mission was leaving, the unbelieving peasants no longer called them mad, but believed in them entirely, and begged them to return to cure and protect them. The house is left standing, and has been presented to the Municipality of Rome, which will use it as a head-quarters for further experiments, while England reserves to herself the right to send there a student free of cost.

Professor Grassi, one of the leaders in this field, Professor at the University of Rome, has now decided upon an experiment on an enormous scale. He will take the south of Italy, on the Mediterranean side from Naples down, and protect the inhabitants, which number about 2,500,000, and are scattered over an area of 20,000 square miles, and declares that in five years he will have completely destroyed the malaria there.

These discoveries are of incalculable benefit to mankind and the world, and financially are perhaps the greatest of the century. What vistas of wealth are now opened up by the possibility of living in health and comfort in places until now considered deadly— like, for instance, certain parts of India and the Gold Coast! England in her Colonies, and Italy in her own country, will be immensely benefited and enriched.—*Daily News.*

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Wood Circular.

London, 3rd December 1900.

EAST INDIAN TEAK.—The deliveries for November amount only to 833 loads as against 1,222 loads in November 1899. For the eleven months of this year they have been 9,833 loads, and in the same months of 1899, they were 16,194 loads. There is no change to report in this market, the dulness of it is sufficiently indicated by the figures, but there has been no alteration in price. Future business also remains very quiet; more, however, in this case from want of unsold stock near enough to handle than from any lack of demand.

ROSEWOOD—EAST INDIA.—The demand is very dull, and sales are only possible at reduced prices.

SATINWOOD—EAST INDIA.—The demand is quiet and stocks sufficient.

EBONY—EAST INDIA.—Good parcels would bring full prices.

Denny, Mott and Dickson's Wood Market Report.

London, 3rd December 1900.

TEAK.—The landings in the Docks in London during November consisted of 62 loads of logs and 241 loads of planks and scantlings, or a total of 303 loads, as against 271 loads for the corresponding month of last year. The deliveries into consumption were 381 loads of logs and 310 loads of planks and scantlings, together 691 loads, as against 1,173 loads in November 1899.

The Dock stocks at date analyse as follows:—

8,628	loads of	logs,	as against	6,735	loads	at the same date	last year.
4,919	„	planks	„	2,535	„	„	„
	„	blocks	„	8	„	„	„
Total	13,619	loads		„	9,278	loads.	

The demand during November, although exceeding the import, was of a very meagre character, but stocks continue to be held very firmly in face of shippers preferring to market their supplies in the East, rather than encourage orders from Europe by lowering their *f.o.b.* pretensions.

Market Rates of Products.

Tropical Agriculturist, December 1st, 1900.

Cardamoms	...	... per lb.	2*s.* 3*d.* to 2*s.* 4*d.*
Croton seeds	...	... „ cwt.	30*s.* to 40*s.*
Cutch	...	... „ „	23*s.* to 35*s.*
Gum Arabic	...	... „ „	23*s.* to 35*s.*
Do. Kino	...	... „ „	90*s.* to 107*s.* 6*d.*
India-rubber, Assam		... „ lb.	2*s.* 10½*d.* to 3*s.* 0¼*d.*
Do. Burma		... „ „	2*s.* 3*d.* to 3*s.* 3*d.*
Myrabollams, Madras		.. „ cwt.	6*s.* to 7*s.*
Do. Bombay		... „ „	4*s.* 9*d.* to 9*s.* 6*d.*
Do. Jubbulpore		... „ „	4*s.* 3*d.* to 7*s.*
Do. Calcutta		... „ „	4*s.* 6*d.* to 6*s.*
Nux Vomica	...	... „ „	7*s.* to 10*s.*
Oil. Lemon-grass	...	... „ lb.	3*d.*
Sandalwood Logs	...	... „ ton.	£20 to £50.
Do. Chips	...	... „ „	£5 to £8.
Sapanwood	...	... „ „	£5 to £5-10*s.*
Seedlac	...	... „ cwt.	51*s.* 6*d.* to 59*s.* 6*d.*
Tamarind, Calcutta	...	... „ „	15*s.* to 16*s.*
Do. Madras	...	... „ „	7*s.* 6*d.* to 11*s.*

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Rotation and Possibility in Selection Forest.

By F. Gleadow, I.F.S., F.R.M.S.

In the *Revue des Eaux et Forêts* for October 1st, 1900, that grand old Forester of France, M. Ch. Broilliard, has a thoughtful and interesting article which required and deserves a second reading. Starting from the idea that the term *rotation* is at bottom no better than a misnomer when applied to the Selection method, he goes on to recommend the abolition of the possibility by volume, with its endless countings and calculations, in favour of a simple possibility by area and number of trees. It is very possible that I have not grasped his full and precise meaning, though I got my original knowledge and love of the work from him, and hope to go on getting more. Still I will do what I can, and try not to misrepresent him. The term *rotation* then (*revolution*) is a misnomer when used in Selection methods. A forester who had never seen or heard of anything but Selection forests could not have discovered or invented it, for he would have no idea to base it upon. The word and the idea are founded upon coppice working and clear fellings in which the word represents an actual fact. Indeed, Indian foresters no longer use the word *rotation* in Selection. We have the "exploitable age" which is divided into "felling cycles." But even the term "exploitable age" is a fiction. At each felling in practice we cut trees of *all ages and sizes*, trees that have reached the top class, and also trees that would never reach it if they stood till Doomsday. We do not know the age of a single one of these trees. Some of the biggest may be well under the theoretical age, some of the small ones may be long past it, according to the conditions under which they have grown. Good sylviculture is the great object, not a rigid adherence to a given age or size. M. Broilliard

quotes from his personal experience some excellent examples of this. In 1891, there was seen at St. Dié an immense fir stump showing that the tree had lived more than 100 years under cover before attaining its freedom.

In 1893, in the forest of Etival, there was felled a fir of 95 c.m. diameter, aged 300 years. At 150 years old it was only 8 inches thick, and so on. Parenthetically, it may be of interest here, though irrelevant, to mention that the Dehra Dun Forest School possesses a round of deodar which is (as roughly recollected) about 7 feet diameter and 700 years old, though it never suffered much from suppression. To resume, what is the rotation? Is it the mean age, or the usual age of a tree of given size? On the one hand, it is impossible for the greater part of the trees to attain this given size. On the other hand, it may be a pity to fell some trees that have attained the given size but are still prospering, and their age may vary as 1 is to 2. In the Selection fir forest, there is neither mean size nor mean age, and the term rotation is consequently incomprehensible except by analogy with some other method, such as that of *regular* high forest.

The use of a possibility by volume, always uncertain and variable, leads continually to new valuations and regulations.

Before each return of the fellings, new countings and estimations have to be gone through, the trees are being constantly subjected to the clawings and blazes of the measurers, and the young stock is not improved by so much going to and fro in it. From a cultural point of view, the drawback to the possibility by volume is its concentration. With a six-year period, the coupe should cover one-sixth of the area, but nine times out of ten it will be condensed into one-twentieth. Hence results too strong a felling, followed by too long a period of neglect, and general irregularity. So long as there is no fixed limit of area, for example, 4 to 6 *trees per acre*, the fellings will not extend over that *area* which is necessary to make a good *cultural* operation. It is really the possibility by volume which has led to disparagement of the Selection method of treating fir forests. Every method of treatment has its appropriate manner of realising the possibility, and if other ways are adopted, the result generally leads to disparagement.

M. Broilliard advocates a possibility limited by *area* even in the Regular method, and as many foresters fail to understand exactly what is meant, he defines it as fixing the compartment over the whole of which the coupe should extend, and laying down the "chiffre d' abatage" which, I gather, means the *proportionate severity* of the felling. Would it not do to fix the area to be revisited, say, every five years? Not so, for at each visit trees might be cut with too great freedom so long as there were any left that could be cut, to the great danger of the regeneration. The *order* of the coupes would be fixed, but not their amount. The possibility would not be truly fixed. The standards over coppice

are in somewhat similar case, and have been quoted as an instance of elasticity in treatment which gives generally fair satisfaction. But M. Broilliard quotes a grumble of the Pont à Mousson people, "so long as we are in the coupes marked by Mr. Jones, we shall get no revenues;" Mr. Jones having given their fathers too much, and reserved too little for the children. He was an exception, but such exceptions are liable to become common in countries like India, where an officer's work is judged by his revenue. The possibility by area in regular high forest would of course lead to variations of the revenue, but the "sustained yield" is a chimera, a counsel of perfection which we are always striving after and never attaining. Even with a possibility by volume, though the yield may be kept fairly constant in quantity for some years, there comes the inevitable revision, and a different yield is laid down for the next period. And even if quantities remain constant, prices do not, so we may as well submit to the inevitable and allow a possibility limited by area to gradually equate itself, which it will do in time if the sylviculture is sound. How then are we to regulate the possibility in a regular high forest, where all the exploitable material is to be removed by several fellings in due order? Not by the number of trees to be reserved, since that number will vary from one coupe to the next, and from one compartment to another. Still less by volume, which will also differ from one compartment to the next, and is also incompatible with fixed coupe boundaries, and due order in the fellings, and good cultural work. The *proportionate felling* alone can satisfy the four necessary conditions: *quantity, area, order, sylviculture.* Thus, if the matter in hand is a forest of mixed oak and beech, fell one oak out of four, one beech out of three. The *quantity* will result from the crop itself, the whole compartment will be worked over, the dates and order of felling are regular, and the sylviculture is as good as the officer knows how to make it. This last remark about sylviculture must not be misunderstood. The officer who would stretch his revenue at the expense of his sylviculture may, if he likes, cut three or four oaks in one place, but he is bound by the rule, "one oak out of four" in the total, and must remember that if he gives way to greed in one place, he will have to leave too many oaks in another, and will gain nothing but discredit for doing bad and irregular work. In cutting one oak out of four, moreover, he may not take the most valuable for no other reason. He is bound by his sylvicultural honour to take the worst first if there are any bad ones, so that the state of the forest should go on improving as it never would under a possibility by volume, although in this case, too, the question of sylvicultural honour comes in. If any subsidiary operations prior to the fellings, such as breaking up the soil surface, are necessary in a given locality, the date and area of the felling being fixed beforehand, also fix the date and area of such operations.

I have more than once been astonished to hear that the Selection method was looked on by the French as a barbarous method, that being quite counter to my own experience. It is Judeich, the Great German Professor, who is responsible. Cotta before him had recognised that the simplest methods of determining the possibility are the best, but he got no further. Judeich denied to Selection the status of a method at all, since its possibility was incapable of being prescribed. But then he was thinking of nothing but *volume*. The Americans are nothing if not original. They seem to be tending towards a *possibility* by *Sawyer's work*, "Board measure," from which may the Fates preserve us.

I wish some of our good comrades would work up and let us have their ideas on the above (or any other) subject. There are plenty of good men and true, if Government would only hurry up with that notification forbidding the use of long chairs.

On "Leaf Fires."

By O. C.

When reading of the results of Fire Conservancy Operations in Indian Forests, with what sad frequency we meet with the assurance that little damage was done to the growing stock owing to the absence of grass and other dense undergrowth; the term "leaf fire" is considered to be an appropriate description of the nature of the conflagration.

In Burma, and even in other Provinces reckoned to be more advanced in forest management, the forester often goes a step further and questions the utility of expensive fire-protection on the ground that where the undergrowth is sparse, the small damage caused by the annual fires does not justify the outlay necessary to ensure success in preventing them.

I have had opportunities of enquiring into these matters, and find that the assertion that "leaf fires" cause little damage is unworthy of acceptance and that consequently the deduction from this assertion is a fallacy, all the more dangerous where in a comparatively new department the subordinate service is taking its ideas and tone from the controlling staff.

It must at least be admitted that the seedling growth is interrupted by any fire, of whatever intensity, that may sweep over a forest area. Such an admission would in itself sufficiently justify an outlay on protective measures, unless necessarily utterly disproportionate to the present or future value of the forest; for any check to the progress of natural regeneration must be more or less serious when the progress and finally even the continuance of the forest is dependant on reproduction by this method. Unfortunately, however, the injury caused by "leaf fires" is more

far-reaching. The intensity of the flames, though it may be comparatively small, is sufficient to so injure the base of the tree that, besides creating a predisposition to disease, permanent distortions result in the growth of the younger age classes which will ultimately materially lessen the value of the mature stems.

It is not attempted to deny that much more injury is caused by those forest fires where the flames blacken the standing stems up to 20 or more feet in height; on such occasions, no doubt, many trees, which in a "leaf fire" would be only injured, are annihilated. But it is surely time to sound a note of warning to the forester not to take for granted that the injury visible immediately after the passing of a fire is all that need be considered, when in fact the most serious effects are those which, in after years, become apparent. It is surely time, too, that we should once for all accept the fact that any fire in a forest is a disaster, and that if an area is worth retaining as a forest, it is also worth while to pay an adequate premium for insuring it against accidents.

I have just passed through a promising young timber forest of teak, *Dipterocarpus*, *Terminalia* and other species, where practically every stem of this immature crop is seriously injured by "leaf fires," which have hardly even blackened the trunks, and thus the well-being of the standing stock and the future of the forest as a whole has been seriously endangered. Unhappily, too, the area contains vast numbers of flowering clumps of the male bamboo, with stems up to 10 inches in girth and 30 feet in height. The period for the annual fires will soon be approaching, and it appears probable that after these have passed a very large percentage of the already weakened standing crop will be killed out, and the type of forest completely altered, a result which will be largely due to the persistency of "leaf fires," which do so "little damage."

Caoutchouc Plantations in Assam.

By W. R. Fisher, B.A., I.F.S.

I see in the report on the caoutchouc plantations in Assam, a statement that the Bomani Hill plantation yielded 9·5 lb. of clean rubber per acre, and that the Charduar plantation yielded 9·4 lb., there being 92 trees per acre on the Bomani Hill and 14 per acre on the Charduar. Mr. McKee remarks that this proves that a densely-planted area does not yield more rubber than one sparsely planted, while it must have cost more to plant out originally and to establish as a going concern.

I chose the site for both these plantations in 1873-74, and managed them for about two years. In the Charduar plantation, lines forty feet wide were cut one hundred feet apart in dense evergreen forest, full of cane breaks, large Ficus trees and other difficulties. Colonel Keating, the Chief Commissioner of Assam,

was struck at the waste of timber, this involved and the great expense of clearing the line, and directed that an experimental plantation should be made on grass land near the Brahmaputra River. Mr. Mann, the Conservator of Forests, considered that trees grown on grass land would not yield anything like the same supply of caoutchouc, as trees grown in the humid air of the evergreen forest, and his opinion was based on the fact, that some large trees that had been tapped in Tejpur yielded very little rubber. The plantation on grass land at Bomani Hill was therefore limited to a small experimental area. The expenditure on it, however, was a mere fraction of the cost of the Charduar plantation, as far as I remember, and it would be interesting if the Assam Forest Department were to publish figures showing the comparative cost of the two plantations per acre, now that it has been proved that they return an equal yield per acre.

If grass land plantation like that at Bomani Hill will afford as good a yield as the forest land plantations in Charduar, a great future may be predicted for rubber-planting in Assam, and there are, or were in my time, enormous areas of waste grass land in that Province.

Flowering of the Bamboo in the C. P.

By A. SMYTHIES, B.A., I.F.S.

A somewhat remarkable event is taking place in the Chanda district of the Central Provinces, and that is the flowering on a large scale of the ordinary bamboo (*Dendrocalamus strictus*). The area over which the flowering extends is estimated at 1,200 square miles, and in this area, although a few clumps here and there have escaped, the phenomenon is universal. But the extraordinary point about it is that clumps of all ages are flowering—not only mature clumps but quite slender seedlings of six or seven years' growth, or even less. I send you some specimens to illustrate this; the rhizomes show that those clumps are quite young. Last year the droughts affected the bamboos in the Dhaba Range of this district, and the bamboo flowered over a small area, and produced a kind of manna, which was described in the Forester (Vol. XXVI., page 363). Many thousands of people were kept alive for some weeks on the seed. This year the area is infinitely larger, and the whole population will, in course of time, flock to the forests to gather the seed.

The consequences to the people in the vicinity of this flowering and subsequent death of the bamboo will be rather serious, as for many years to come, they will not be able to find sufficient stores to satisfy the numerous wants of the agricultural population to the north and west of Chanda—at any rate, the price of bamboos will be very much higher.

The Government revenue which now amounts to about Rs.20,000 from this source will also suffer, as, when the dead bamboos have been utilized, there will be no more available for some 15 years or so. It would be interesting to ascertain whether such a universal flowering of this particular species has been recorded before. Needless to say, the oldest inhabitant has no recollection of such an event, and the flowering of the smallest clumps is believed to be unique.

It is probable that in this district at least, the bamboo does flower gregariously over fairly large areas, as three of the eldest inhabitants informed me that they had seen the bamboo flower twice: first, when they were about 10 years old. Their ages were probably quite 70. Hence it is not unlikely that this bamboo flowers at intervals of about 30 years.

[*We would refer our readers to Volume XXV.* (1899) *of the "Indian Forester," pages* 1—25, *and* 305, 306.—*Hon. Ed.*]

The Forests of Arrakan, Burma. *

By E. P. Stebbing, I.F.S., F.E.S.

Discussion with the Deputy Commissioner, Arrakan district, on the present method of working the Forests.

At the commencement of this article I stated that my visit to Akyab was made in connection with the working of the Chittagong Division in Bengal. The Division is chiefly a water one; the forest produce is floated down the rivers and the royalty is realized at toll stations, situated on the banks of the waterways, the timber being at the same time marked with the Government hammers. Soon after my arrival I discovered that a large quantity of unmarked timber and boats (dugouts) existed in the district, and the answer generally forthcoming to my enquiries as to the reason for the absence of the Government marks was, that the timber or boats in question had been brought up from the Arrakan districts, either direct by sea or along the sea face for a portion of the route and then through the numerous tidal channels which intersect all the southern portion of the district. The result of this presence of unmarked wood, &c., in the Chittagong district, greatly increased the difficulty of working the forests and checking the timber and boats brought out, and in order to understand exactly what arrangements were in force in Arrakan, I determined on my visit to the Deputy Commissioner.

A conference with him showed that the arrangements for collecting revenue on the Arrakan timber were very slight, a sum of Rs.4,000 odd representing the total annual revenue from the forests of his district. The Deputy Commissioner informed me that the timber was sold standing in the forest at Rs.3 per ton, provided the amount was paid before cutting and extracting the

* Begun in February Number, 1901.

wood. Failing this prior payment, Rs.5 per ton was charged. Passes were issued either by the Deputy Commissioner himself or by the Township Magistrates. The timber was not, however, *marked in any way* before being taken out of the forest or subsequent to its removal. This produced my difficulty in Chittagong. The Deputy Commissioner informed me in answer to a question that he was not aware that boats (dugouts) were exported from his district. Jarool boats (jarool is the best timber of Chittagong) are, however, numerous in my district and they came from Arrakan, their preparation from the forests in the Chittagong Division being prohibited owing to the enormous waste their construction entails. He further informed that there was no regular system of management in force for the Arrakan forests, and that he did not see his way to introducing one at present. He thought it probable that his forest areas were large, but he did not know exactly what timber they contained. His annual revenue from them was roughly Rs.4,000. In 1869, Dr. Schlich remarks that the revenue from the Arrakan forests, as a whole, had never reached Rs.5,000. In this connection I may mention that some merchants in Akyab informed me that they were being supplied with jarool in Akyab at Rs.50 per ton. I gathered from enquiries I made that the forests in the north of the district abounded in jarool, and as I shall show this statement is borne out by the fact that the wood is at present largely exported from here.

Description of the Northern Arrakan Forests.

I will now state shortly my impressions of the Northern Arrakan forests I passed through on my return to Chittagong, and will then, after touching on the export of timber from these forests, detail my reasons; for the opinion I have formed that a reconsideration of the advisability of the reservation of the Arrakan forests, as a whole, seems to be justifiable.

The forests north of the Kolandyne River resemble those lying to the south of the river, which were reported on by Dr. Schlich, in that they may be divided into three belts.

I.—The Mangrove Forests.

The mangrove forests comprise the low-lying swamp forests on the sea-board.

II.—The Dry Forests.

The dry forests are those situated on the rising ground immediately adjacent to the swamp forests.

The evergreen forests situated in the mountain belt.

III.—The Evergreen Forests.

These forests, I can dismiss in a few words as I saw nothing of them except from a distance. It was evident that the Toungya cultivation was largely carried out within their area, numerous burnt patches in the day time and fires at night being visible.

I.—The Mangrove Forests: (*a*) Description.

These forests are situated on the low ground running along the coast line of the Arrakan district and on the islands and banks of the rivers up to the point when they leave the hills and

also on the banks and churs in the network of canals which intersect the western side of the district. I noted that these islands filled the Kolandyne for some 50 miles upwards from its mouth and were clothed with the mangrove jungle, amongst which I noticed kripa (*Lumnitzera racemosa*), which is common in Chittagong. The sundri (*Heriticra littoralis or fomes*), common in the Sundarbans Division, is, I believe, also fairly abundant in these forests, but I am unable to personally vouch for this.

During my trip from Akyab north to Bothedong, I went through numerous kals and into and up the Méyu River, and I noted that the mangrove jungle was abundant everywhere. I also observed that the edges of the banks of the canals were fringed with a single line of the palm (*Nipa fruticans*) so plentiful in the Sundarbans (Bengal), where it is known as Golpatha. The palms are planted in this position, the leaves being used by the poorer classes for roofing their dwellings, instead of the sunn grass, in almost universal use (where not replaced by corrugated zinc roofing) in the Chittagong district.

The same predominance of mangrove jungle is to be observed on the banks of, and on the churs situated in, the Naf Estuary, the river which separates the southern portion of the Chittagong district from Burma (Arrakan).

This Sundarbans forest generally reaches about 50 feet in height, consisting of a mixed forest containing trees of all ages. The growth is very dense, aerial roots being numerous and rendering progression through the forest extremely difficult. Among the trees recognisable, I noted kripa (*Lumnitzera racemosa*), goa(?) gattea (*Periops candolliana*), sundri (*Heriticra littoralis or fomes*).

(*b*) Present management.

At present no revenue appears to be collected from these mangrove forests, perhaps owing to the small population and the great abundance of the jungle. I was told that the firewood used in Akyab itself was brought up from forests situated some distance to the south-east in the next district. If this is so, I do not understand the reason, as firewood is abundant at its very door.

(*c*) Future management.

For the present, at any rate, there would not appear to be a great demand for fuel from these forests, and a more detailed inspection will not improbably show that their reservation is not at present necessary, save perhaps of areas round the larger towns where firewood is being cut.

II.—The Dry Forests: (*a*) Description.

These forests, as already mentioned, are situated on the dry ground immediately adjacent to the mangrove forests forming a belt between these latter and the evergreen forests. The woods are mixed uneven-aged, virgin ones, and appear to be well stocked where untouched by heavy fellings and toungya cultivation. An inspection, however cursorily made, shows, however, that this latter is doing irreparable damage and that areas clothed

with fine forest are rapidly being denuded, the woods being replaced by a useless scrub-jungle. That the former—the heavy fellings—are also seriously impairing the forests I will show later on.

The dry forests are the home of the Pyinkado where found in Arrakan. Dr. Schlich, in his report, stated that he did not visit the forests situated to the north of the Kolandyne River, but believed them to be similar in character to those on the eastern bank. I am able to corroborate his statement that the tree exists in these northern forests, but my time was too limited to enable me to ascertain whether it was abundant or otherwise.

In addition to the Pyinkado, and at present holding a position of as great, if not of greater, importance in the forests of this portion of Arrakan, are three trees, jarool (*Lagerstömia Reginæ*), khoira (*Acacia catechu*), and garjan (*Dipterocarpus turbinatus*). They are all good timber trees, and in the last few years their wood has obtained a marketable value owing to a greater demand. I was informed that these trees are to be found fairly abundantly over this area, and from the export operations at present taking place I should think that this statement is probably correct.

Many of the other trees mentioned in Appendix A are to be found in these forests, but their importance is, I believe, at present small, although there is some demand.

(*b*) Present management.

In my interview with the Deputy Commissioner at Akyab referred to above, I have already mentioned the method on which these forests are worked, adequate supervision with the available staff being impracticable. The sale of the timber would appear to be practically in the hands of the Township Magistrates. As far back as 1870, Dr. Schlich stated that he thought this state of things should be discontinued, and the following would seem to show that the time has arrived when these forests should be relegated to the management of the Department.

I have said that a demand has arisen for the three timber trees, jarool, khoira and garjan, and my enquiries have shown me that heavy fellings of these trees are being made in the forests in the north of Arrakan immediately to the south of the Teknaf Estuary. How far such cuttings may be going on in other parts my inspection was too limited to enable me to ascertain. At the present moment there are at least two places on the Naf Estuary from which timber of the above kinds is being exported in large quantities, both in brigs and large native "balam" boats. These places are Maungdaw and the Prooma Kal. There is or was a very fine forest round these places, and it is rapidly being cut out and ruined by the heavy fellings at present being made in it. It has been already mentioned that on payment of a royalty of Rs.3 per ton a pass is made out for the intending trader who then proceeds into the forest and cuts what he likes. Under this pass the wood has, I understand, to be measured up in the forest before it is taken out, and the purchaser must give notice to the Examining

Officer when he has cut the amount of timber he has paid royalty for. Now the royalty actually realized by Government is very small, and out of all proportion to the amount of timber that is being taken out; at least this is the opinion my short inspection and subsequent enquiries have led me to hold. The balance of the timber is therefore removed illicitly, and the following is one of the methods in which this is done:—A trader takes out a pass for a certain amount of timber, we will say 100 tons, and goes into the forest to fell it. Once here he cuts as much as he possibly can within the time, but only presents for examination at the end of the period the 100 tons he has paid royalty on. Before asking for this inspection, however, he removes the extra timber cut, the paucity of the staff rendering this illicit removal an easy matter.

The trees are either converted into dugouts *in situ* after being filled or cut up in the forest or just outside, into beams, planks, posts, scantlings, &c., and quantities of these are to be seen at Maungdaw and the Prooma Kal. They are exported in this form. That this trade in Arrakan timber is assuming some importance is further borne out by the fact that large advances are now made to sawyers who live on the Moiskal Island, situated off the coast in the south-west of the Chittagong district, and these men go down and spend the cold weather felling in the Arrakan forests.

(*c*) Future management.

It is hardly necessary here to make any remarks as to the future management of these forests. A careful examination of them, based on the knowledge that the conditions of environment, &c., as existing in 1870, have considerably changed, is required, and it is with this object in view that the present note has been written.

(*To be continued.*)

II.—CORRESPONDENCE.

A Madras Phyllanthus Overlooked.

In going over the specimens of plants of the order *Euphorbiaceæ* collected by me in various places in India, I came across those of a common shrub of the Madras Presidency which I had collected on the Yerramalai Hills of Kurnool, where it was common and almost gregarious. I was completely puzzled by it as I could find nothing to agree with it in the "Flora of British India," so I took it to the Herbarium at Kew, and, with the kind help of Dr. Stap, ascertained, after some trouble, that it was the plant which was figured in Wight's "Figures of Indian Plants," 1994, as *Cherizandra pinnata*. In the "Flora of British India" it has been included, by some mistake, under *Flueggia microcarpa*, a well-known Indian plant found in abundance in places in various forest regions, which is however quite different. Its real name, as

rightly determined in De Candolle's "Prodromus," is *Phyllanthus Wightianus*, Muell. Arg., under which name it should have been included in the "Flora of British India," in a separate section of *Phyllanthus Chevizandra*.

The plant is said by Wight to be "abundant on arid laterite "soils along the western shores of the Pulicat Lake, where it forms "extensive low jungles within about 20 to 25 miles in a north-"west direction from Madras. It is also found in the Northern Circars." I have seen it myself in various places in the Chingleput, Nellore, Kistna and Kurnool districts. It is deciduous and flowers when leafless. It has somewhat the appearance of a small shrub of *Phyllanthus Emblica*, but with larger, rounder and more distant leaves, and the fruit is a small three-celled capsule.

Sir D. Brandis, who happened to be at Kew at the time, has suggested my sending you this note, as some other Forest Officer may also have been puzzled by the absence of the plant from the "Flora of British India." It is not mentioned in "Beddome's Flora Sylvatica."

J. S. GAMBLE.

Insect Plagues in Deodar Forests.

With reference to the correspondence on the above subject in the November and December Numbers, a new insect attack has been noticed in the Simla Hills this year. It would be interesting to know if the insect has been observed elsewhere. In May and June the deodar trees were attacked by a caterpillar which stripped them of all their needles. The insects disappeared at the commencement of the rains and new needles appeared on the trees in July. The attack was noticed in two forests, *viz.*, Cheog forest below Fagu and Kalela, near Kotkhai, and about 20 miles distant from the former, and in each case extended over about 100 acres. The crop consists of pure deodar pole forest. The parts where the deodar are mixed with blue pine or spruce were not attacked. I presume that, if these caterpillars appear for two or three years in succession, all the trees will be killed. By digging at the base of the trees a number of pupæ were obtained, but they have not yet turned into moths.

KALESAR: *Punjab.*

E. M. COVENTRY.

[A number of these pupæ, which Mr. Coventry kindly sent to Mr. Stebbing, are now at the School. If moths are obtained from them, Mr. Stebbing has undertaken to identify them.—HON. ED.]

The Paris Exhibition Awards.

In the *Indian Forester* for November 1900, an article which had appeared in the *Timber Trades Journal*, entitled "Indian Timber at the Paris Exhibition, 1900," was reproduced. It would

appear from various remarks made by the writer that he can hardly claim to have been well informed on the subject on which he writes, nor can he have been aware of the fact, that India, at the Paris Exhibition, did not mean an exhibit of articles by the India Forest Department alone, but an exhibition of Indian artware, commercial products, &c., including exhibits by the Forest Department, the whole exhibited by the Government of India—a very different thing to an exhibit by one of the great Departments alone. One man had to be put in charge of the work in India, and this man was found, I believe, at the suggestion of Sir E. Buck, in the able and energetic Inspector-General of the Forest Department, Mr. Ribbentrop, C.I.E. He it was, with Sir E. Buck, who carried out the whole scheme of the exhibits, and had more space been available in the building, an even finer show that which has been called 'the most unique thing in the exhibition,' would have been made. To Mr. Ribbentrop, and not to Mr. Rose, or any member of the Indian Sub-Committee, the chief credit for the collection of the Indian exhibits and the general scheme of their general arrangement belongs.

The writer of the article in question makes the following statement:—"In fact, we think the Indian Sub-Committee of the British Royal Commission has made an exceedingly good display with the very meagre fund (£12,000) placed at their disposal, and particularly is credit due to the Honorary Secretary, Mr. J. B. Rose, for the tasteful manner in which the exhibits have been arranged, and generally for the organisation of the section."

This statement is as misleading as it is incorrect. I have said that the credit due for the collections, naturally entirely made in India, belongs to Mr. Ribbentrop. He also drew up a scheme for their arrangement in the building in Paris. The carrying out of this work at the latter place was entrusted to Mr. Gamble, F.R.S., C.I.E., late Conservator in the Forest Service, assisted by Messrs. Muriel (of the Forest Service) and Hallé, and the credit due for the tasteful manner in which the exhibits have been arranged, and generally for the organisation of the section in Paris belongs to these gentlemen, and not to Mr. Rose or the Indian Sub-Committee.

I may add, what has apparently been entirely overlooked in the article in question, and in others on the subject, that the entire trophy was put together, each piece being fitted in its place, numbered and entered in a catalogue by Mr. Manson, Conservator of Forests, in Calcutta, under the personal supervision and direction of Mr. Ribbentrop. High praise is certainly due to Mr. Manson for the able and energetic way in which he carried out this work—praise that can in no way be claimed for Mr. Rose or the Indian Sub-Committee.

P. Q. M. F.

Coppicing in Unprotected Forests.

I am interested in the letter in the December issue of the *Indian Forester* on the subject of coppicing in Unprotected Forests. The so-called "Protected Forests" in this district are somewhat similarly circumstanced to those in Raipur, and the latter would, I imagine, contain for the most part the same species of trees. The crop in such forests here consists of sál sometimes, but usually of *Cleistanthus collinus*, *Anogeissus latifolia*, *Diospyros*, *Ougeinia*, *Zizyphus Xylopyrus*, *Odina*, *Nyctanthes*, *Phyllanthus Emblica*, *Terminalia tomentosa* and *Chebula*, *Boswellia serrata* and *Buchanania latifolia*, and on northern aspects *Bauhinia retusa*, and occasionally *Chloroxylon Swietenia*. Nearly all coppice and pollard well. Fires run through the forests nearly every year. Both cutting and grazing vary in intensity. The people never use their axe more than they can help. They cut two or more feet above the ground, and they bend the tree over till it breaks as soon as it will break. Here forests occur, which have been submitted to this treatment, in varying degrees and for varying periods, and the ultimate result appears to be that where there is any soil the trees give place to a growth of grasses, and where there is no superficial soil, first one species, then another disappears, until there remains only a heap of black rocks, from the crevices of which a few sál poles and bushes of *Cleistanthus collinus* grow, and there is not enough leaves and grass for even fires to do further damage. I think that in the case of the Raipur Forests, under the conditions formulated, their reduction to one of the states described above is only a question of time. The question is whether the forests would last any *longer* if properly coppiced than when the trees are cut off some feet above the ground. I am inclined to agree with Mr. Long that they would not, as a rule, derive any benefit from the trees being cut flush with the ground. It is not so much on account of grazing, because some of the species (here at least) are not grazed even by goats, but on account of the annual fires. Personally, however, I think more data are required as to the effect of ground fires on the coppice shoots of trees that have been properly coppiced, say, just before the rains. Is it true that every shoot that comes in the way of a fire is killed? I am inclined to believe that, apart from many small patches, especially on rocky ground often escaping fire for two years together, many of the trees abovementioned will, if *properly* coppiced, grow sufficiently hardy in one year to resist a moderate ground fire, and that it would be worth while experimenting in this direction.

H. H. H.

Tree Growth on Iron Soils.

In the course of examining a forest area for the purpose of marking off areas of approximately equal capability, I had to walk over two large hills from 1,750 to 1,850 feet high. These hills

are covered with dense spear grass about 3 feet high, among which are hidden boulders of various sizes. There is scarcely a tree over an area of 100 to 150 acres, although an adjacent higher hill is well clothed. The very few trees that do exist are evidently not happy, and consist of dwarf, badly-grown individuals of *Anogeissus*, *Lagerstræmia*, *Terminalia tomentosa*, *Schrebera* and *Buchanania*. The hills have often been burnt, but not more so than the adjacent stocked ones. On examination of the boulders I found that they were full of an ore of iron, and would be interested to learn whether there are other cases which point to soil so constituted being inimical to tree growth. Iron occurs in many parts of this district, but I have not observed it in such large quantities elsewhere, nor any marked effect on the crop.

IRON.

Damage by Wild Elephants.

With reference to his letter in the November Number of the *Indian Forester* regarding the damage done by wild elephants, has the Conservator of Forests, Bengal, tried arming his boundary posts with barbed wire? I have heard this suggested as a likely remedy.

G. E. S. CUBITT.

Recruitment for the Indian Forest Service.

The following appeared among the telegrams in some Indian papers recently :—

"*The Indian Forest Department.*—It is notified that the Entrance Examination for the Indian Forest Department for next year at home will be the same as for the Indian Police Department, candidates being permitted to enter for either or both the services. The Forest candidates who qualify will thereafter spend three years studying at Cooper's Hill and abroad."

There is nothing new in this, but why is it allowed to continue? Is it believed at home that the difference of pay on arrival in India is sufficient inducement to make the best men, or those who pass highest and have their choice of services, choose the Forest Department? A comparison of the relative standing of men of the same year, three years subsequent to the examination, should dispel any such illusion.

The Police Officer comes out soon after the examination, and though he commences his service on Rs.100 a month less than the Forest Officer, by the end of three years he has probably been promoted; he has passed his local examinations, has three years' service behind him, counting towards furlough and pension, and has been emancipated from College-life for three years, during which he has cost his parents nothing.

The Forest Officer goes through a three years' course of training, not one day of which counts for service for furlough or pension, arrives in India with all his local examinations before him, and meets the Police Officer on his way home on privilege leave drawing the same pay (at least) as the Forest Officer is about to commence on. The Forest Officer's training has cost *his* parents about £1,000, and he is in most ways worse off than the Police Officer.

There is evidently something wrong in the State of Denmark, or the status of the Forest Department, which ranks as a technical Department, and should either have special attractions in the way of pay and pension to enable it to attract the best men, or else should have an Entrance Examination to itself.

TSEROFSKI.

III.—OFFICIAL PAPERS AND INTELLIGENCE.

Report on the Teak Trade of Chiengmai, Siam.*

By Mr. Acting-Consul J. Stewart Black.

Exports to Burma.

The exports to Burma for the year 1899 amount to 175,444*l.* as compared with 252,837*l.*, a decrease of 77,393*l.* This decrease is chiefly accounted for by the smaller deliveries of teak from the Siamese Salween district to Moulmein. The value of teak worked out from this district amounts on an average to about half the total exports. In 1899, 17,824 cubic tons, valued at 79,314*l.*, passed the duty station at Kado. The corresponding figures for 1898 were 26,479 cubic tons, valued at 100,657*l.* On the Bangkok side the output amounted to 86,336 logs of all sizes, or, roughly speaking, 25,326 cubic tons, valued at 96,250*l.*, slightly less than the output of 1898, valued at 100,000*l.* The total output of teak, therefore, from Northern Siam during the year 1899 was 53,150 cubic tons, valued at 175,564*l.*, showing a decrease of about 25,000*l.*

Teak.

Output compared with 1898.

For the purposes of comparison a statement showing the total output on the Bangkok and Moulmein sides, respectively, during the last ten years, is added. The statistics as regards Bangkok are not official as, previous to the advent of the Royal Siamese Forest Department in 1896, no official returns were available. They are, however,

Output for last ten years.

* Diplomatic and Consular Reports, Siam. Trade of Chiengmai, No. 2518, Foreign Office, August 1900. Printed by Harrison and Sons, St. Martin's Lane, London. Price—One Penny.

the estimates of timber traders, and are substantially correct. Only full-sized logs are given, and the figures are for the floating season which begins with the rains in May and ends in the beginning of the following year in February or March according to the state of the water in the rivers. The under-sized timber sent to Bangkok has little influence on the export trade to Europe, as it is used locally. The Moulmein figures have been obtained from the returns published by the Government of Burma, and are for the months ending December in each year. The returns include logs of all sizes, the figures for full-sized logs not being obtainable here.

Statement of the Output of Teak from Northern Siam for the ten years 1890-99 *(inclusive.)*

Year.		To Bangkok (Full-sized Logs).	To Moulmein (All Sizes).
1890	Number ...	31,000	62,117
1891	,, ...	11,000	43,873
1892	,, ...	72,000	63,670
1893	,, ...	73,000	52,463
1894	,, ...	72,000	... *
1895	,, ...	65,000	55,935
1896	,, ...	59,000	47,132
1897	,, ...	31,000	62,717
1898	Cubic tons ...	76,000	26,479
1899	,, ...	53,000	17,674

Cause of decrease in 1899.

The decrease in 1899 is due to the deficiency in rainfall during the past three years. In 1897, the rainfall amounted to 41½ inches, in 1898, 42½ inches, and in 1899 less than 40 inches. In 1893, when the last very heavy rain occurred, a total of 73 inches was registered. This deficient rainfall resulted in a very poor floating season, and this was particularly the case as regards the River Me Ping and its tributaries (the Chiengmai side). Only a few logs from this district got through to Bangkok in the course of the year. No logs at all came out to the main river from many of the tributaries, and in some instances logs put into the streams early in the rains never moved at all. The River Me Ping was unusually low during the year, and at the height of the dry season there was said to be less water in the bed of the stream than has been seen for fourteen or fifteen years. The last arrival of timber at the duty station at Paknampho was in the week ending February 10th. In the previous season the last arrival was in the week ending February 10th, whilst the date of last arrivals during the twelve years before that has varied from January 20th to March 17th.

* No return.

Prospects for next year.

In consequence of timber not moving during 1899 for want of water, the result is that if the rains for 1900 are only moderately heavy, the arrivals will exceed that of any other season. Over 20,000 logs are lying in the main stream well on their way to the duty station; whilst in the upper stretches of the river, there are also large quantities of timber which should, with fair average rains, reach the duty station this season. It has been predicted by weather prophets—it must be added, interested weather prophets—that the rains of 1900 will rival those of 1893 when 73 inches fell, and that the output of teak will not only beat all records but prove too large even for exporters. It is possible that the rains may be usually heavy, though the only basis for prediction seems to be the fact, that seven years have elapsed with less than average rainfall. The rains up to the present (end of June) have not exceeded those of the previous seven years, but it is during August and September that the greatest fall may be expected. One or two good floating seasons will just at this time make a great difference in the finances of all engaged in the teak business. Most of the present leases lapse in 1901 and 1902, and there is a clause which provides that timber still lying within the boundaries of the forest on the expiry of the lease be-

Large output expected.

Lapse of timber to lessor.

comes the property of the lessor. The lessor is nominally one or other of the local authorities, but, practically, the Siamese Government as the nominal lessor or forest owner is not allowed any voice in the matter of the disposal of the timber or the forests. An immense quantity of timber is now in the process of extraction, and should the seasons remain persistently bad till 1902, British companies and British traders will incur heavy losses. In some forests it takes quite three years to work the timber out, and as leases have been granted for a period of six years only, the margin for bad seasons is not very large. As may be well understood, the rainfall is, therefore, one of the great factors for good or evil in business in this part of the world, and the numbers of tenths of inches daily recorded is a matter of anxious interest.

Extraction of teak more difficult.

Everything is combining at present to make the extraction of teak more expensive and more difficult. The establishment of the Siamese Forest Department, an indispensable machine for the proper collection of revenue and the protection of the forests,

Restriction of new regulations.

necessarily leads to restrictions resulting in fines for infringement of regulations, and the uncertainty and trouble caused by the institution, or threatened institution, of law suits.

Increased price of elephants.

The price of elephants, without whose valuable aid timber cannot be dragged, has gone up three-fold, though it is to be hoped that this is only temporary, and labour has not only

become more expensive, but, what is more, serious becoming exceedingly difficult to obtain.

Scarcity of labour.

The heavy labour in the teak forests is performed by Khamoos, a hardy hill tribe hailing from the district around the Nam-U to the north-east of Luang Prabang. They are a dirty, ignorant, but for Indo-Chinese people, hardworking race, and have always monopolised the working of the forests in Siam. Before the annexation of the east bank of the Mekong by the French in 1893, they came down in large numbers to Siam, and were willing to work for very small wages. They were conveyed by headmen of their own tribe, who arranged their engagement for a period of one or two years with forest contractors at a rate varying from 30 rs. (2*l.*) to 50 rs. (3*l.* 6*s.* 8*d.*) per annum, and food, which comprised rice, tobacco, and curry-stuff. The food costs about 5 rs. per month, or say, 4*l.* per annum. Many of the foresters to whom they were hired never settled up with them at the end of their term, but by promises and small presents induced them to remain, so that it was not uncommon to find Khamoos working for foresters who had failed to pay their wages for five or six years. After the French annexation all these Khamoos became French subjects, and the French Consul made their hiring a special branch of his Consular work, and brought pressure to bear on defaulting foresters to pay arrears. Many Khamoos, finding themselves suddenly wealthy in the possession of 100 to 200 rs., at once returned to their homes, and only the few who had taken to themselves wives and settled down in the country village remained behind. This exodus soon began to affect the supply of labour, and during the last two years this has been accentuated by the much smaller number of men coming down, and the majority of time-expired men returning to their home. It is just at this time, too, that a larger supply of elephants are working in the forests, and all possible efforts are being exerted to hasten on the delivery of timber which may lapse to the lessor, according to the clause in the leases already referred to. This lessened supply and increased demand has had the natural result of raising the scale of wages, and new men, who formerly would only have received 40 rs. (2*l.* 13*s.* 4*d.*) per annum and food, are now paid as much as 120 rs. (8*l.*) with food, which in the meantime has gone up 50 per cent. in price, while experienced men, capable of managing an elephant, demand 240 rs. (16*l.*). Thus it happens that labour which some years ago cost, say, 110 rs. (7*l.* 6*s.* 8*d.*) per man per annum, now costs 210 rs. (14*l.*).

Failing Khamoos, the only labour available is the native of the country, the Lao. Unfortunately they are very indolent and possibly physically incapable of performing heavy continuous labour, and not even the attraction of what is to him a small fortune will induce them to undergo for any length of time the hard labour and isolation of forest work. The British firms and

the Burmese foresters are now, however, compelled to supplement the supply of labour with this unsatisfactory material, but it is invariably found that after the original advance has been worked off, and the Lao is a few rupees in pocket, he goes back to his native village to smoke native cheroots and bask in the sun.

Labour question serious.

The question of labour is indeed most serious, and if the supply of Khamoos keeps on diminishing, timber men will be at their wits' end to find means to carry on their works. Schemes for importing labour have been discussed, but on account of the climate the expense and the risk have never gone beyond the point of being mooted.

The amount of British capital estimated to be invested in the teak industry is 2,000,000*l.*, and the British companies are full of anxiety at the present moment. The fact of working expenses going up by leaps and bounds, the supply of labour threatening to be quite inadequate to the demand, the difficulty of inducing the native contractors to comply with the new forest regulations, and, above all, the uncertainty of the renewal of leases, and the still greater uncertainty as to what new regulations the Siamese Government may wish to insert in the new leases, all combine to render the position of the teak merchant in Siam anything but a bed of roses for the time being.

It was inevitable that after the lax and reckless way in which the teak forests had been worked for many years that all sorts of difficulties should arise from the enforcement of new regulations, and a great deal of labour has devolved upon the authorities of Great Britain and Siam in smoothing over these difficulties; but much still remains to be done, and some time will necessarily elapse before the new regulations will work without friction, and the conflicting interests of the Siamese Government and the British merchants equitably adjusted.

Forest Pests. *

1. In September 1899, the Deputy Conservator of Forests, Western Circles, forwarded some caterpillars which he reported to be defoliating teak trees in the Thana district. On examination they proved to be the larvæ of the moth Paliga damastesalis, Wlk. It has been reported almost every year as defoliating teak in various parts of India.

2. In September 1899, the Reporter on Economic Products to the Government of India, forwarded a series of the larva, pupa and imago, of a moth, the larvæ of which were said to be defoliating sál trees in Jalpaiguri. On examination the moth proved to be Lymantria grandis, Wlk. It has been frequently reported before as defoliating sál in India.

* Indian Museum Notes, Volume V., No. 2. Price, Re.1.

3. In January 1899, we received from Mr. J. C. McDonald, through the Superintendent, Madras Central Museum, some coccids which were reported to be attacking the roots of Erythrina six months old. Mr. McDonald writes :—

"These insects attack the roots of Erythrina plants six months old, and have in fact wiped out wholesale a field of fifty acres, which is shaded by the above tree. The damage began to be apparent about the burst of the North-East monsoon in November or so. The soil is quite a dry, light, and very friable one. This is the first that I have seen of this sort of damage after an experience of over 18 years of planting."

The specimens were forwarded to Mr. R. S. Newstead for identification, and his report has not yet been received.

4. In March 1900, some beetles were forwarded by Mr. G. M. Ryan, Deputy Conservator of Forests, Western Circle, from Thana district, Bombay, which he found burrowing into Khair (*Acacia catechu*) trees. This beetle (Sinoxylon sp.) has been frequently mentioned in Indian Museum Notes as attacking sál (*Shorea robusta*), *Terminalia belerica*, the guava (*Psidium guava*), and other trees in different parts of India.

5. In February 1899, Mr. G. M. Ryan, Deputy Conservator of Forests, Western Circle, forwarded some leaves of *Diospyros Melanoxylon* which were covered with galls. The leaves were forwarded to Mr. G. B. Buckton, who discovered a Psylla within the galls, which on examination proved to be new to science. He has described it as Psylla obsoleta. His description will be found on page 35, and the insect and gall are figured on plate V. (figs. 10—15.)

6. In July 1899, the Manager, Court of Wards Estates, Backergunge, forwarded through the Director, Department of Land Records and Agriculture, Bengal, some betel leaves covered with insects. These on inspection proved to be Aleusodids, and being new to our collection were forwarded to Mr. G. B. Buckton for examination. The insect proving to be unknown to science, Mr. Buckton has described it under the name of Aleusodes nubilans. His description will be found on page 36, and the insect itself is figured on plate V. (figures 7—9.)

The Manufacture of Turpentine and Colophony in the Punjab.

The following account appears in the Punjab Annual Forest Report for the year 1899-1900, which has been reviewed in the February Number (Vol. XXVII., No. 2) of this Magazine :—

"The operations for utilising *chil* pine resin may be noticed in some detail. During the season 1898-99, 16,500 blazes yielded 1,392 mds. of crude resin, including 450 mds. mentioned in para. 52 of last year's report. The total cost amounted to Rs.4,110-12-6, or an average of Rs.2-15-3 per md., including the cost of all tools, pots, &c., and carriage to the distillery at Nurpur.

An experimental distillation of 309½ mds. was made with country stills at a cost of Rs.381-5-0, including that of packing and landing at the Agency depôts in Amritsar and Lahore. The yield was 229 mds. 38 seers of colophony and 2,823 quart bottles of turpentine, or an average per md. of 29 seers, 11·5 chataks of colophony and $9\frac{1}{10}$ bottles of turpentine. The sales up to the end of June 1900 amounted to 343 mds. of crude resin, 87 mds. of colophony, and 1,415 bottles of turpentine, realizing Rs.3,979-2-4. The result of last season's working was, therefore, an expenditure of Rs.4,496-13-6 and a revenue of Rs.3,979-2-4, with a balance in stock of 740 mds. of crude resin, 143 mds. of colophony and 1,374 bottles of turpentine. During 1899-1900, 60,500 blazes are being worked, and the yield to the end of June 1900 amounted to 3,108 mds., and is expected to rise to 6,000 mds. by the end of the collecting season. The distillery plant has been supplied by Messrs. Garlick & Co. of Bombay at a cost of Rs.5,370, exclusive of carriage. The requisite buildings were constructed and the plant put in position by the end of the year, ready for work to commence at the beginning of the rains. Subsequent working will be detailed in next year's report; it may, however, be stated that the plant has proved to be capable of disposing of 31 mds. of crude resin a day, that the average result per 100 mds. is 170 gallons of turpentine and 70 mds. of colophony, and that the cost of distillation, including all charges, comes to Re.0-6-6 per md. It is hoped that the N.-W. Railway will take all the turpentine, and there seems to be no difficulty in disposing of the colophony, chiefly for making bangles. A clear profit of Rs.2-8-0 per md. is expected. The experiment gives promise of being most successful, as the product can be profitably placed on the market at lower rates than the imported articles."

Experimental Fruit and Vegetable Gardens in Burma.*

Experimental gardens.

Reports are received from the experimental gardens at Taunggyi, in the Southern Shan States, at Sinlumkaba in Bhamo, at Sadôn and Sima, in Myitkyina, and at Falam in the Chin Hills. The reports are printed in full in Appendix I. of the Report with exception of that on the gardens in Myitkyina. In these two gardens little but English vegetables have been grown, but experiments are now being made with apple, pear, peach, plum, and apricot trees. Strawberries have also done well.

The Deputy Commissioner points out that an orchard at Myitkyina would probably be in a few years self-supporting. Myitkyina is within 30 hours of Mandalay and 48 hours of Rangoon by rail, and it would be possible to supply both markets with English fruit.

* Report on Land Records and Agriculture, Burma, for the year 1899-1900. Price, Re.1 = 1*s.* 6*d.*

Bhamo.—The orchard at Sinlumkaba has made a good start. Most of the young fruit trees are thriving. Lichees have failed and filbert and cobnut, gooseberry and currant trees do not promise very well.

The Deputy Commissioner wishes to devote more attention to those fruit trees that will not grow in the plains and whose fruit will bear the risk of transport to market. At Bhamo, Myitkyina, and Katha peach trees have yielded an abundance of fruit in private gardens, and there is no doubt that they grow in those districts equally well in the plains as on the hills.

Chin Hills.—The Government grant was only made for the orchard and garden at Falam, but half of the fruit trees obtained were planted at Haka and Tiddim. At these two posts there is no gardener, and most of the fruit trees have perished. At Falam three-quarters of the trees planted still survive. Strawberries and English vegetables, except broccoli, do very well. The Chin Hills are at present out of the reach of any large market, and it would be useless to grow more fruit and vegetables than are needed for the European population in the Hills. Even potatoes are said not to be relished by the Chins, and are grown solely for sale to Europeans.

Southern Shan States.—The report on the Experimental garden at Taunggyi is not published this year separately. Experiments in wheat cultivation are no longer carried on, as the Shans are fully alive to its importance, and are able to grow wheat without further encouragement in the Mayelat. The vegetable garden was washed away by two floods in October and November, and consequently the receipts from the sale of vegetables have diminished from Rs.216 last year to Rs.128-12-0 this year. The dry-weather crop of potatoes was fairly good, but the wet-weather crop was a failure. Potato-growing by Shans is not expected to progress until some facilities are afforded for reaching the Burma market. In the orchard, strawberries have done well, and there was a good crop of peaches, but unfortunately much of the fruit was ruined by cockchafers. The nectarine trees have yielded an abundance of fruit. The Superintendent has now proved satisfactorily that the *Docinia Indica* is suitable for grafting European apple trees on. The total expenditure on the garden and orchard was Rs.3,844 and the receipts obtained by the sale of the produce amount to Rs.1,778.

English Vegetable Seeds.—In Pakokku the experiments were carried out by the District Officers and by the Assistant Conservator of Forests and were fairly successful, especially with radish, lettuce, carrots and peas. In Mandalay, the rain in November washed all the plants out. In Bhamo, ants destroyed the carrots and turnips in Shwegu, while in Bhamo town a blight attacked the tomatoes. In Myitkyina, the vegetables were grown in the Sadôn garden; cabbage, broccoli, khol, rabi and beet did not get enough water, and turnips were eaten by insects. In the Sima garden

most of the vegetables did well, but were not so good as last year owing to heavy rain. Turnips, tomatoes, celery, parsley and French beans sown in April were good in spite of the warm weather; beans, lettuce, parsley, khol, rabi and tomatoes grown during the rainy season did fairly well. In Katha, the experiments conducted by the Burmans gave little or no results, turnips and peas were fairly successful, while asparagus did well in the jail garden. In Sagaing and Shwebo, where there should be little reason for failure, the experiments were not successful, due to the general difference shown regarding them, also to the heavy rainfall in Sagaing in November.

In the Upper Chindwin, the vegetables proved a success and were useful, and partially failed only in the Kindat and Mingin townships; in the latter case due to heavy rains. In Meiktila, the experiments were only a moderate success. They were grown by Chinamen. In Myingyan, the vegetables were planted by a Burman, and due care is said to have been given to them, but without success. In the Chin Hills, at Falam, no record of the early sowings were kept owing to officers being absent on column duty, but the seeds appear to have given good results. Vegetable seeds were also sent to the Superintendent of the Northern Shan States. The sowings made during the rains are reported to have failed owing to heavy rain and want of sunshine. In the dry weather, the vegetables, with the exception of three, asparagus, onions and parsnips, did well. The Shan cultivators were successful with English tomatoes, and it is said that if seed were imported in large quantities the indigenous variety would be neglected in their favour. The garden at Lashio is some distance from wells and all the water has to be carried up. Red, white, and black ants also gave much trouble and no means was found of getting rid of them. If the ground is constantly being dug up, however, it is probable that the ants will cease their attacks.

The Imperial Institute.

Quarterly Report by the Director of the Scientific Department on enquiries conducted for the Government of India.

I have little to add to the statement made in my Quarterly Report of July last, owing to the intervention of the summer vacation. Work has now been actively resumed, and several investigations on the subjects previously mentioned are nearing completion, and will be reported upon at an early date.

Since the date of my last Quarterly Report, commercial opinions as to the value of the gum of *Prunus eburnea* and of Malabar Kino have been obtained and forwarded to India.

(Sd.) WYNDHAM R. DUNSTAN,
Director, Scientific and Technical Department.

4th October 1900.

IV.—REVIEWS.

Forest Administration in Kashmir State during 1899-1900.

A perusal of the Kashmir Forest Department Report for 1899 affords ample proof that the post of Conservator of Forests in Kashmir is not the bed of roses it is popularly supposed to be. Though the department is one which pays its way handsomely, funds are allotted to it in a most grudging manner, the staff is inadequate, miserably paid, and admittedly incompetent, the operations of the department are openly opposed by the subordinate officials and consequently by the general population, and frequently the department is called upon to effect the restoration of forests which have been so ruthlessly hacked about by contractors that no further felling can be attempted in them for another three-quarters of a century. Such a legacy devolved on the department in the year under review in the shape of the Ramnagar Forests, which lapsed to the State through the demise of the Jagirdar, Raja Sir Ram Singh, K.C.B. In spite of these many difficulties good progress is being made in many directions, and if the Conservator can gain over the opposition which now exists and can secure a more liberal distribution of funds for his work, great progress should be made in the next twenty years, as the possibilities of the Kashmir coniferous forests are very great.

Financially, the department is in an excellent condition. The average net surplus for the past nine years is Rs.5,00,075. For the present year the surplus amounted to Rs.6,38,396 or Rs.1,38,321 in excess of the average, the increase being mainly due to a larger quantity of timber being floated down to the plains, and to better prices being obtained for sleepers. It is probable that even this handsome revenue might be considerably increased within a few years if the present fatal policy of starving the department were given up and funds were freely provided for carrying out necessary improvements.

It appears from Form 61 that, at the commencement of the year, the area of forest in charge of the department was 1,969 square miles, and at the close of the year 2,294 square miles. These figures, it is said, however, do not convey an accurate idea of the area of actual forest under the control of the department, because, in the absence of officers capable of selecting areas worth retaining as forests, the course followed at present is to enter as such all areas shown as "khalsa" waste land in the settlement records. It is therefore probable that in time much of this area will be thrown out, and it is estimated that the final forest area will not exceed 2,000 square miles. This being so, given reliable and competent Divisional Officers, the Conservator should have no difficulty in acquiring a thorough working knowledge of his charge, and in placing forest conservation in Kashmir on a sound and practical basis.

In the first step towards the settlement of its forests, *viz.*, the demarcation of boundaries, the department has met with considerable difficulty, nor is this to be wondered at in a State where it is possible for a woman to openly defy the department. The lady in question, Bachnu by name, claims a certain area as her property, but has admittedly no proof whatever. In spite of the department having leased the produce, she continues to appropriate it, and although she has been repeatedly prosecuted, the Forest Department has been unable to obtain any redress, and the civil authorities "seem unable to put an end to her opposition." Surely the position of the civil authorities might, under those circumstances, be more accurately described by the words "seem unwilling to put an end to her opposition."

As a natural sequence to the difficulties attending demarcation and settlement of the forests, little progress is being made in surveys. The outer boundaries of 846 square miles of forest have been surveyed up to date, but no attempt appears yet to have been made to effect a detailed survey of the forests.

The only working-plans in existence are for forests situated in the Kamraj district. They are eight in number, and cover an area of only 10,818 acres, so that there still remains a great deal of work to be done on the preparation of working-plans. The forests comprised in the existing plans are mainly coniferous, the statistics on which the plans are based have been got by means of sample plots and by actual enumeration, and the system prescribed is either improvement fellings or "jardinage" with improvement fellings.

During the year Mr. W. Mayes, Deputy Conservator, Punjab, has been deputed to draw up a working-plan for the forests of the Bhadrawat Jagir. These forests are said to be large and valuable, containing not less than 50,000 acres of deodar. It would be well if the State would take similar steps with the more valuable of its own forests.

It has already been remarked that the establishment is inadequate and poorly paid. Great difficulty is experienced in obtaining suitable men as Rangers and Divisional Officers. Hitherto it has been customary to employ men whose only recommendation was that they were of good family, but men recruited in this fashion are never likely to give satisfaction, and there should be no difficulty in impressing on the State authorities that there is no lack of trained private students from the Imperial Forest School, who would be willing to take service under the State, provided the emoluments were made sufficiently attractive. Nor will a forest guard do much work for a monthly pay of Rs.1-4-0, nor for Rs.3-2-0 for the matter of that. A man must be given as much as will keep himself and family comfortably, and Rs.6 or Rs.7 per month should be the very lowest pay given.

One hundred and sixty-four forest cases were taken into Court during the year, chiefly on account of unauthorized felling. Less

than 50 per cent. of the cases resulted in conviction, a percentage which might well be improved upon, especially as numerous petty offences, to the number of about 480, were dealt with departmentally by the acceptance of compensation.

No regular fire-protection is attempted, but the fires which did occur only affected an area of about 10,000 acres, and are said to have done little damage to the trees. Regeneration, however, in the areas burnt over must have been very considerably retarded, and the effect on the younger plants must have been to give them a stunted growth.

Generally the natural reproduction of deodar is very satisfactory, but in places the blue pine is a source of danger to the successful reproduction of deodar owing to its abundance and profuse regeneration. Silver fir is very common, but not intrinsically important, though the day may come when it may be found possible to utilise it for purposes which at present require more valuable timbers. With regard to artificial reproductions, little has ever been done with the exception of small sowings of deodar in a few places. These have not proved a success, and it has been decided to abandon further experiments in this direction for the present at all events.

The State forests have to meet the demands made on them by departmental working, purchasers and free grants. The total amount of timber and firewood removed during the year was 5,035,256 and 31,151,494 cubic feet respectively, as compared with 3,885,577 and 27,639,521 cubic feet removed during the preceding year. The departmental operations were mainly confined to the production of railway sleepers, of which 1,246,453 cubic feet were removed during the year, being a very considerable reduction on the output of former years, probably due to the supply being in excess of the demand. In Kashmir the saw has been successfully introduced, and at present all logging by means of the axe is forbidden. The sawing is mainly done by Punjabis who are said to be better workmen than the local men. The rates paid for sawing were 4½ annas per broad-gauge sleeper to local men, and 5¼ annas to Punjabis. In parts of the State those rates were exceeded. The sleepers are all transported by water, and the floating charges varied considerably; but with water-carriage and sawing charges only amounting to about 5 annas per sleeper, these operations must result in a very handsome profit to the State, as on an average the price obtained for sleepers is Rs.3-0-6. That the Railway will continue to pay this rate when Australian sleepers can be obtained for about Rs.2-5-0 per sleeper, each sleeper guaranteed for ten years, does not seem at all certain.

The following is of interest as showing the dimensions to which deodar can attain in the Himalayas:—"In the Desa Valley one forest giant was felled, the girth was 23 feet; the annual rings gave only 220 years age, which shows very fast growth indeed for

deodar. The number of sleepers obtained, 10 feet in length, was 265 in all."

Forest Conservation in New South Wales during 1899.

The department of lands (Forest branch) publishes an interesting little pamphlet, entitled "Annual Report of Forestry, 1899," in which are detailed the several steps which have been taken in New South Wales to prevent the wholesale destruction of the State forests.

The area reserved for forestry at the close of 1899 amounted to 5,946,355 acres held under pastoral or other lease, and consists of three classes, on two of which license fees are charged for felling timber, and on the third class, in addition to the license fee, a further royalty on the quantity of timbers felled is charged. These reserved areas are at present being classified with a view to placing the more important of them under some permanent and definite system of working; but it is not stated what working system it is proposed to introduce. At present in leasing Crown lands conditions are inserted for the preservation of useful timbers and for the making of improvements whenever possible, but the day must come when those temporising steps will no longer suffice, and the working and improving of the forests will have to be taken up on a systematic and advanced basis. The longer this step is delayed the more difficult will be the work, and the greater will be the initial necessary expenditure.

The export of hard woods to Europe is steadily increasing and inter-colonial export has already attained very considerable dimensions, New Zealand alone having taken as much as 4,000,000 superficial feet of hard wood timber during the past year. This being so, it is a foolish policy to postpone the introduction of systematic conservation on the ground that the revenue will not at first increase with the expenditure.

Apart from the classification of the various forest lands, the department during the year has done a little practical work in carrying out thinnings in some of the pine (*Callitris calcasata*) forests. Some cedar planting has also been done. The State also maintains a forest nursery, where a reserve seed-supply is kept, and from which as many as 40,000 plants of various sorts were distributed during the year.

The Nagpur Experimental Farm in the Central Provinces.

The work carried out in the Nagpur, Central Provinces, Experimental Farm during the past year 1899-1900 is reviewed by the Chief Commissioner in a single sentence. "The rainfall of the year," we read, "was exceptionally scanty, and the results are very disappointing. The kharif crops failed for want of rain in the month of October, and the rabi crops could not be sown owing to the dry state of the ground; it is therefore useless to criticise the results of the year."

The Nagpur Experimental Farm, however, besides carrying out purely agricultural experiments, is also given to dabbling in forestry, and its scope in this respect has lately been largely increased, owing to the Telinkheri gardens and plantations having been handed over to its management by the Forest Department. It may be remembered, that "the Telinkheri Garden, like Paldi Sakardara and Sonegaon, was originally one of the Raja's gardens, and was, after the annexation of the Nagpur country, declared nazul, *i.e.*, property of the State. The last three gardens were eventually given back to the private estate of the Bhonsla representatives. The Telinkheri Garden was retained and continued to be managed by the Local Fund Committee until it was handed over to the Forest Department in 1872. In placing the garden under the management of the Forest Department, Sir John Morris, then Chief Commissioner of the Central Provinces, gave that Department a large area attached to the gardens for the purpose of an experimental plantation. In making over the garden and the adjacent lands to the Forest Department, the Chief Commissioner had a two-fold object in view, namely (first), that a well-preserved plantation of forest trees with good roads running through it and an ornamental garden in its midst would afford the public a pleasant place of recreation, and would be greatly appreciated by the residents of the station; and (second), that one-fourth of the plantation would in course of time provide fuel and building timber to the Nagpur City. The Forest Department succeeded in raising a good growth of forest trees on the larger portion of the area received for the purpose, keeping a smaller portion for the cultivation of food-crops. In later years the Forest Department have honey-combed the plantation by bringing several strips of land situated in different parts of the plantation under cultivation."

The reason for the rejection of these by the Forest Department was purely a financial one, though the Department are themselves wholly responsible for the step taken. The garden did not pay, and consequently the Central Provinces Forest Department, who apparently at that time were only able to judge of the value of forestry from a money point of view, would have none of it. The fact that the gardens formed an excellent area for the starting of a "forestry experimental station," which is so badly wanted; the question of its utility as a "park" for the study of trees; its utility for carrying out experiments with exotics – all these questions were altogether overlooked under the mistaken idea of at once realizing a direct saving of a few rupees, though the indirect loss to the Department in general might be considerable.

However this may be, there is consolation in the thought that the Agricultural Department is now, so we learn, undertaking valuable researches in forestry; though, as a matter of fact, little or nothing was done during the year under report. The whole question is disposed of in the following paragraph :—

"Several young trees in the new plantation on the Telinkheri Hill were damaged by fire in May 1899. Many of the seedlings, however, were found to be alive in the last rainy season, but a large number has succumbed to the drought of the year under report. I am glad to say, however, that the teak and khair seedlings have resisted the dryness of the season during the monsoon of the current year. I intend planting some seedlings of the Ceara rubber plant, which is said to do well in a dry and arid situation."

It is not stated with what object the Ceara rubber plants are being planted, but the experiment is likely to succeed, as may be gathered from the following notes on the subject collected by Mr. Reuther, I.F.S., and reproduced below :—

Manihot Glaziovii (Ceara).

Climate.—Thrives under a very wide range of conditions. *In Ceara*, grows even in desert plains with rainfall under 50 inches, where the vegetation is scorched up during the greater part of the year, and thrives also on mountains up to 3,500 feet elevation, where the rainfall reaches 100 inches and the night temperature falls even below 60°. A rainfall of 60 inches to 70 inches is ordinarily sufficient, but about 100 inches suits the tree better. In Ceylon, thrives up to 3,000 feet elevation.

Soil.—In Ceara, thrives best in scanty soil among granite boulders ; never in marshy soil. Though growing readily on hillsides in poor, rocky soil, unsuited to almost any agricultural crop, it thrives best where the ground is covered with shrubs.

In Ceylon, grows on most barren soils.

Characteristics.—A moderate-sized tree, with erect stem 30 feet to 50 feet high and 2½ to 5½ feet girth (at 3 feet from the ground). Rounded crown.

Hardy, adaptable, fast grower; not prone to insect or fungoid attack ; requires little or no attention once established.

Readily raised from seed ; can be propagated from cuttings as easily as willow. In every part of the world where it has been introduced, the seed production is abundant, and the seed may be gathered already at 3 to 5 years of age. Large areas could therefore be planted in a short time. In Brazil the seed is universally sown directly in the pots which the trees are intended ultimately to occupy (just like teak seed in *taungya* plantations), and nurseries and transplanting are not required.

Artificial Cultivation.

Spacing.—Recommended to be planted thickly, with judicious thinning to follow.

Germination.—Seed-coat hard and thick ; said to require more than a year to germinate. But germination inducible within two or three weeks by rasping off with a file both edges at the radicular end (recognizable externally by the two-lobed caruncle).

Development.—In Ceylon, attains in 2½ years a height of 25 feet to 30 feet and girth of 1 foot 9 inches at 3 feet from the ground. Flowers at 18 months of age.

Rubber.—Quality excellent ; second only to the best "Para." Yield equal in quantity to that of "Para."

There is also an Agricultural School in connection with the Farm, and under the circumstances it would be interesting to know whether any forestry is taught at this institution. No doubt during the "rains" the services of the Nagpur Forest Divisional Officer might be rendered available, though, perhaps, this is hardly necessary. M. F.

V.—SHIKAR, TRAVEL, &c.

A Bare Statement.

Are the coolies all ready? Yes! Well, that's all right. We've got to go to the top of that hill, have we? Anyhow, it does not look far. Great Scot! but its a goodish stiff climb. Now we're at the top. What ho! Still farther is it? These hills are jolly deceptive. At last we've got there. Where are we going to sit? So this is the place—thank goodness, I've got here alive after that terrible climb. Nasty, damp-looking place, too, under yew trees. Anyhow, its more comfortable than deodar needles. Wonder, which way the bear will come, if there are any. So this is the place where a Sahib had three shots last year and did not get anything. I hope missing isn't catching (something weird about that last remark, will some cricketer kindly explain what I mean). When *is* the beat going to begin? Let's have a look at the armoury. Give me the ·500 Repeater, and just be careful you don't let off that ·450 Martini by mistake. Can't get comfortable on a slope of 45°; one's knees get too far away, and then one's feet slip. Don't suppose I shall be able to hit anything at all. Suppose the bear came up that nullah to the left, or perhaps up that ridge to the right; but, above all, I hope they won't get up out of those bushes just below me. Thank goodness, they have commenced. What a long way off the tom-toms sound. There's only one man out of 40 shouting. What brutes they are! Why don't they give tongue properly? Hullo! what's that? What an awful shock to get over an old fox—but what a beauty! The old Shikari, I notice, is sitting closer to me. Don't believe the old man can see or hear much. Do I hear a trampling of leaves away to the low right? Yes, I do, by jove. Let's have another look at my pop-gun. Aha! there he comes up the ridge, a fine large black bear; can't see much of him. Hope I shan't miss. Why in the dickens doesn't he come out into the open—ho, yes; bad luck take him, he's turning off; must have a shot. Can only see his head and neck. Bang! hullo, he's dropped backwards. Must have hit him in the neck, as he didn't utter a sound. What! not got him, you old fool? Of course I have. I'll go and have a peep. Right Oh! he's as dead as mutton. I can see his legs in the air. Get ready again. Guess those coolies can make enough row when there is a prospect of a wounded bear breaking back. Why, here's another big bear coming up almost behind the other, but giving a better shot. Bang! I've hit her. What a row she's kicking up, yet on she comes. Another shot, that's downed her. Ho! by jove, she's up and off again. A couple more shots land her at last. What awful tough brutes they are. Here, hiyou old Shikari, give me some more cartridges. What! got no more? Never expected to get five shots; then hand me the ·450. Whirroo! there goes another, but what a little'un; can't see it. Its bolting back diagonally across the line of coolies at full tear. Bang! that was a risky shot, the coolies dead behind it. Wonder,

if I hit it. Shikari says no; then I must have. Coolies are close up now. What! I have bagged the little one, have I; thought so; where is it? 180 yards down to the left in the open. What good luck. Let's go and look at the others. Here's No. 2, a fine female, but in what a mess. One bullet in the shoulder, two behind it, and one a little further back. They do take some hitting. Now for No. 1. What a rummy sight—a male, I hit him behind the ear and he was caught up against a yew tree on his back. No wonder he didn't get far. Bring them down to camp whilst I have a look at No. 3. There he is a goodish way down the hill in an open spot encircled by admiring coolies. What a hole in his side behind the shoulder. It's a wonder the little beggar got so far. What did you say? Never heard of a Sahib shooting three bears in 5 minutes; don't you believe it. No more excitement to-day; but what good luck, and shooting not altogether so bad, especially after having done a 10-mile march, padding the hoof the whole way. Never expected it. Now for a drink and a tub.

P.S.—The bears measured respectively 6'-10", 6' and 4'-6", not so dusty.

E. RADCLIFFE.

VI.—EXTRACTS, NOTES AND QUERIES.

Observations on Packing and Transport of Plants, Fruits and Seeds. *

By J. H. Hart, F. L. S.,

Superintendent, Royal Botanic Gardens, Trinidad.

To insure the successful packing and transit of any commodity, it is first necessary to be certain that the material to be sent is in a fit state to be packed. Plants, fruits and seeds are no exception to the rule.

In the first place, a plant should be well rooted, well established, not overgrown, nor too small. It should be clean and free from injury and disease (parasitic insects or fungi), and should carry a certain number of foliage leaves.

A fruit should be full grown or mature, but not fully ripe, free from bruises of any kind. The stalk should not be pulled out, but clean cut. The exterior of the fruit should be perfectly dry.

Seeds should be freshly gathered, not kept in hand longer than actually necessary.

The following are a few of the various methods recommended for packing plants, fruit and seeds. :—

Plants.

The art of packing plants consists in maintaining their vitality uninjured while in the packed state, and in securing them from damage during transit.

* West Indian Bulletin. The Journal of the Imperial Agricultural Department for the West Indies. Vol. I., No. 3. London Agents: Messrs. Dulan & Co., 37, Soho Square, W. Price—Threepence.

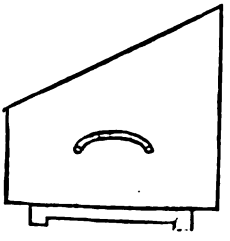
The best appliance in which to enclose plants which have to be sent long journeys is the Wardian case. This may be briefly described as a glass-roofed, wooden box of any required dimension.

Plants in the tropics are nearly always in a growing state, and excepting bulbous plants, they can seldom be packed in a resting condition. There are some plants, however, such as agaves, orchids, cacti, &c., which travel well, if packed in dry shavings, in a well-ventilated, ordinary, packing case. Roses and plants of like character, coming from a temperate climate, are best packed in the autumn in the resting condition, but they should have sufficient moisture in the packing about the roots to sustain growth when they reach the high temperature and humidity of the tropics.

The Wardian case is primarily intended to preserve the vitality of growing plants by affording them sufficient moisture, light, and air. This is effected by constructing the case in a certain manner, thus keeping up a regular supply of moisture for the use of the plants. Plants in Wardian cases are given only sufficient ventilation to prevent the interior temperature reaching an excessive height.

There is considerable variation in the form adopted by different packers in constructing their cases. I have prepared diagrams of three of the most common forms :—

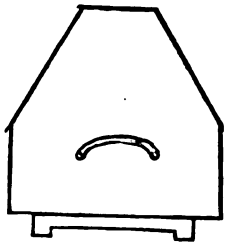
No. 1 has a roof sloping one way only ; No. 2 has a gable roof with a flat, boarded top ; while No. 3 has a sharp pointed gable roof. No. 1 is the cheapest, No. 3 the most expensive. No. 1 is the cheapest, because it is of very simple construction, but it has several disadvantages. It does not allow much head room, and from its form it offers a tempting seat to the lounging passenger, resulting in broken glass and damage to its contents. It is of the utmost importance that the glass of a Wardian case should be kept intact, otherwise the contents are liable to serious injury from drought, sea-water, rats, mice, &c. ; in fact, the main object of the case is destroyed when the glass is broken.



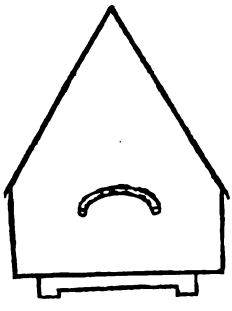
No. 1.

The form of case I have called No. 1 does not permit of easy handling without upsetting ; for, if lifted by the handles, one side is found to be heavier than the other, and the case turns a somersault. A well packed case, however, should be capable of being turned completely upside down without injury. The condensation, which takes place on a glass roof with one slope, will, of course, be delivered on one side of the case only, and thus the packing material around the roots on the higher side of the case will be gradually deprived of its moisture, and the plants on that side will suffer This case is not nearly so strong as Nos. 2 and 3.

The chief advantage of No. 2 is that it gives a larger amount of room for the same "ship's measurement" than No. 1, but it has the serious disadvantage of having a flat top. This flat top condenses moisture, and the water accumulates on the smooth surface of the wood in large drops, and these instead of running down on the inside of the glass, as in Nos. 1 and 3, fall into the centre of the case, and, if they happen to be delivered full on the stem of any plant, that plant is very likely to be killed before the end of its journey. No. 2, when carried on deck, also admits of use as a seat.



No. 2.



No. 3.

The third form of case is that generally used by the authorities of the Royal Gardens, Kew, and it is in the writer's opinion better suited to the transport of plants for long distances than either of the others. The condensed moisture of the interior is equally distributed by the sloping glass roof.

The only fault attached to this case is that by "ship's measurement," taken to the pointed apex of the roof, it has more cubic contents than Nos. 1 and 2, but this is probably more than compensated for by its not affording a deck seat. This case has an advantage over No. 1 in that its centre of gravity is much lower, reducing the risk of turning over when handled.

Wardian cases should always be packed under cover, the plants should be ready some time before, and should be in that condition known to cultivators as "damp" (*i.e.*, neither in want of water, nor too wet.)

Cleats should be arranged in the interior of the longest side of the case, having notches one inch deep and some three or four inches apart, into which cross bars should fit when the plants are all in place. The packing material should be light in weight and somewhat absorbent, such as leaf-mould, peat, or cocoanut refuse. As the plants are placed in the case, this material should be packed neatly around the pots and rammed firm with a rod small enough to enter all the interstices. When finished, the surface of the packing should be level and the rims of the pots just covered with the packing material. Clay pots, the new metallic pot, or pots of bamboo may be used. When plants are turned out of pots, each plant should be tied up in sacking into a solid ball before packing. No plant should ever be placed loosely into

the packing of the case. It is better to place the plants regularly in rows lengthways, and when the packing is finished, or while it is proceeding, some coarse straw or dry twigs should be placed between the rows, and these will keep the packing firm when the bars are in place. The bars, one inch square, should cross the box from side to side, fitting into the notches of the cleats. A similar cleat with notches will now take the ends of the cross bars nearest the packer, and being well pressed down, should be screwed or nailed securely. The cleating should be sufficiently strong to prevent the packing from moving, even if the case is turned upside down with considerable concussion. The packing being finished, it is well to sprinkle the interior of the case with a little water, but great care must be exercised in this matter, as too much or too little may mean the destruction of the plants. The best plan is to pack the case two or three days before it is required for despatch, and to close it up when seen to be in exactly the right condition. This condition, however, is one which only the experienced eye can secure, and cannot be described.

All Wardian cases should be glazed with rough plate glass, but if clear glass is used it should have a coating inside of white paint, to keep out direct light. The glass roof should be protected by cleats of wood of sufficient strength, placed at intervals which will not allow corners of other packages to break the glass. It has been stated that a great deal of the safety of the plants in a Wardian case consist in having the glass unbroken. If this unfortunately happens, the breakage may be temporarily repaired by pasting a parcel label, or piece of light cloth, over the fracture; this will often save a valuable lot of plants from irreparable injury. It is a good plan when shipping plants to put a notice to this effect on the case. I have always found ships' officers willing to attend to such a trifling matter if it is brought to their notice. On one occasion I observed a captain regularly superintending the washing of decks near a large case of valuable plants, in fact, he looked after it better than the owner.

Plants sent from the tropics to the temperate zone should only be despatched when there is no danger of cold weather on the voyage. For many years the Trinidad Department has arranged to send plants to Europe and America only during the summer months, as it had been found that ninety per cent. of the failures were due to having to pass through a low temperature. Hence all our arrangements are made for June, July, August and the early part of September.

Plants coming to the tropics from hot houses in temperate climates can only be sent with certain safety during these months. Occasionally they may come through with safety at other times, but there is always the chance of their getting a cold snap in the

Channel, or on a railway platform, or wharf, which may seriously injure or destroy them.

Orchids in their growing stages should always be sent in Wardian cases, but if resting or dried they may safely be sent in ordinary closed cases, packed loosely in dry wood shavings, and well-ventilated by small openings, covered with perforated zinc to keep out rats, mice, &c. The chief point in packing plants of this class is to support them with the packing, at the same time allowing sufficient ventilation to prevent fermentation, or mould fungi accumulating on the tubers or leaves. If packed in large cases, plenty of struts or bars should be nailed in the cases stretching from one side to the other to take off the weight of the plants, and not allow them to press too heavily one upon another. Orchids are best sent immediately after flowering.

Filmy ferns (species of *Trichomanes* and *Hymenophyllum*), are best sent in tight cases (even tin-lined cases may be used), packing the plants between layers of soft damp moss, so as to form with the ferns a soft, wet, spongy mass all through. Many lowland ferns from wet districts, such as *Dancea* and *Marattia*, will also go well by this method, but ferns, as a rule, must be in Wardian cases.

A case of filmy ferns sent to Kew, as above described, during the past year, reached that establishment in excellent condition.

In packing plants from the open ground, for local transport, care should always be taken to water copiously before taking them up, so that they may contain a large amount of moisture, and their vitality be better preserved during transit.

Care should always be taken to prevent the exposure of the roots of any plant to dry air or sun, as a few minutes will often do an immense amount of harm.

Fruit.

My first experience of packing fruit for ocean transit was in October, 1873. In that year I sent a box of Nova Scotia apples from that country to England. I ventured to mention at the time to Dr. Masters, "I think Nova Scotia bids fair to become the apple-producing country of the future." How far this has been realised is within the knowledge of many who have seen these apples in the English market. My consignment was a successful one; Dr. Masters reported: "They were packed in coarse sawdust, and came to hand almost without a bruise." These apples were among the first, if not the first, sent to England from Nova Scotia. To-day the trade is of considerable dimensions. I mention this to show that by good packing much may be done in the way of exciting interest in new productions in suitable markets.

Some people hold that only valuable goods are worthy of good packing, and that cheap things will not pay to pack well. Such arguments are fallacious. So far as my own experience goes, whatever is worth packing at all is worth packing well, for even if the packing costs more than the article itself, it should

nevertheless be put upon the market in the best possible condition. Cheap and ineffective packing is dear at any price. It is clear that it is better to expend 20 per cent. on packing, rather than lose 40 per cent. or 50 per cent. of the returns owing to defective packing. West Indian orange growers have been heard to say: "We cannot afford to pack the same as the Mediterranean people." The reply is clear. "Then do not expect to get a market for your goods." There can be little doubt that in the fruit trade the profit comes chiefly in the economy with which the packing is carried out. By economy, I do not mean cheapness. There is economy in effectiveness, as well as in cheapness. It is certainly false economy to pack *fully ripe oranges* in barrels for cheapness.

With fruit, as with plants, the material must be in good order. It will never pay to shake down the oranges from the tree to the ground, carry them for miles in a cart, and then shunt them into a barrel. Success can never attend such handling, for all fruit must be handled as carefully as eggs. A blow that would crack an egg will certainly destroy a fruit; and if such fruit is packed, no matter how carefully, it will assuredly arrive at its destination in bad order. To secure arrival in good condition all fruit must have been carefully gathered, and, without exception, treated in the most careful manner to prevent bruising.

Fruit also requires certain treatment previous to packing to assist in securing safe transit. This treatment is what I would call "hardening." No fruit should ever be packed when freshly gathered, but how long it should remain must be learnt by experience, as a great deal depends upon the state of the weather. Oranges should be picked at least three or four days before packing, and laid out in single layers until all the moisture, or what is known as the "sweat" of the fruit, has disappeared. To pack fruit when wet or damp, is to court certain failure. The full details of packing are too long to include in a paper of this kind.

There is one point in connection with temperature which must be taken into account. If fruit, such as bananas, are kept at too low a temperature they become "chilled" and will rot before they will ripen. It has been frequently stated that to carry fruit successfully, it is necessary to use ice chambers. I believe this idea to be a mischievous one, and it has hindered in no little degree the problem of the safe transit of fruit. The Jamaica No. 11 mango was safely sent to England from Jamaica in 1873, when the transit took 21 days from port to port. In 1875, and again in 1891, the mangosteen reached home from Trinidad in good condition. In no case was cold storage used. Apples, which reach the West Indies in ice vessels, if packed near the ice, are valueless for flavour, while those brought over in well-ventilated packages, stowed properly in a cool part of the ship, arrive in excellent condition, and keep their flavour for a great length of time.

The exact degree of temperature suitable for the cold storage of fruit is not sufficiently well understood. Some people take it to be at or near freezing point, while others adopt temperatures of say 40° or 50° Fah. This latter, I believe, would be a good temperature for fruits grown in a temperate climate, but if we are dealing with tropical fruits, it is probably too low. Cold storage at freezing point may do for dead meat, &c., but is not suitable for the preservation of fruit. Still, we must have *cool* storage, and how to obtain the desired temperature, must be decided by shipowners and by shippers of fruit.

What is required is a well-ventilated hold, maintained at a certain minimum temperature which should be some 10° or 15° below that at which the fruit matures. Fruit will stand considerable hardship, provided it is carefully gathered, well dried, and well packed. It is not easy to say, however, which of these three conditions is essential. If a fruit is bruised in the picking, it is inevitably doomed to rot. If not carefully dried, it will almost as surely ferment and rot, and if squeezed or heated in the packing, it must arrive in a bad condition.

The best cases for packing oranges are those furnished with trays admitting one layer only, with bars to take the weight when set on end. A very good and serviceable case is one having a capacity of two cubic feet and divided in the centre. In a barrel the lowest row has to sustain the weight of all those above it, which may amount to something like three to four pounds per orange. *The continued use of the barrel for oranges and similar fruit helps to bring our beautiful West Indian fruit into grave discredit.*

The package of pine-apples has to be conducted on the same principle. They should never be packed in barrels but in light crates, each fruit having a separate compartment. Small and indifferent fruits are rarely worth shipping, and, if in abundance, should be preserved or sold locally.

Mangoes can be safely sent, if picked in the condition known as "full," so as to gradually ripen during transit. In this case it is also necessary to separate the individual fruits, and high class fruit should be packed in the manner adopted for apricots and peaches by European growers, namely, in single compartments with soft packing material.

The actual business of packing fruit is an art which only practice can perfect, and most of the failures are due to imperfect knowledge of the conditions which are necessary to success.

A common idea exists that cultivators can, by planting at certain times of the year, get fruit, such as mangoes and pine-apples, to ripen at certain seasons. This may sometimes be possible, but I am of opinion, after a quarter of a century's experience, that the control which can be exercised by the grower over the time of ripening is small, and cannot be depended upon for successive seasons. If we could control wet and dry weather, in the

same way as under glass cultivation, something might be done; but until we are in a position to do this, the mango and pine-apple season will be in June, July and August, the coffee crop will come in November and December, and cacao will ripen in June and November, with variations of dates in accordance with the season.

There is great need for study of the possible means to get a crop of fruit out of season, for fruit out of season is well known to pay. I think, however, that more success will come if the attack is carried on from a different direction. It is true that we might by withholding water imitate the dry season, and by giving water imitate the wet season; but still uncontrollable differences would yet remain, for it is clear that we could not control the state of the atmosphere surrounding the branches even if we kept the roots dry, and we could not give the dry air coincident with the dry season, during rainy weather, and if we kept a plant well watered, its branches would still be affected by the drought.

The best means to obtain the end in view, would be to seek plants which ripen earlier or later than the general crop, and by selection obtain varieties which come in extremely early, or conveniently late, and thus meet the demands of the "out of season" markets. Selection of this kind is carried out in Europe and America, and might equally well answer in the tropics if a little attention was devoted to the subject.

I have digressed somewhat from packing and transport of fruit, but I must plead the excuse that we must know how to get our fruit before we can pack or transport it.

Seeds.

Some people are under the impression that the Botanic stations maintain seed shops, where any kind of tropical seed can be purchased in the same way as from seedsmen in temperate climates. It is not so. There are very few tropical seeds indeed, which can be safely kept for more than a month, a great many which cannot be kept more than a week, and not a few whose vitality is destroyed in one or two days if not properly cared for. Thus, a seed shop under European conditions for tropical seeds is impossible.

Tropical seeds possess for the most part a very fugitive vitality, and are easily destroyed by an excess of either drought or moisture; but more quickly by the former. Even if left exposed to air, the humidity of which is generally high, they suffer largely, but if in a position where the alternations of dryness and humidity can effect them, they are destroyed in a very short time.

Proper methods have, therefore, to be devised to keep them in a suitable state until they reach their destination.

Such seeds as mango, cashew, nicker beans, some palms, &c., can stand a large amount of hardship and will keep for a long time, and may be packed in bags or boxes for transit. It is quite a different matter, however, with seeds of *Artocarpus*,

Brosimum, *Amherstia*, *Castilloa*, *Hevea*, *Cynometra*, &c., &c. Such seeds must be preserved in a suitable medium to keep them in good condition and preserve them for any length of time either in hand or on a journey. The best medium found so far is the fine dust or short fibre from the interior of the cocoanut, commonly called cocoanut refuse. This material is the lightest that can be employed and answers well for almost any kind of seeds. It is especially suitable for packing in tins for transmission by post.

Another material which has been successfully used is weathered charcoal dust. New or unweathered charcoal dust is just as bad for packing seeds as weathered dust is suitable, on account of its caustic character and the amount of moisture it will absorb from seeds packed in it. A danger with both materials is that spores of certain fungi get into them and destroy the seeds they cover.

Packing for delicate seeds should not be too dry or too wet, but a happy medium between the two, just sufficient to prevent the seed losing moisture and insufficient to start it rapidly into growth. On the whole, it is better that seeds should germinate on the way than be kept too dry, provided the process of growth does not reach beyond a certain stage.

Experience teaches that greater success is met with if seeds are started on their journey as soon after harvesting as possible, and not kept a day longer than is necessary. If only required for home use, they are best sown as soon as possible after being gathered.

There is another danger to which even the hardiest of our seeds are subject, and that is, the attacks made upon them by ants, weevils, and other small insects. Seeds which have suffered in this way are often to all appearance perfectly sound, but a close examination will generally show that the germ or growing part has been entirely destroyed. The seed is therefore useless.

Persons living in temperate climates, with no experience of the tropics, can hardly believe that seeds cannot be dealt with in the tropics as in temperate climates, *viz.*, gathered, cleaned and placed in a "dry drawer" until required. Proof that imported seeds will not keep is to be found in the universal complaint of the bad quality of the seeds which are on sale. Many trials of freshly imported seeds have been made at Trinidad. As a rule, they have been found to be good on arrival, and to lose vitality exactly in proportion to the time allowed to elapse since they were imported.

Peas, which on first arrival showed a germination of 98 per cent., kept for one month in a dry drawer will have their vitality reduced to 40 per cent., and in three months' time not 10 per cent. will germinate. Other kinds of seeds are affected in a similar way. If the period of test, however, happens to be in the dry season, vitality will be found to be more persistent.

These facts were recognised many years ago, and have been met by ordering periodical supplies at frequent intervals. Seeds can be kept for a greater length of time if they are imported in

packages which have been sealed in dry air in the temperate zone and only unsealed as required. The best packages for seeds are small tins opening readily with a thumb piece, like Huntley and Palmer's biscuit tins, or the tins used for packing Capstan tobacco. Continental seedsmen adopt new methods quicker than English traders. The latter do not appear to exert themselves to keep the West Indian trade.

The transport of seeds should always be made by the quickest route and by parcel post, where possible. Consequently they should be put up in light and handy packings.

SUMMARY.—(*a*) *Plants.*

1. Always select healthy and well-established plants.
2. Use dry, well-ventilated cases for orchids, cacti, bulbs, &c.
3. Pack filmy ferns, mosses, &c., in damp moss in closed cases.
4. Pack plants in growth, or likely to come into growth, in Wardian cases, well battened down, and see that the case contains the proper amount of moisture before finally closing.
5. Adopt the safest case, and ventilate sufficiently.
6. Take precautions to minimise risk of injury during transit; in particular guard against excessive illumination, drought, displacement and movement of packing material, breakage of the glass, changes of temperature, and damage from salt water, animals, &c.
7. When packing plants for short distances, it is sufficient to protect the roots and prevent rapid evaporation.

(*b*) *Fruit.*

8. Pick the fruit when mature, but not over-ripe.
9. Let the fruit stand some time before packing, so as to ensure a hardened surface and freedom from moisture. Handle it as carefully as eggs.
10. Pack so as to prevent movement and bruising, but do not squeeze.
11. Pack in small cases, *not in barrels*, and use cheap and light packing material.
12. Do not allow fruit to travel in too high or too low a temperature.
13. To obtain supplies of fruit out of season, select early and late varieties.

(*c*) *Seeds.*

14. Transport all tropical seeds as soon as harvested.
15. Keep seeds secure from attacks of ants and weevils.
16. Pack short-lived seeds in damp cocoanut fibre, or *weathered* charcoal refuse.
17. Ship always by the shortest route.
18. In the tropics import packages of European seeds in airtight cases, and open as required.

[*Note added.*]

Extract from "Gardeners' Chronicle," No. 674—Vol. XXVI., November 25th, 1899.

INFLUENCE OF DRYING UPON THE GERMINATION OF PALM SEEDS.

Seeds of *Oreodoxa regia* sent dry, packed in capsules of paper, did not germinate till after the lapse of one year and-a-half; whilst seeds sent in moist wood charcoal germinated in a few weeks after sowing. Comparing results, it was evident that out of about forty species of palms, only three or four species germinated when the seeds were sent over here dry, and of these only a few seeds; whilst almost all the seeds of nearly all the species germinated when the seeds had been packed in a moist medium, and arrived in a moist state.—*Dr. Udo Dammer, Gross Lichterfelde, near Berlin.*

Aborigines of the Nilgiris in South India.

The Nilgiris are a group of mountains, 6,000 to 8,000 feet high, connected with the Western Ghauts just south of Mysore, and are inhabited by five interesting native tribes, of whom four are aboriginal. The fifth tribe is that of Badagas, so called from Vada, which means north. Three hundred years ago these people came from the north, *viz.*, the Canarese country, after the breaking up of the great kingdom of Vijianagar, and they have maintained the Canarese language and the worship of Siva, which they brought from their northern home. They now number 20,000 and are very conspicuous near the large towns of Coonoor and Ootacamund, where they are the bulk of the day-labourers. They have a yellowish clayey complexion like the soil in which they toil.

The lowest of the four aboriginal tribes are the Irulas who live on the lowest slopes of the hills. They are of the Mongolian type of countenance and sell the produce of the forests to buy grain. They have no marriage ceremony, but each boy chooses a bride for himself when he is old enough.

They worship Vishnu under the name of Rangasawmy at a prominent peak known as Rangasawmy's Pillar. Their language is like the Tamil of the south country.

A more conspicuous tribe are the Kurumbas, who live on the higher slopes in hamlets of four or five huts each. The huts are constructed of wattle and mud. They live on roots and game and sell jungle produce. They also make baskets and milk vessels out of bamboo stems and play rude instruments at the funerals of the Todas.

Like the Irulas, they have no marriage ceremony, but allow the youths to make their own choice, and their widows can re-marry.

They are very light, the men averaging only one hundred pounds in weight. "Stupid as a Kurumba" is a native proverb, but it is said they always tell the truth. Their number on the Nilgiris is hardly a thousand, but there are branches of this tribe on the Palani and other ranges further south.

Our engraving shows a group of Kurumba women and children belonging to a branch called "Muduvas." The meaning of the name is "back carriers," and they explain it by saying that once one of their women put her child down while she was at work in the jungle and a tiger carried it off. So ever since they have carried their children on their backs, even while at work. The picture shows the small children slung on their mothers' backs. It also shows the profuseness with which the women adorn themselves with rings, bracelets and necklaces. The advance towards civilization is shown by the caps on the boys' heads.

Somewhat more numerous than the Kurumbas of the Nilgiris and much more in evidence are the Kotas, the industrial tribe of the mountains. They live in seven villages, each containing from 30 to 60 huts. The only door of a hut is 46 inches high by 26 inches wide. They keep cattle, but do not milk them. They practice the industrial arts and till the land; their lands being the most fertile spots on the mountains. The women make clay pots on a wheel.

A Kota may have but one wife, unless that one is barren; widows may re-marry.

While the average weight of the men is only 105 lbs., they are twice as strong as the Badagas; yet they are despised because they live on carrion and may not approach a Badaga temple.

Each Kota village has two temples and two priests who are hereditary. They recognise one god and his wife.

Their possession of the best lands indicates their having come early enough to get first choice, and that, therefore, they must have preceded the Badagas, who are the only other cultivating tribe. It is said that they were originally brought from the plains to work for the Todas.

The Todas, the fifth tribe referred to, are the most singular of all the people on the mountains, and as such, have become objects of great curiosity to all visitors to the Nilgiris. One man of them was even taken to the Chicago Exposition. They were formerly hunters and are now buffalo-herders.

They have a copper hue and features of the Caucasian type. The women have a more aquiline nose than the men. The average weight of the men is 111 lbs.

They have long hair curled at the ends, and the women are careful to keep it in curls, thus differing from most women of India, who think curly hair a misfortune.

They are a lazy set. The men refuse to do anything but herd buffaloes and collect tribute from the Badagas and Kotas, and at the present time they beg from Europeans, who are pauperizing

them with constant gifts. The women work a sort of embroidery on clothes with Nilgiri nettles for stitching and English needles. Formerly the Kotas made needles for them.

They live in hamlets of five huts each called "Munds." Three of these huts are dwellings, one a dairy-temple, and one a calf stable for buffalo-calves.

They have a hundred mounds scattered over the mountains. Each dwelling hut has no other opening than the little front door, 32 inches high, by 18 inches wide, and one has to crawl in on all fours. These oval pent-shaped huts are of bamboo, fastened with rattan and covered with thatch.

They practise polyandry and, to a limited extent, polygamy.

A woman, when married to a man, is the wife of his brother as well, though the marriage ceremony is performed only with the eldest brother. Infanticide was formerly practised with reference to female infants, but the British Government put a stop to it.

When a woman salutes a man, she raises his feet, one after the other, to her forehead. An old woman, however, may receive this honour from a man.

Todas have games that they play something like "puss in the corner" and "tip-cat."

The dairy-temple is the abode of the priest, who only can enter it, and woman may not come near it. The priest keeps and milks the sacred buffalo-herd.

The Todas fear their priest, thinking that God dwells in him, and makes known His will through him.

The initiation to the priesthood is very severe. For eight days and nights a candidate must stay alone in the jungle, with no covering on his body and no other protection than that afforded by the juice of a certain tree rubbed on his body. He may retain office as long as he likes, and the usual term is three or four years.

Once a year a buffalo-calf is sacrificed. Their worship is mostly buffalo-worship. Their songs are in praise of their buffaloes. The only occasion when they are known to have risen higher than their buffaloes in song is the time when they composed a song in praise of a missionary lady, working among them, on her departure for England on furlough.

When a Toda dies, several buffaloes are slain to accompany him to the other world, and his arm is placed around the horns of one of the slain buffaloes.

They have green funerals and dry ones. The green funeral consists of the burning of the body with its attendant sacrifice of buffaloes and other ceremonies. The ashes are left to the winds.

The dry funeral is one that takes place at the beginning of each year in memory of all who have died the previous year. They gather together in great numbers and slaughter a number

of buffaloes and perform many ceremonies. The flesh of the slain buffaloes is given to the Kotas who furnish the music. The names of the dead are never mentioned again.

They think that a string bridge leads to heaven, and that hell is a swamp full of leeches. They have no idols. Except as they may have borrowed one or two from the Hindus. Their worship is that of the elements and ancestors, and has a pastoral coloring that indicates a Vedic origin. They have no written language, but their lady missionary has introduced the Tamil character to provide books for them.

They number 750. No one has ever been baptized as a Christian. One became a candidate and had prepared himself to arrange his matrimonial affairs in accordance with Christian requirements, but when it came to the loss of his share in the buffaloes of his family, he could not endure that and went back to his heathen life.

The Todas receive tributes of grain from the Kotas and Badagas. If a Badaga refuses tribute, all they do is to prepare to occupy a "mund" near the Badaga's fields. The Badaga would pay much rather than have a herd of buffaloes overrunning his crops. So the tribute is soon forthcoming.

The buffaloes are in a semi-wild state, and have been known to chase cyclists on the roads.

They do not seem to be decreasing, but rather are on the increase. But their constant cry for "Elam" (alms) indicates a degeneration of character resulting from the curiosity they excite among all foreigners.—*The Scientific American.*

Conservation of Feathered Game and Songsters.

We have frequently insisted that the ground and feathered game of India could be effectually protected did the authorities make it known that they were in favour of legitimate proceedings to ensure it, so hail with satisfaction the recently expressed intention of Sir John Woodburn to encourage acclimatisation and conservation in and around Darjeeling. True, His Honor's intention, so far as they have been made public, are confined to songsters and brilliant-hued birds, but the precautions taken with regard to them may well be extended to game, as both play important parts in forest economy. Great, no doubt, as is the havoc wrought among pheasant, chikor and partridge in and around our hill station by gun, trap and net, it is a mere fleabite compared to the destruction of eggs and young broods by the senseless annual grass fires, and that these are intentionally caused all experienced people know. Though writing in the interest of sportsmen and game preservation, the Forest Department, we feel assured, will endorse our opinion that stringent measures should be adopted to put a stop to the practice, in the interests, both of the Government revenue

and those of future generations of the people themselves; as so long as the reckless custom is unchecked, rehabilitation of jhumed tracts is impossible, and no one need be told that the evil of denuding our mountain's sides of their timber is becoming more and more apparent as time goes on. An abandoned jhum, at the end of the first rains, despite the rivened black stumps presents still, marked indications of promising rehabilitation were the sprouting second growth permitted to develope; luxuriant as is the crop of grass, the vigorous young timber shoots would hold their own and gain the ascendency were they allowed to do so; but as the dry March winds set in, whole mountain ranges are given to the flames, annihilating everything in their course, sweeping through budding plantations, while the dense rolling smoke penetrating to the innermost recesses of primeval forests in the neighbourhood scatters the ground game farther and farther afield, besides suffocating nestlings among the upper branches wholesale. Unless, therefore, measures to meet the evil are energetically taken, we may look in vain for domesticating the familiar birds of our temperate zones, while the indigenous ones must inevitably grow less and less. Fire paths avail little, for their extent to be of any service must be too large to admit of efficient patrol. Vigilant as was the watch kept on the forest reserve at Upper Shillong in the spring of 1877, and again ten years later, it did not prevent a conflagration that nearly involved the whole station in destruction. That these fires were intentional was proved by the finding of bamboo choongas stuffed with charred cotton placed in heaps of fir droppings to windward, but the Rs.200 reward offered failed to detect the incendiaries. Now, except in very rare instances, most of our hill slopes, as also the plateaux, possess numerous springs such as the one that issues from the side of Dodabetta, as you enter Ootacamund from the east, supplying the station with water by the well-arranged system of conduits led round the amphitheatre above the lake; the same conditions obtain at Shillong where a copious supply gushes out just below the peak grove; and as nearly all our hills enjoy the same conditions, there could not be much difficulty in arranging a system of easily blocked conduits, the overflow from which during the dry months would damp all vegetation over an enormous area; many small streams meandering through the prairie like plateaux could be dammed or diverted with the same object, and these waterways would admit of far greater and constant supervision than the open glades under the name of fire-paths that may be seen running for miles round our forest reserves. If it is not possible to eradicate from the hill stockman's mind that firing is unnecessary, let them work their will over strictly limit-areas, being held responsible for the fire spreading beyond such. Jhumers in many parts pay no rent or other compensation for the annual destruction they cause, but in common justice it may be demanded from them that they be called upon to construct the dams, conduits or diversions recommended.

We are influenced in what we write on conserving our moorlands as *The Field* in a recent issue mentions the gradual deterioration of the heather at Home, and, though no doubt, proprietors will take steps to preserve that indispensable cover for grouse, what we advocate would render feasible the introduction of that much-desired game to this country; and it must also be remembered that the timid hare—not the rabbit—when afforded a safe asylum, would prove a great acquisition. Previous to the establishment of the Shillong station, when the environs were tolerably well-wooded, the bamboo partridge abounded, but denudation and fires have well nigh obliterated him, that he in common with pheasant, would return is certain. Those who will go through Goodwin Austin's Book on "The Birds of the Naga Hills and adjacent Regions," will be astonished at the number of these attractive little beings; and if energetic steps are taken to conserve them, there is no doubt, but that the plantations and gardens, as also the small woods throughout our hills, would soon resound to their twittering and the landscape rendered gay with the flashing of their plumage. The Forest Department would incur no extra expense if the above suggestions were acted upon; the money now expended in clearing fire-paths and endeavouring vainly to beat back flames would simply be diverted into another, and we venture to assert, a much more effective means of combatting an evil that each year is intensifying in such disastrous effects as uncontrolable floods, destruction of all but the coarsest fodder over immense areas that should not only teem with game but afford grazing ground for raising that equine stock, but which the whole world acknowledges the present deficiency of. Close times and adherence to game laws could be much more rigidly exacted among the sparse population of our hill tracts than among the teeming bustees of the plains, though much might be effected in the low country could we enlist the sympathy of zamindars in the cause of game preservation; but we fear, in Lower Bengal more especially, so long as the large eka wastes remain in their present unutilised state, the prevention of jungle fires is well nigh impossible.—*Asian.*

Foresters at Cooper's Hill.

We have once more to bid farewell to our Third Year Foresters, who, early next year, take their departure for Germany for their practical course of forestry. We have always found, that, thanks to the physical test they have to pass before entering the College, the forest students are extremely useful to the College in many ways, and our departing friends prove no exception to the general rule.

Curiously, amongst the six men we lose three football captains:—Richmond, as captain of the Rugby fifteen, has done all that could possibly be expected of him, although he has been seriously handicapped by an injury to his knee received in the Oxford match. Robinson has led the "A" team to victory in every match it has played, and Burke has captained the soccer team through its chequered career this year.

In addition, Newman has greatly distinguished himself at "three-quarters" since circumstances compelled him to play in that position instead of forward, to which he was accustomed, and he has besides acted as Secretary both of the Dance Committee and of the Musical Society.

Hopwood has the distinction of being one of the best rifle shots and sprinters in College, and heads the list of those qualifying for a Government Forestry Appointment.

The extra forestry student Machhar is deservedly popular with his colleagues and all other members of the College, and some of his feats in the Gymnasium will long be remembered.

We wish them all the best of good times in Germany, and success in their subsequent careers in India.—*The Cooper's Hill Magazine.*

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Wood Circular.

London, January 1st, 1901.

EAST INDIA TEAK.—The importation of Timber and Planks has been:—

	1894. Loads.	1895. Loads.	1896. Loads.	1897. Loads.	1898. Loads.	1899. Loads.	1900. Loads.
The deliveries:—	9,849 10,620	22,200 18,399	23,312 21,941	20,428 18,410	18,083 18,526	12,835 17,017	15,024 11,053

The Teak trade has had practically no history during 1900, certainly no sensation, and being so far doubtless happy, has, nevertheless, been a little dull. The year began under the brightest auspices with a shrewd demand and a high level of price. For a couple of months or so cargo rates went still a point or two higher, and for the rest of the year there has been no change in quotations, but these said quotations have not been too readily obtainable when wanted. In London the year's trade has been a small one, the importation has outrun the deliveries rather considerably, and the stock has accumulated, without, however, having any depressing effect on prices. The high cost is the only reason apparent for this dulness, it makes buyers

nervous, and turns the trade into a hand-to-mouth one, business being possible only as demand arises and not when sellers want to sell. The importation of this wood from Java has made some progress during the year and may become important. The quality is not liked by a conservative trade any more than was that of the importation from Bangkok a few years ago, or the importation from Rangoon before that, but there seems no inherent defect in it, and with due attention to selection and manufacture, it may yet take its rank as the others have done.

The London Timber Market during 1900.

Churchill and Sim's Circular, dated London, January 1st, 1901.

SATINWOOD—EAST INDIA—*Logs.*—The supply during 1900 was considerable, and this added to the stock brought forward, kept the market depressed all through the year. Finely-figured logs, when wanted, brought good prices, but the demand was neither large nor constant, and small or plain wood was not easy to sell. The stock on hand is quite sufficient to supply the probable demand for some months to come. *Boards.*—The import was much reduced, but most of the shipments were rather poor and of narrow widths, which are seldom readily saleable; this with the large supply of logs brought prices down very low, and should prevent such consignments being repeated. Quotations are for logs from 6*d.* to 12*d.*, and for boards from 4*d.* to 9*d.* per foot.

PADOUK.—The supply was again very small, and there is a danger of this wood, which is often asked for in vain, losing its position in the market simply through want of stock. The logs imported from Africa have not, so far, proved a good substitute for the genuine wood from the East Indies, of which imports in logs or planks are now much wanted, and would sell readily at from 3*s.* to 5*s.* per foot cube.

EBONY—CEYLON.—The import was very light, and, as all arrived in the first-half of the year, the market has been bare for some time. The demand was good, prices being very firm with a steadily upward movement, and rates for all descriptions of Ebony are now higher than they have been for many years. Supplies are much needed and could not fail to sell well. Quotations are from £12 to £17 per ton.

EAST INDIA.—There was only one small import, which came in the spring, and brought a good price, since then there has been no supply, and early arrivals would find ready buyers at full prices, as the inquiry is active. Quotations are from £9 to £13 per ton.

Market Rates of Products.

Tropical Agriculturist, January 1st, 1901.

Cardamoms	...	... per lb.	2*s.* 3*d.* to 2*s.* 4*d.*
Croton seeds	...	... ,, cwt.	30*s.* to 40*s.*
Cutch	...	... ,, ,,	23*s.* to 35*s.*
Gum Arabic	...	... ,, ,,	23*s.* to 35*s.*
Do. Kino	...	... ,, ,,	65*s.* to 80*s.*
India-rubber,	Assam	... ,, lb.	2*s.* 10½*d.* to 3*s.* 0½*d.*
Do.	Burma	... ,, ,,	2*s.* 3*d.* to 3*s.* 3*d.*
Myrabollams,	Madras	... ,, cwt.	6*s.* to 7*s.*
Do.	Bombay	... ,, ,,	4*s.* 9*d.* to 9*s.* 6*d.*
Do.	Jubbulpore	... ,, ,,	4*s.* 3*d.* to 7*s.*
Do.	Calcutta	... ,, ,,	4*s.* 6*d.* to 6*s.*
Nux Vomica	...	... ,, ,,	7*s.* to 10*s.*
Oil, Lemon-grass	...	... ,, lb.	3*d.*
Sandalwood Logs	...	... ,, ton.	£20 to £50.
Do. Chips	...	... ,, ,,	£4 to £8.
Sapanwood	...	... ,, ,,	£5 to £5 10*s.*
Seedlac	...	... ,, cwt.	51*s.* 6*d.* to 59*s.* 6*d.*
Tamarinds,	Calcutta	... ,, ,,	15*s.* to 16*s.*
Do.	Madras ...	... ,, ,,	7*s.* 6*d.* to 11*s.*

FLOATING ON THE MAUTAR GAD.

THE

Errata, Vol. XXVII., Jany. No.

Page	3,	line 13,	*for* 'Route de' *insert* 'Route du.'
„	6,	„ 9,	from below, *for* '*acacia*' *read* '*Acacia.*'
„	7,	„ 18,	*for* 'Menispennaceæ' *read* 'Menispermaceæ.
„	8,	„ 9,	from below, *for* 'pinuster' *read* 'pinaster."
„	13,	„ 2,	*after* 'schools' *insert* 'was.'
„	18,	„ 6,	*for* 'Finland' *insert* 'the Caucasus.'
		„ 8,	*for* '618,000' *insert* '72,000' and *for* '32' *insert* '39.'
		Line 9,	*for* '87,000' *insert* '8,000.'
		„ 11,	*after* 'area' *insert* 'about 15,000 sq. miles.'
Page	22,	„ 26,	*for* 'dominion' *read* 'Dominion.'
„	24,	„ 2,	*for* '*Cercidophyleum*' *read* '*Cercidophyllum.*
		„ 4,	*for* '*Piceaicca*' *read* '*Picea.*'
		„ 5,	*for* '*Lerix*' *read* '*Larix.*'
„	40,	„ 23,	*for* 'large' *read* 'larger.'

known locally as telescopic flooring.

Sleepers are taken and laid in the bed of the stream in such a manner as to form a trough-like channel into which the best part of the water of the stream is guided. The upper ends of the sleepers forming the channel are laid under or outside the ends of those next above it, and where too much water escapes the cracks are stopped with grass and leaves. The method can be understood from a glance at the accompanying photograph. The channel rests, as far as possible, on the boulders and rocks in the stream bed, but is propped up with sleepers laid crossways.

THE

INDIAN FORESTER.

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Floating Works in the Jaunsar Division, N.-W. P.

By P. H. Clutterbuck, I.F.S., F.Z.S.

In the *Indian Forester* for July 1900, there appeared a detailed account of the Kulni Export Works by which the sleepers are brought down to the Jarár depôt in the Mautárgádh. It may prove interesting to readers if a short account is now given of the way in which the sleepers are exported from there to the plains of India.

It may be stated at once that the export is done by floating, but this is effected by three distinct methods, which have to be adopted in accordance with the bed of the river and volume of water flowing in it. It will simplify matters if these methods are described separately.

I.—Telescopic Floating.

From the Jarár depôt, which is at the place where the wet slide ends in the Mautárgádh, to the place where that gádh or mountain stream empties itself into the Tons is about 5½ miles. The bed of the stream is rocky and full of boulders. At flood-time floating is found to be impossible, as the sleepers would get out of control and would be swept away and lost in the Jumna. Consequently special arrangements must be made, and the simplest and most economic method that could be devised is that known locally as telescopic floating.

Sleepers are taken and laid in the bed of the stream in such a manner as to form a trough-like channel into which the best part of the water of the stream is guided. The upper ends of the sleepers forming the channel are laid under or outside the ends of those next above it, and where too much water escapes the cracks are stopped with grass and leaves. The method can be understood from a glance at the accompanying photograph. The channel rests, as far as possible, on the boulders and rocks in the stream bed, but is propped up with sleepers laid crossways.

Where the bed is very uneven, sleepers are piled up to the required height. Where small pools occur, in which the sleepers can float easily without artificial assistance, the channel ends and commences again below the pool. When all the sleepers have been passed along, those forming the channel at the upper end are taken up, passed down, caught at the lower end, and laid, so as to continue the channel; and so on, until the Tons is reached. About 150,000 to 200,000 pieces, mostly metre-guage sleepers, are brought out each season, and the cost is about 7·5 pies per piece for the 5½ miles length. The number of men employed is about 100 at the commencement of the work, about 400 when the work is in full swing, decreasing to 80 or so at the finish. Of the men engaged, about 60 are Pachmis from the Punjab, and these are the ones who construct the channel. The remainder are local coolies. It takes about 75 days to transport the whole number over the 5½ miles to the Tons.

II.—Floating by Single Sleepers.

As each sleeper reaches the Tons, it is pushed out into that river and allowed to drift. The sleepers thus launched proceed on their way down until they get stranded, stuck in groups, or get out of the current into side pools. A gang of about 55 men, consisting of 1 head *mullah*, 6 *mullahs* on large *sarnai* made of inflated *sambhar* skins, 25 *mullahs* with small *sarnai* made of inflated goat or sheep skins, and the remainder *dúbáru*, *i.e.*, men who cannot swim, proceed along the river as soon as all the sleepers have been launched. They re-launch all the sleepers as they come to them, leaving none behind them. The large *sarnai* are used in the deep pools. The man who propels one of these lies across it on his stomach, using a paddle on one side and his feet on the other. He is well out of the water, and keeps himself quite dry except his feet. These large *sarnai* are also used for conveying the *dúbáru* across the river as required.

The small *sarnai* are used for getting from rock to rock in the rapids. A *mullah* who uses one of them ties it loosely round his waist, so that he shall not under any circumstances lose it; he then puts the inflated hind legs of the skin between his legs and, clasping the neck in his arms, throws himself into the water. He guides himself with his legs and one arm. By means of these small *sarnai* the *mullah* can get to any part of the river, no rapid being too bad for them. The second photo published this month shows a typical reach of the Tons with stranded sleepers. It is taken at the turn in the river above the Tiuni Bridge.

A Ranger generally accompanies the *ghal*, as the total number of sleepers launched, is called collectively. The sleepers are eventually caught at Dákpathar on the Jumna, where there is a boom * across the river. At Damog, about 10 miles above this, the sleepers are only re-launched and sent down gradually, so that too many

* This boom is described in Schlich's Manual of Forestry, Vol. V., p. 393.

Negative by P. H. Clutterbuck.

FLOATING ON THE TONS RIVER.

may not reach the boom at a time. Sometimes heavy rain occurring at such a time, causes the river to rise and carries down so many sleepers, which before were stuck, that the boom has to be re-opened for fear of its breaking with the strain, in which case a great deal of extra expense is incurred in recapturing the sleepers further down the Jumna, and many get lost altogether.

Dákpathar is about 2 miles below the Tons-Jumna Junction, and about 57 from the mouth of the Mautárgádh. The cost of floating for this length varies from about 1·75 to 2 pies per piece. The time occupied is about 2½ months. On an average about 99 per cent. of the original number launched arrive safely. A certain amount get broken in transit. Some, too, are stolen since the right bank of the Tons for the greater part of the way is not Government territory, and is therefore difficult to patrol.

Last year (1900), 188,000 pieces were sent down, of which 175,000 were metre-gauge sleepers. A contractor took up the work of conducting the floating from the Jarár depôt to Dákpathar for 9· pies per piece. The weather was favourable, and he has profited by the contract.

III.—Floating by Rafts.

Below Dákpathar rafts can be floated, so the sleepers are taken on from there in that way. Each raft, called a *béra*, contains 328 metre-gauge sleepers, formed of two halves, side by side, each called a *salak*. On the raft an additional 24 sleepers are carried. Each salak is made up of a double layer of sleepers placed crossways, 64 in each layer, with 32 sleepers lying in double rows on the top, firmly bound with ropes made of *bhaber* grass, *Ischmœnum anjustifolium*. About 2½ maunds of this are required for each raft. It costs Re.1 per maund. The rafts steered with poles are floated 26 miles down the River Jumna to Tájawála, where, entering the Western Jumna Canal, they are taken 160 miles along it to Delhi. The majority of the sleepers go to Delhi, but a few are sent to other places by rail from Abdullapur Station, which is 27 miles along the canal from Tájawála. The canal fees are 1½ annas per metre-gauge sleeper. The cost of rafting is Rs.16-2-per raft of 344 sleepers, so the total cost of floating the sleepers from the Jarár depôt to Delhi, about 248 miles, is under 3½ annas per sleeper.

Statement showing cost of floating per metre-gauge sleeper from Jarár Depôt to Delhi, 248 miles :—

	As.	p.
Telescopic floating from Jarár Depôt to the Tons, 5½ miles, at 7·5 pies per piece	0	7·5
Floating from the mouth of the Mautárgádh to Dákpathar, at 2 pies per piece	0	2
One per cent., lost in transit, at Re.1-8 divided among 99 per cent. which reach safely, each	0	3
Rafting including rope	0	10·5
Canal fee	1	4
Establishment and Miscellaneous	0	1
Total ...	3	4

Visit to the Forest of Fontainbleau, France.

By E. McA. Moir, I.F.S. (*Retired*).

In connection with the Forest Congress, held at the late Paris Exhibition from the 4th to 7th June, an excursion was arranged to the famous Forest of Fontainbleau, situated about 50 miles to the south of Paris, on the Lyons line of Railway.

Accordingly, on the 9th of June, about 100 members of the Forest Congress started from the Lyons Railway Station at 9 A.M., and, after a pleasant run, arrived at Fontainbleau about 10-30.

The day was a perfect one, with bright sunshine and a cool breeze, and the country passed through, consisting of undulating fields, all covered with splendid crops of wheat, potatoes, clover, &c., interspersed with many fine orchards and vineyards, also with many picturesque patches of wood and plantations, was looking its best, and tended to put everyone into the best of spirits.

On arrival at the station of Fontainbleau, we were met by M. E. Reuss, Inspector of Forests in Charge, supported by his Guard Général, together with several Brigadiers and Forest Guards, all attired in their smartest uniforms, in honour of the important occasion.

Outside the station we found five or six large four-horsed brakes or waggonettes awaiting our arrival, and, after being each presented with a neatly bound map of the forest, we soon settled down into our respective places, and at once started off on our tour of inspection of the most important parts of the famous Forest of Fontainbleau.

As the forest is a most extensive one, and our time being limited to six or seven hours, we naturally only attempted a drive through the principal and most important parts, situated to the north of the town of Fontainbleau.

We had, therefore, no time to make any very minute observation of the state of the forest with a critical eye, and for the following information I am mainly indebted to an interesting and concise pamphlet on the Forest of Fontainbleau, compiled by M. Reuss, and of which we each received a copy, but which, I regret to say, many members being so enchanted with the beauty of the scenery, failed at the time to study.

As regards the history of the Forest of Fontainbleau, it was formerly known under the name of the Forest of Bière, and formed part of an extensive forest area, occupying the valleys of the Loire and Seine, and of which the Forest of Orleans and Montages are the other most important remnants still in existence.

This forest formerly constituted the special hunting ground of the King of France, and especially of Louis XIV, and was long considered the private property of the Crown.

The French Court usually proceeded to Fontainbleau every autumn with the object of hunting, hawking, &c., and many a gay

and festive scene was doubtless enacted within its silvan precincts.

After the French Revolution the forest became the property of the State, and is now considered, on account of its extent and proximity to Paris, one of the most important forests under the charge of the French Forest Administration.

The Forest of Fontainbleau is situated on the left bank of the River Seine, in the departments of the Seine and Maine, and forms part of the conservatorship of Paris, where the conservator has his headquarters.

The area of the forest, which is stated to have remained about the same during the last 300 years, is 17,000 hectares or about 42,500 acres, and this includes an area of about 800 acres devoted to military rifle and artillery ranges, &c.

The geological formation of the forest consists of what is known as the Fontainbleau sandstone belonging to the Miocene period, the deposit having a thickness varying from 100 to 150 feet.

Overlying the sandstones in many places are found beds of recent clay, and marls of various degrees of thickness and extent.

The whole area of the forest has been much modified by the action of water, and is therefore much cut up into small valleys with intervening plateaux, and low hills called "monts," which, however, only attain a height of 150 to 450 feet above the level of the Seine.

On the whole, the result is a dry and not very fertile forest soil, except in the places where clay and marl predominate, in which spots it may be said to be of good quality.

Owing to the generally dry and pervious nature of the soil, there are few perennial streams to be found in the Forest of Fontainbleau, the only one of importance being "La Madeleine" which, after filling the lakes in the old Palais grounds, contributes to the town water-supply.

All the other streams are either absorbed locally early in the summer or form small marshes, most of which also dry up during the hot weather.

As regards the suitability of the soil for forest growth, it may be said to be of a medium quality, except where the clay and marl predominate, and there the trees attain fine dimension.

The vegetation of the Forest of Fontainbleau consists principally of the following species:—

Robur Oak (*Quercus sessilifolia*) is the most important, and constitutes about 50 per cent. of the whole forest vegetation.

After the Oak comes in importance the Scotch Fir (*Pinus sylvestris*), which was introduced about the year 1786, and has become now quite naturalized in this locality.

This species reproduces itself with the greatest ease, so that the treatment of the Pine portions of the forest, as far as natural reproduction is concerned, presents no difficulty.

Although about 13,000 acres of pure Scotch Fir forest exists, it is satisfactory to note that up to the present no particular damage has been caused by any serious invasion of insect pests, but as this is to be feared, steps are now being taken to introduce a mixture of Beech along with the Pine. After the Oak and Scotch Fir, the Beech (*Fagus sylvatica*) may be said to be the next and most important forest species, as it constitutes about 15 per cent. of the remaining forest growth.

The timber and fuel of this species are not, however, considered of very good quality at Fontainbleau, and it is principally as a soil-improver and nurse, that its growth is encouraged.

The other species which constitute the main forest vegetation at Fontainbleau are Hornbeam (*Carpinus Betulus*), Birch (*Betula alba*), Poplar (*Populus alba*), Elm (*Ulmus effusa*), Maple (*Acer campestre*), Ash (*Fraxinus excelsior*), &c.

The secondary vegetation and undergrowth of the forest consists of various small trees and shrubs, of which the principal, Juniper (*Juniperus communis*), attains a height of 15 feet, and the timber is sufficiently large to be used for carving purposes. The following shrubs and plants are very common throughout the whole forest, *viz.*, Broom (*Cytisus scoparius*), Heath (*Calluna vulgaris*), Bracken (*Pteris aquilina*), &c.

As regards the areas covered by the principal forest species, they are distributed as follows:—

The Oak, with undergrowth of Beech and Hornbeam, covers about 46 per cent., the Scotch Fir about 20 per cent., and the remaining 24 per cent. consists of mixed forest.

The central part of the forest, *i.e.*, the portion situated to the north of Fontainbleau, and which may be compared to the kernel, has always been treated on the high forest system.

In the other deciduous parts situated to the north and south of the principal forest area, the system of Coppice with Standards was introduced about 100 years ago with the main object of meeting the increasing fuel requirements of Paris, to which place the fuel is easily and cheaply transported by means of barges, plying down the River Seine.

The following interesting natural facts regarding the Forest of Fontainbleau may be recorded, and they have had an important effect on the condition of the forest vegetation during the last 20 years.

The most serious damage was that caused by the severe frost and snow during the winters of 1879 and 1880, and the effects were naturally more severe in the Pine portions of the forest, where large numbers of trees were broken by the weight of the snow.

Besides the Pine, which mainly suffered, various other species were more or less damaged by the severe frost of those two winters, the only species which really escaped being the Birch, which was hardy enough to escape all damage. The result of the injury done

by the frost during these two winters was that the sanctioned Working Plan prescriptions were completely upset, and an immense quantity of wood was thrown suddenly on the market, and, as a matter of course, had to be disposed of at very low rates.

A good deal of damage has also been done to the Forest of Fontainbleau from time to time by violent storms, notably by those of the winters of 1827, 1893, and of the 14th of February 1900, on which occasion about 12,000 Pines were blown down, the deciduous tree, as usual, having fairly well escaped.

Owing to the comparatively dry and inflammable nature of the Pine portions of the forest, and to the fact that it is much resorted to by visitors, also that numerous main roads traverse it, along which innumerable motor-cars are continually flying, it is not to be wondered at that fires are of frequent occurrence, due to the carelessness of visitors. The areas burnt during 1892, 1893, and 1897 were respectively 475, 100, and 875 acres, and these were considered most serious fires from a French Forest Officer's point of view.

As they, however, only represent a failure of about 1½ per cent. of the whole area protected, Indian Forest Officers would, I think, consider themselves uncommonly lucky in most years to escape with such good results.

Again, the action of lightning is said to have caused considerable damage, especially to the Oaks, and many trees injured by lightning are frequently met with all over the forest.

The trees struck are principally Oak and Fir, and it is worthy of note that Beech trees are seldom injured.

In olden times the Forest of Fontainbleau seems to have been subject to much maltreatment, and wholesale pilfering took place by the neighbouring inhabitants, and this was systematically connived at by the underpaid and corrupt officials of those times.

This unsatisfactory state of affairs was, however, to a great extent put a stop to as early as the year 1664 by a vigilant minister of Louis XIV called Colpert, who undertook the proper demarcation of the forest, and inaugurated some important Forest regulations for its better management and treatment.

The result of these praiseworthy reforms had a most beneficial effect on the welfare of the forest, and it may, therefore, be said to have come under conservancy treatment, more or less strict, from an early date.

Up to the time of Louis Philippe, *i.e.*, 1835, the forest seems to have been generally treated on a system of selection felling, besides Coppice with Standards in a few places.

At this time, however, the old system was changed, and the method of seed-felling with thinnings in accordance with the new

teaching of the Nancy Forest School was fully established on a new scientific footing.

No detailed Working Plan was, however, framed till the year 1861, when a special Working Plan Commission of Forest Officers drew up an elaborate plan, the main features of which were as follows:—

54,310 acres were laid down to be treated as high forest with regular seed-fellings, the rotation being fixed at 120 years, this being divided up into five periods of 25 years each.

4,045 acres were laid down to be treated on the Coppice with Standards system, having a rotation of 30 years.

And, finally, 4,067 acres were to be treated on no particular system at all, but left practically to a state of nature, the object being to meet the æsthetic or picturesque tastes and ideas of the numerous tourists and artists who resort to this forest during the summer months.

This well-considered and elaborate Working Plan was closely followed till the year 1880, when the devastation caused by the frost and snow already referred to, necessitated the plan being considerably deviated from, and the substitution of a provisionary Working Plan pending the thorough revisal of the regular Working Plan.

This arrangement continued for 12 years, which shows the sometimes unavoidable instability of elaborate forest working schemes, and during that period the damaged portions of the forest were gone over by a series of improvement fellings, planting, &c., so as to bring them as far as possible into a proper state for the Revised Working Plan Scheme. After very careful consideration the Revised Working Plan came into force during 1892, and under its provision the forest is now sub-divided and worked as follows:—

1st.—Area to be treated as high forest, and comprising about 18,097 acres, and consisting of the best portion of the deciduous forest.

This has been divided into nine Working Circles, the whole to be managed on a rotation of 120 years.

2nd.—Section consisting of the resinous forest and comprising about 8,230 acres, divided into five Working Circles, to be worked on a rotation of 72 years.

3rd.—Selection felling or jardinage portion, comprising 7,457 acres, divided into five Working Circles, to be worked on a rotation of 7 years.

4th.—The Coppice with Standards portion, comprising 4,392 acres, to be managed on a rotation of 30 years.

5th.—The picturesque or æsthetic portion, comprising an area of 4,040 acres, to be managed according to fancy considerations, or almost left to nature.

It may be observed that the object of the first section is to provide well-grown timber for building purposes and railway sleepers, for which there is an ever-increasing local demand.

The object of the second section is to furnish cheap and plentiful fuel for Paris, where the demand is steadily on the increase, owing to the excessively high price of coal, which at present is selling at £3 per ton.

As regards the third section managed under the system of selection felling or jardinage, the reason for this mode of treatment is that the portions so treated are situated on rocky and inferior ground, and thus unsuitable for other more regular treatment of high forest.

With regard to the system of Coppice with Standards, it might be expected that, taking into consideration the dry nature of the soil of Fontainbleau, it is somewhat surprising that the system should be maintained at all, but the explanation given is that it is useful for the fuel-supply, and if it is finally decided to convert some of the coppice areas into high forest later on, the presence of the standards will materially assist towards a satisfactory transformation.

In the fifth or æsthetic part of the forest, which naturally contains all the most picturesque spots, much appreciated by artists and tourists, are to be found most of the finest Oaks and other fine trees, some of which bear historical names, such as *Clovis*, &c.

None of the picturesque trees are, of course, ever felled, but are allowed to decay and fall naturally, and one ancient Oak, which had recently collapsed, measured 16 feet in girth and about 100 feet in height.

The Forest of Fontainbleau is noted for the completeness of its system of roads and paths, being traversed by about 80 miles of natural and departmental roads, and 1,200 of main forest roads, all of which are kept in splendid order.

The most romantic of these roads is what is called the Circular Road, which describes a circle round the Palace of Fontainbleau. It has a radius of five miles, and commands some fine vistas and views of the surrounding forest, and is much appreciated by visitors. As regards the question of the disposal of the game in the Forest of Fontainbleau, it is sold by auction on a five years' lease, and fetches about 8 annas per acre per annum.

This high price is, of course, due to the proximity of the Forest to Paris, and as good shootings are scarce in France as compared with England and Scotland, great competition takes place at the auction sales.

In addition to the ordinary small game, such as pheasants, partridges, woodcock, rabbit, hares, &c., there are a good many fallow and roe-deer, the former much resembling the Indian cheetal.

There are also a few wild pigs, and during severe winters, wolves sometimes frequent the forest, when exciting and elaborate hunts are instituted to ensure their capture.

The following is a statement of the average annual outturn of the Forest of Fontainbleau in material and money during the years 1889 to 1898 :—

Outturn of timber, fuel, &c., per annum,	35,666	Cubic metres.
Or about	1,160,000	Cubic feet.
And the value of the above in money is estimated at	4,22,500	Francs.
To this must be added the revenue from miscellaneous produce, including the game lease, *viz.*	82,362	
Grand Total ...	5,04.862	Do.
Or about ...	3,15,539	Rupees.

The average annual expenditure stands thus during the ten years referred to :—

Spent on works of improvement, such as roads, plantations, &c.	56,156	Francs.
Cost of Establishments	30,747	Do.
Rates and taxes	17,031	
Grand Total ...	103,934	Do.
Or about ...	64,958	Rupees.

The net annual revenue during the ten years referred to therefore amounts to Rs.2,50,581.

After making reduction for the absence of receipts from the 4,040 acres of æsthetic forest, Public Works fees, grants, &c., the net annual average outturn of the Forest of Fontainbleau stands at 2·37 cubic metres per hectare, or about 30 cubic feet per acre.

As regards the annual net revenue of the forest, it amounts to 28·17 francs per hectare, or about 7 rupees per acre.

This result may be said to be very good as compared with the net annual revenue per acre from many Indian forests, but as far as a comparison with other French forest goes, it is considered considerably below the average, as some of them render as much as 50 francs per hectare, or about 12 rupees per acre per annum.

I must not forget to mention that when we had completed about half of our tour of inspection, we arrived at a snug restaurant, situated in the middle of the forest, where we were provided with an excellent breakfast to which we all did ample justice.

During the repast a band of seven or eight forest guards enlivened us with some of the old Nancy Forest School tunes rendered in a lively manner on the "cor de chasse."

After breakfast several appropriate speeches were made by the forest representatives of six or seven different nations, and these were much applauded.

Mr. R. Fisher, our representative, in a concise and lively manner, enumerated the blessings and advantages the Indian forests have derived from our intimate connection with the French scientific teachings and practical forest management, and his speech was well received and applauded.

After completing our tour of the forest, we ended up with a visit to the ancient Royal Palace of Fontainbleau, which was formerly one of the principal residences of the French Monarchs, and afterwards of the Emperor Napoleon. This Palace is beautifully situated in the middle of the forest, and about three miles from the River Seine. Immediately to the north of the Palace lies the small town of Fontainbleau, containing about 13,000 inhabitants, and it forms a favourite summer resort of visitors, and specially of artists from Paris.

The Palace is a most extensive building, occupying the four sides of a large square, and consists of numerous suites of apartments, banqueting halls, theatre, and other chambers of all shapes and sizes, and ornamented and decorated in the most costly manner.

The floors consist of polished oak and marble, and the wall decoration consists principally of ancient tapestry, mirrors, carvings, and gildings of great value and elaborate designs.

There are also numerous pictures, statues, and other works of art, all executed by the most renowned French and Italian artists of bygone days.

The State apartments of the famous Queen Marie Antoinette were the most interesting shown to us, and contained many objects of the greatest interest and value.

Since the fall of the Empire in 1871, the Palace of Fontainbleau has not been used as a State residence, and is only now maintained as an interesting show place for the gratification and entertainment of its numerous visitors.

The Palace grounds are of a most extensive and picturesque description, and consist of elaborate flower beds, lakes, alleys, all interspersed with clumps of exotic trees and shrubs of numerous species, and ancient French landscape gardening may be here seen in its greatest perfection.

Having completed our tour of the Palace and grounds, we again proceeded to the Railway Station, and reached Paris at 7 P. M., much pleased with our interesting and instructive excursion, the one great regret being that more of our old Indian Forest friends (who were doubtless at the time engaged with dry "dufter" work, or struggling with Forest conflagrations) were not fortunate enough to accompany us, but we sincerely hope that they may some day all enjoy a similar pleasant and instructive excursion on their final return from their sojourn in the forests of our great Indian Empire.

The Forests of Arrakan, Burma.*

By E. P. Stebbing, I.F.S., F.E.S.

The Export of Timber from the Arrakan Forests.—I have shown that my observations and enquiries at Maungdaw and in the Prooma Kal led me to the discovery that a large amount of timber was being cut in the forest round these places, or perhaps I should say that these points and Akyab are, (with possibly some others,) the centres at which the timber is collected and loaded into ships for export, and the question now arises as to what becomes of this wood. One has not to go far afield to obtain the answer. The wood is cut up and exported in the form of beams, planks, scantlings, posts, &c., and also as dugouts. These latter are loaded into big balám boats (boats built of planks to a certain extent), and exported to Chittagong and elsewhere. A large number of these Arrakan-made dugouts are always in evidence in the Chittagong Division. The balam boats go down to Arrakan to engage in the paddy trade with the Arrakan Mills, and on their return load up with dugouts.

The beams, planks, &c., are loaded up into brigs and schooners and carried to Chittagong, Barisal, Chandpur, Naraingani, Zalokadi, Bohar, Shahabajpur, &c., the ship returning to Chittagong from these places in many cases loaded up with jute.

My enquiries have led me to form the opinion that it may be taken as an almost indisputable fact that only a portion of this timber has paid royalty to Government, since the Deputy Commissioner at Akyab states that only Rs.4,000 odd revenue are made out of his forests per annum, and this export trade requires to be most carefully enquired into.

The woods chiefly exported are Pyinkado (*Xylia dolabriformis*), Jarul (*Lagerstræmia Reginæ*), Khoira (*Acacia Catechu*), and Garjan (*Dipterocarpus tuberculatus*). No royalty is said to be leviable on other classes of woods, although they are also exported. Canes are also exported from these forests. Arrakan wood is plentiful in Chittagong, and hundreds of Jarul and Koira posts undersized (*i.e.*, under 4 feet 6 inches in girth) and otherwise, are to be found in the southern portion of the district.

The jute brought to the Chittagong Port is consigned to Messrs. Ralli Brothers and M. David & Co., and both these firms, I understand, are engaged in this Arrakan wood trade, as are also Messrs. Bullock Brothers and the representative of Messrs. Ahmuty & Co., and several native firms of the town. I believe these firms, most of the European ones at any rate, simply buy up the wood in large quantities, either at Maungdaw, Akyab, or at one of the other places of export in Arrakan or at Chittagong itself, and have nothing to do with the extraction of the trees from the forest or with the payment of royalty thereon. That the export is considerable will be seen from the above facts and from

* Begun in February Number, 1901.

certain figures which I obtained from the Collector of Customs of the Chittagong Port. These latter, however, represent but a portion of the timber extracted, as the wood consigned to the other places in Eastern Bengal mentioned above never comes into the Chittagong Port, nor do many of the balam boats which come up by the inner route through the canals.

The figures speak for themselves and are sufficiently startling.

During the year 1898-99, 22·6 tons of Iron-wood, valued at Rs.2,036, 93·5 tons of Jarul wood, valued at Rs.5,612, 20 tons of other wood, valued at Rs.806, and 5 tons of canes, valued at Rs.1 001, were imported into Chittagong, or a total value on the imports of Rs.9,455.

During 1899-1900, the imports were:—

			Rs.
Iron-wood	...	... 78 tons =	4,680
Jarul wood	...	... 203 „ =	11,598
Other wood	...	... 34 „ =	1,690
Canes	...	... 7¼ „ =	906

or a total value on the imports of Rs.18,874, *i.e.*, double that of 1898-99.

During the present year 1900-1901 up to June 18th, we have the following figures:—

			Rs.
Iron-wood	...	... *nil* tons =	*nil*
Jarul wood	...	... 612 „ =	31,540
Other wood	...	... 6¼ „ =	312
Canes	...	... 2·6 „ =	394

or a total value of Rs.32,246, *i.e.*, almost double the figures of 1899-1900, and that for less than three months (*i.e.*, from April 1st), although possibly the most important months of the year. It will also be found that all the iron-wood exported in the form of beams, posts, and planks comes from Akyab Port, and this leads me to the supposition that this wood is cut in and brought from the Pyinkado Forests, situated to the south of the Kolandyne river, *i.e.*, those visited and reported on by Dr. Schlich. This would show that traders have started cutting in these forests.

As far as I have been able to learn, the Pyinkado Forests have not as yet been called upon to supply sleepers on a large scale for the Assam-Bengal Railway, whose terminus and head-quarters are now at Chittagong. From the customs returns of the Port of Chittagong, I have, however, discovered that 60 tons of Pyinkado sleepers, valued at Rs.3,600, were imported into Chittagong from Akyab in 1899-1900 for this railway, probably long sleepers to be used for point-crossings. It is probable, however, since European firms are now engaging in the trade, that it will not be long before an attempt is made to work the iron-wood forests with the view of under-selling the Pegu-Pyinkado sleeper at present used on the line.

In addition to sleepers, the Railway Workshops also make use of Jarul and other woods, paying Rs.60 to Rs.65 per ton for the Jarul.

(To be continued.)

II.—CORRESPONDENCE.

The Oldest Rubber Plantation.*

In The *Indian Forester* (Vol. XXIV., p. 160), I presented some facts in relation to the oldest India-rubber plantation in the world, which is located on the Pamanukan-Tjiassem estate, in the Residence Krawang, in Java. At that time I wrote that the plantation came into existence in the year 1872, basing my information on personal conversation with the owner of the estate, but the opinion of the present chief Overseer, Herr van Henkelom, seems to be that the plantation dates from the year 1864.

The young plants of *Ficus elastica* were obtained from the adjacent forests, by cuttings of branches, or by marcotting the uncultivated trees, an operation to which the inhabitants of Java frequently resort. The before-mentioned rubber trees are especially adapted to the process of marcotting. All that is necessary is the removal of a strip of bark ¾ centimetre wide, and to bandage the wound with earth. After about fifty days roots will appear through all sides of this ball, which can then be cut off. It is advisable before planting these young plants, which are about ½ metre in height, to place them, or rather nurse them, in rich, well-shaded soil for a period of about fifty days, in order to heal the cut thoroughly.

It is my opinion that the original cost of this plantation on the Tjiassem estate was not very much, because the *Ficus elastica* was planted about 8½ yards apart each way, or 72 to the acre, within coffee plantations which were no longer productive, and required not much cultivation. I estimate the cost of the plantation at about $7 per acre. Altogether 72½ acres, embracing 5,200 trees, were planted.

The first tapping was done in 1886, and the following figures will give the details:—

Years.	Pounds.	Average ounces per tree.	Value.
1886	5,512	17	$2,880
1887	4,954	15	2,592
1888	1,514	4	792
1890	3,307	10	1,728
1891	6,113	18	1,858
1892	5,992	18	1,229
1895	3,197	10	1,973
1896	3,113	10	1,561
1897	6,731	21	3,648
1898	6,731	21	4,213
Total ...	47,164		$22,474

* This letter is reproduced from *The India Rubber World*.

Tappings could not be made in every year. In thirteen years (in three of which the trees were not tapped) a total of 47,164 pounds was harvested, an average of 3,628 pounds per year, or 10 ounces per tree per year. During the four years 1895-98, the average was 4,943 pounds, or 15 ounces per tree. The yield per acre, therefore, from 1886 to 1898, averages 50 pounds, and from 1895 to 1898, 68 pounds.

The figures given above, by the way, in the column headed "Value," must be understood as referring to the income to the planter after deducting all expenses, not only of harvesting the crop, but also the initial expenses and the yearly expense for care of the plantation. From the information supplied to me in regard to the prices obtained for the rubber, I should infer that the yearly expense for the last four years covered by the table had amounted to an average of $12 per acre per year.

An analysis of the figures above given will show an average yearly net profit of $39·30 per acre, the figures for 1898 showing a profit per acre of $58.

With respect to the possible yield from *Ficus elastica*, it may be mentioned that Herr Mulder, in Sudimara (West Java), obtained in 1897 from three trees 48 kilograms, and 20 months later from the same trees 45 kilograms. This is respectively per tree 35½ pounds and 33 pounds.

A. H. BERKHOUT,
Late Conservator of Java Forests.
Wageringen, Holland.

Flowering of Arundinaria Falconeri in the Darjeeling District in 1900.

You were good enough to publish a short note I sent you in the *Indian Forester* for July 1900, about the flowering of bamboos in the Darjeeling district, and as I have some more information on the subject, I send it to you for record.

All of the three bamboos, the vernacular names of which were given to me as *Singhané* and *Maling* in the Darjeeling district, and as *Prém* in the Tista Forest Division, have been determined by Mr. Gamble to be one and the same species, and its scientific name is Arundinaria Falconeri (*Bth. and Hook. fil. Gen. Pl.* iii., 1208).

It has been my privilege to study this bamboo in all the localities in which it has flowered in the Darjeeling and Tista Forest Divisions, so I wish to take this opportunity of placing on record the result of my observations.

Mr. Gamble, in his now classical monograph on the Bambuseæ of British India, which constitutes Vol. VII. of the annals of the Royal Botanic Garden, Calcutta, has described this species in great detail, and gives its habitat as the Himalayan Range from

Kumaon to Bhutan ; and, after recording the localities from which it has been reported, and the Botanists by whom it has been found, goes on to say that very little is known about this species, which is clearly chiefly found in Nepal, and extends eastward to Bhutan and westward to Kumaon.

It has been reported in flower in 1821 by Wallich, and in 1876 by C. B. Clarke, and it has now flowered a third time in 1900.

The bamboo is decidedly a rare one and near the station of Darjeeling has been much cut, together with the true *Maling* (Arundinaria racemosa), for fodder for ponies and cattle, and the first flowering spikes found by me were those formed at the lower nodes of culms, which had been cut for fodder.

Arundinaria Falconeri has flowered in the Rangirun Forest (Block I. of the Senchal Working Circle of the Darjeeling Forests Working Plan), and in the Rangbi Forest (Block II. of the same Working Circle). On the Ghoom Range, (which forms the water-parting between the Balasan river, which flows south into the Darjeeling Terai, and the Little Rangit river, an affluent of the Tista river,) it has flowered in the Nai Forest (Block II. of the Tasiding Working Circle) and the Mim Forest (Block II. of the Mim Working Circle). Both these localities have a northern aspect. In both these instances the bamboo was confined to ridges or precipitous ground inaccessible to the fodder collectors.

Crossing the Little Rangit river, the bamboo again appears on the southern slopes of the Singalila Range below Tongloo.

In the above localities the bamboo was found at an elevation of between 6,000 and 7,000 feet, and is associated with *Safed Champ* (Michelia excelsa), *Buk* (Quercus lamellosa), *Kates* (Castanopsis hystrix), *Kapashi* (Acer Campbellii), *Kawle* (Machilus sp.), *Kharani* (Symplocos racemosa), and other species of trees typical of the higher temperate zone of hill forests.

In the Tista Forest Division it is found only on the Pankasari Ridge, which connects the Rechi la Ridge (the boundary between Sikkim and British India with Bhutan) with the Labah Ridge. This locality is quite 20 miles as the crow flies from Rangbi in the Darjeeling district, and the Tista river which intervenes is only about 1,000 feet above sea-level, where it flows between these two localities.

At Pankasari, where the bamboo is not cut for fodder, it forms a dense undergrowth to the exclusion of everything else, and differs much in general development (it is here uninterfered with) from the specimens met with in the Darjeeling Forests.

Three distinct patches of the bamboo were noticed, one close to and below the new Pankasari Bungalow, at an elevation of 8,000 feet, and associated with *Buk* (Quercus lamellosa), *Baloo Chinia* (Heptapleurum impressum), *Seto Chimal* (Rhododendron grande), *Bara Katus* (Quercus pachyphylla), *Lissoo* (Ilex dipyrena) and *Kapashi* (Acer Campbellii).

The other two patches were at elevations of 7,000 feet and 6,000 feet, respectively; the lowest patch being about 3 miles from Sabah itself. I think 8,000 feet may be put down as the greatest elevation at which the bamboo is found, and that it may descend as far as 6,000 feet, but not lower.

The culms form a distinct clump similar to Arundinaria aristata (*Rato Nigalo*), the high elevation (10,000—12,000 feet) bamboo of this district. The clumps are rather open, the individual culms being from 3 to 4 inches apart. This species does not form trailing rhizomes as does the true *Maling* bamboo. The culms are hollow from half-an-inch to three-fourths inch in diameter, and are from 10 to 20 feet high. There are from 16 to 20 full-sized culms in a clump which would lead one to suppose that the age of the bamboo would be from 21 to 25 years old, and this age agrees well with the date of the last recorded flowering in 1876.

Arundinaria Falconeri is found in a zone below the true *Maling* (Arundinaria racemosa) and above the *Gopé* bamboo (Cephalostachys capitatum). Its distribution throughout the Darjeeling district is much more general than was formerly supposed to be the case.

Seed of this bamboo has been collected both in the Darjeeling and Tista Forest Divisions, and is being sent to the Inspector-General of Forests for distribution. It should grow well out of doors in the southern parts of England, where it will be a welcome addition to the many Japanese species of bamboo which have already been introduced.

It will be interesting to know if it has also flowered in the Kumaon district in 1900, and I feel sure that some of your readers can enlighten us on this point.

C. GILBERT ROGERS,

Darjeeling. *Deputy Conservator of Forests.*

III.—OFFICIAL PAPERS AND INTELLIGENCE.

The Teak Trade of Bangkok and District.*

BY MR. CONSULAR-ASSISTANT CARLISLE.

Teak.

Teak shows a large increase in the year, the export rising from 22,692 tons, valued at 168,605*l.* in 1898 to 36,616 tons, worth 323,867*l.* in 1899, an increase of 13,924 tons and 155,262*l.* These are the official figures, but, as in previous years, they differ considerably from the statistics compiled by firms directly interested in the

* Diplomatic and Consular Reports, Siam. The trade of Bangkok and District for the year 1899, Foreign Office, 1900. Price, Threepence.

trade. The latter calculate the 1899 export to foreign ports as 38,661 tons, that for the previous year having been 26,495 tons, which would make the increase 12,166 tons. The year may be considered on the whole a very good one for the exporter, for, although the floating season was again not altogether satisfactory, the export was large, and prices were high. Bangkok was, however, at a disadvantage in the matter of high freights, paying as much as 3*l.* as against 2*l.* from Burma. The local selling value of European timber was about 10*l.* per ton.

Destinations of Export.

Taking the export to be 33,661 tons as above, it was distributed as follows:—

To	Quantity.
	Tons.
Europe	1,1576
Singapore	3,784
Hong-Kong...	13,261
Bombay	8,678
Saigon	317
Other Countries	1,045
Total ...	38,661

Of the direct shipments to Europe, 7,617 tons went by chartered sailing vessels, of which 12 were loaded during the year. The Danish East Asiatic Company's steamers carried the remainder. It is impossible to say what proportion of the shipment to Singapore was destined for the European markets, but it may be safely estimated at not less than two-thirds. In the same way, it is impossible to say how the shipments to Hong-Kong were ultimately distributed.

Export for last ten years.

In order to give an idea of the average output, the exports for the last ten years, as stated in the annual custom-house returns, follow:—

Year.	Quantity.
	Tons.
1890	38,735
1891	16,100
1892	14,637
1893	30,089
1894	57,719
1895	48,994
1896	49,690
1897	38,767
1898	22,692
1899	36,616

British share of the trade.

Great Britain continues to hold by far the largest and most important share of the teak export business and of the teak forests. A forest lease, however, has recently been granted to a Danish and another to a Chinese firm.

Prospects of the trade.

The prospects for the current year are promising. The output during the past six months has increased, and European values have held up well.

Forest reform.

Teak merchants in Siam are naturally manifesting considerable interest in the new precautions for forest preservation, which are being taken by the Siamese Government with the advice and assistance of Forest Officers from Burma. The Government is now bringing the teak forests of Siam under systematic control. They propose in effect to considerably limit the area of forests now being worked, and to charge rentals in addition to the present royalties. They now issue the forest leases themselves instead of allowing the local "Chaos" or chiefs to grant them as formerly. They are increasing, too, the limit of girth of trees which may be felled, so as to bring the practice more in line with that obtaining in Burma. The effect of all these measures will, no doubt, be to somewhat limit the teak output while preserving the lives of the forests. No diminution from this cause is likely to be felt for some years yet, however.

General remarks.

An interesting difficulty of the trade is the increasing dearness and scarcity of elephants in the north. This is partly due to the fact that most of these animals used to come from the east bank of the Mekong, and that since the French annexation of that region the officials have discouraged their export in every way. At the same time, the constant demand for elephants on the Burma side drains them out of Siam.

Other parts of the country, however, still contain numbers of wild elephants, and, it is said, that a Chinese firm is getting up a considerable herd from the Malay Peninsula for work in the north. It will be interesting to see if this proves a remunerative experiment. It is probable that in time carriage by carts and mechanical means of haulage will be largely adopted.

The consumption of teak appears to be increasing regularly. Besides its use for ship-building and railway rolling-stock there is an increasing and noteworthy demand for it in Europe for house-building and furnishing. The growth of European navies means a corresponding demand for teak, despite the desire to use as little wood as possible in the construction of war-ships. For sheathing and armour backing it seems to be necessary, and the amount of teak consumed in building a battle-ship is said to be about 1,000 tons. Teak merchants suggest that the result of "Belleisle"

experiments should be to minimise the danger to be apprehended from the inflammability of teak timber.

The bulk of the teak supply of the world comes of course from Burma, Siam being a long way second. The prejudice against Siam, as compared with Burma teak, still holds good in great part, though many experts say that Siam timber is now for all practical purposes as good as Burmese. The British Admiralty, however, continue to reject the Siamese material. One local source of consumption has been closed, that of the Royal Railway Department, which has now erected a small mill and cuts its own hard wood.

IV.—REVIEWS.

Forest Administration Report of the Lower Provinces of Bengal for the year 1899-1900.

The report under review is particularly interesting as showing the great development which has taken place during the year in the exploitation of minor forest products from the departmental forests of Bengal. Leaving the consideration of this question, however, to its proper place, we will proceed to take the report in the usual sequence, beginning with the subject of areas.

At the close of the year (30th June 1900), there was a total of 13,589 square miles of forests under the Bengal control, divided into 13 divisions. Of this total, 5,881 square miles were *reserved forest*, 3,675 square miles *protected forest*, and 4,033 square miles *unclassed*. The only real alteration recorded is a transfer of 141 square miles for cultivation purposes from the Sundarbans protected forests to the district authorities. Other alterations are impending; but they do not concern us now.

The Conservator has good grounds for complaining of the authorities entrusted with the forest settlement operations in the Chittagong Division. They not only appear to have unnecessarily delayed matters, but important papers are also reported to have been mislaid. The Chittagong Forest Settlement has now been "*in progress*" for several years. It is consequently high time it were finished, and Mr. Wild appears to be justified in expressing as his opinion that the Settlement authorities "are not adepts in the work."

Another case under the head of Settlements, which deserves attention, is that relating to the Jalpaiguri Fuel and Fodder Reserves. At the last Revenue Settlement not less than 843 different plots of land were set aside as fuel reserves; but we

now learn that these have been reduced to 42 "out of which 23 have been settled as jotes, six are to be let out for cultivation, and one is to be reserved for building sites, while 12 are recommended to be made protected forests and placed in charge of the civil authorities." Truly, a grand result! Let us hope that too much paper and red tape has not been consumed!

A forest survey party was at work in Singhbhum during the year, and the Superintendent reports that the following work has been done, *viz*:—

Triangulation	...	... 150 square miles.
Levelling	...	... 35 linear miles.
Detail survey or 4" scale		... 185 square miles.

A record was also prepared showing the distribution of the forests. Moreover, two parties will be at work during the current year, so that the mapping of the Bengal Forests should soon be completed, a satisfactory result without which the preparation of working-plans is always extremely difficult.

Form 50 shows that 2,354 square miles of reserves (in 3 Divisions) were under working-plans at the commencement of the year; 183 square miles (1 Division) came under working-plans during the year; and working-plans for 841 square miles (2 Divisions) were in course of preparation. Moreover, 2,503 square miles (6 Divisions and half of Darjeeling) have still to be taken in hand; that is, about 42 per cent. of the total area of reserves.

Amongst the protected forests about half the total area situated in the Sundarbans Division is worked under the provision of one working-plan. On the subject of working-plans, Mr. Wild's remarks are worth quoting: "First as to the area for which plans are required. This in Form 50 was shown to be 9,000 square miles (including all classes of forest), but the Form does not show the agency for working-plans, and arrives at the figure by deducting the area under sanctioned regulated management from the total area of the forest. If a reference be made to the Annual Administration Report for 1892-93, para. 39, it will be observed that for a large portion of this area there is no immediate necessity for working-plans. Then as regards the means at disposal for carrying out the work. The Government of India has now recognised that, so far back as the last reorganisation in 1891, the scale allotted was inadequate, while a new Division was formed in 1895, for which no extra appointment was given. This has *now* been remedied, but still no provision for working-plans has been made, and the work that has to be done must still be done by Divisional Officers whose hands are already completely full, though at the same time no opportunity will be lost of securing the services of special officers for this work alone. The importance and necessity of the work has not been under-estimated, and will not be overlooked. In the neighbouring provinces, it is true, much greater progress

has been achieved, but the comparison below will show that Bengal has not had the opportunities those provinces have had: —

Province.	Total area in square miles.	No. of separate divisions.	Staff.						Area for which working-plans prepared and sanctioned up to 30th June 1899.	Percentage of total area under sanctioned working-plans.
			Conservators.	Deputy Conservators.	Assistant Conservators.	Supernumerarie.	Provincial Service.	Total.		
1	2	3	4	5	6	7	8	9	10	11
Bengal ...	13,730	13(*a*)	1	9	5	2	7	24	4,437	32
North-Western Provinces and Oudh.	4,078	16(*b*)	3	9	7	...	9	28	3,358	82
Central Provinces	19,115	19(*c*)	2	10	7	...	9	28	6,920	36

(*a*) Includes 1, (*b*) 3, and (*c*) 2 Direction divisions.

"Touching the simplicity of the Bengal plans, while possibly there is no more complicated plan in the whole of India than that for the Darjeeling forests, there could be no more simple plan than that for the Sundarbans or even that for the Tista forests."

There is a great deal to be said in favour of the contention that unsettled areas, such as the unclassed and some of the protected forests, should be excluded from the area totals when comparing the results in different provinces. And if this be done, or if the number of Divisions alone be taken into consideration, it will be found that Bengal does not compare unfavourably with other provinces.

The Sundarbans Division was the only Division which sent in Forms 2 and 3 punctually. We should suggest their preparation before the sending in of the Annual Reports by Divisional Officers; for, if this were done, Forms 57 and 58 could be prepared from Forms 2 and 3, and not *vice versâ*. As it is, grave doubts naturally arise as to whether the provisions of the existing plans have been carried out; but, on the whole, they seem to have been acted up to.

Rupees 28,156 were spent on buildings and Rs.22,253 on roads; and it is particularly pleasing to find that the important question of housing the out-door establishment is receiving attention.

The storm that passed over Darjeeling in September 1899, did great damage to the paths, &c., in the Darjeeling Division, and it is estimated that their thorough repair will cost some Rs.10,000—a sum which could not be made available during the year under report.

An increase is recorded in the number of cases taken into Court, due to a greater number of fire offences so dealt with. On the other hand, there is a slight decrease in the number of

cases compounded, the average amount accepted as compensation, being Rs.3-1-2 per person, as compared with Rs.3-3-3 during the previous year.

Turning now to "*fire-protection*," it will be found that the year's results are particularly satisfactory. It will be remembered that in Bengal good and bad seasons have alternated since 1890-1891, and by rights the season under report should have been a bad one. It is gratifying, therefore, to find that the accustomed alternation of good and bad years has been broken, and, as Mr. Wild remarks, "if the season of 1900-1901 reverts to it, the forests will have enjoyed three successive good years." The results show that of the areas under protective measures, 124,345 acres were burnt or 9·19 per cent. of the area attempted, as compared with 23,756 acres or 1·77 per cent. of the previous year (a wet year), and 338,543 acres or 27·09 per cent. burnt in 1897-1898 (a dry year).

Omitting the Sundarbans, Chittagong, Sonthal Pargannahs, Darjeeling and Tista Divisions, where fire-protection by special measures is not really in force, we find that, out of a total reserved area of 1,241,585 acres, systematic fire-protection was undertaken over 1,113,382 acres, with the result that fires burnt over 124,344 acres, 10·9 per cent. of the area attempted. The expenditure incurred came to Rs.12,976, or 2·2 pies per acre attempted.

Two questions, in connection with fire-protection in Bengal, deserve to be prominently set forth, namely, the percentage of area over which systematic fire-protection is attempted, and the cost. It will be found that 90 per cent. of the reserved area is under protection; and this result is obtained at the very low cost of 2·2 pies per acre.

In Singhbhum, a large number of cases (27) against Fire Conservancy Rules were prosecuted with extremely satisfactory results. Mr. Wild is glad to note that the punishments, generally, have been of a more deterrent nature than in previous years. "Considering the difficulty," he writes, "in most fire cases of procuring any evidence at all whenever convictions *are* obtained, the punishment ought, in all cases, to be exemplary, and it is satisfactory to know that the attention of the Deputy Commissioner has been specially called by Government to the last case abovementioned.

"It may, in concluding this important subject, be further mentioned that, in consequence of the many and severe fires in the early part of the season in the Saitba block of the Singhbhum Division which is burdened with concessions, Government has agreed to the Department closing to the enjoyment of these privileges, at once and at its discretion, such portions of the forest as may be burnt over. In addition proposals have also been made at the instance of the Government of India to alter the existing law and to make villagers jointly responsible for fires. These endeavours should bear good fruit."

The Forest Department at Darjeeling are carrying out experiments with the object of purifying the milk-supply of that station. Mr. Keventer of Aligarh fame, has set up a dairy at Senchal, and has received some large concessions to help him in his undertaking.

Natural regeneration is reported on the whole as "*normal.*" In the Sonthal Pargannahs a quantity of seed was destroyed by storms. In the Singhbhum Division the attempt to procure natural seedlings from the forest for the natural garden at Chaibassa discovered the fact that seedlings of several species, other than sál, die down in a hot season and shoot out again on the advent of the rains. The following note is also worth quoting:—

"As instances of what a judicious preparation of the soil to receive the seed might effect, it may be remarked that in the Singalila forests of the Darjeeling Division, the hoeing up of the ground around a *buck* and a *champ* tree resulted in a dense cover of young seedlings which have been fenced in in order to watch the progress of the experiment, while the new embankment on the railway that now runs through the Buxa forests is in many places nearly covered with sál seedlings. Closely connected with this, it is satisfactory to observe that the fresh landslips in the Takdah Range of the Darjeeling Division are being self-sown with utis (*Alnus nepalensis*), and that the areas devastated by the cyclone of 1897 in the Chittagong Division are being naturally re-clothed."

The area under regular plantations remains the same, 2,872 acres, chiefly in the Darjeeling, Kurseong and Chittagong Divisions; whilst the area under cultural operations is creeping up, and it now stands at 3,812 acres. The cost for "upkeep" came to Rs.4,068 (Rs.4,040 being spent on "cutting back" after the cyclone in Chittagong); and Rs.8,646 were expended on cultural operations.

The sum spent on regular plantations is small, and it is hoped that thinning, cleaning, and weeding operations are not altogether neglected after the planting year has gone by.

The landslips above the railway at the Peylajhora, in the Kurseong Division, has been again planted up with some 10,000 plants, chiefly tun and champ; some remark as to the present condition of this slope would have been very interesting.

Teak, *Pterocarpus Marsupium*, and *Dalbergia lanceolaria* are the plants chosen for the plantations in Orissa.

Creepers were cut over 28,395 acres, as compared with 24,609 acres in the previous year, at a cost of annas 1·4 per acre.

Under "*experiments*," and chiefly in connection with the exploitation of minor forest products, many that are now going on in Bengal deserve attention. As a result of previous experiments, the Kashmir walnuts (*Quercus serrata*) and Spanish chesnuts are now flourishing in the Darjeeling Division; *Eriodendron anfractuosum* (*Kapok of Commerce*) is doing well at Jalpaiguri; whilst the Divi Divi in the Sonthal Pargannahs, raised from local seeds

is growing luxuriantly. On the other hand, the Horse chestnuts, English oaks, and Chinese oaks at Darjeeling; the camphor trees in the Tista, the "Kapok" (a tree of the tropics) at Darjeeling, and the Divi Divi in Kurseong are turning out failures. As regards the experiments undertaken during the course of the year, *Phœnix nepicola*, *Ischœmeum angustifolium*, and *Castanospernum* were sown at Sukna (Kurseong Division) with varying success. The Sabai or Bhabar would probably do better on the hills between 1,500 feet and 3,000 feet elevation, that being its natural habitat.

Some seeds of the Travancore bamboo were sown at Kalimpong, but only a few came up; we quote below Mr. Wild's remarks on the India-rubber experiments:—

"*Ficus elastica*.—One hundred and twenty-four cuttings at Tashiding now average 30 feet high and are throwing out aerial roots. Sixty-four have been transplanted into Mangbur, 12 in the forest around the nursery, and 6 at Kalimpong. Seed sown in Chel and Garubathan nurseries has germinated well. Nine seers of seeds procured from Assam were sown in carefully-prepared nurseries at Sukna, at Gulma, and at the ninth mile on the Tista Valley Road; the result was unsatisfactory; at Gulma the seed did not germinate at all, while at Sukna 66 and at the ninth mile only 10 seedlings came up. Fifteen pounds of seed sown in pots at Kaptai produced 700 seedlings, of which, however, only 187 seem to have survived. These have been pricked out into nursery beds and are doing extremely well. Fifty-seven cuttings have produced fine, healthy plants. One hundred and fifty seedlings produced in the Tista Valley from local seed and from seed from Assam have been planted out in Mangwa block. Fresh seed sown during the rains of 1899 germinated, but all the seedlings died in the cold weather.

"*Manihot Glaziovii* (Ceara rubber).—At Buxa these did not germinate, while Tista has not reported the result of the seed sown last year.

"*Hevea brasiliensis* (Para rubber).—The 3,150 seeds received last year were distributed as follows:—

"Kurseong, 1,000; Jalpaiguri, 650; Buxa, 1,500. In Kurseong (at Sukna) 651 produced plants, but only 273 survived and are strong and healthy, being 17 inches to 42 inches high. In Jalpaiguri and Buxa they were not a success. In all cases the seed did not arrive till the end of October and many had germinated during transit. A fresh consignment of 6,000 seeds was received during September 1900, and it is hoped this batch will be more successful.

"*Kickxia africana* and *Castilloa elastica*. (The new West African and Central American rubber trees)—Forty-five and 110 young plants were obtained from Ootacamund since the close of the year (31st July 1900) and hove been planted out at Sukna."

Lastly, extracts of tannin were prepared from *Ceriops Candolliana* and sent to Calcutta and Dehra Dun, and some timber

of *Excœcaria Agallocha* (a tidal shrub) was sent to the Balli Paper Mills as likely to produce suitable pulp for paper-making.

The wire tramway which was erected during the previous year in the Tista Division, with an arrangement for allowing the loaded runners to turn at the points of support on its journey down, has proved a failure. The removal of produce by Government agency was introduced for the first time in three Divisions, and it proved a success as regards the exploitation of India rubber in the Kurseong Division, and a profit of Rs.134 per maund was realized.

Fruit of *Terminalia Chebula* and *belerica* to the extent of 2,157 maunds were collected and sent to Calcutta, and a profit of Rs.1,000 is anticipated. The same system was adopted with the fruit of *Strychnos Nux vomica*, but only a small profit was made, these invoices being consigned to a native broker in Calcutta. The revision of the triennial lease of sabai grass for paper manufacture resulted in a rise from Rs.30,000 to Rs.1,26,000 for the next three years—a very satisfactory increase. Before 1894 Rs.1,500 per annum only were realized from this product.

In the Sonthal Pargannas sabai grass realized Rs.16,558 levied from the exportees for the first time at a rate of 1 anna per maund.

The outturns improved all round, timber by 920,016 cubic feet, or about 14 per cent.; fuel by 2,316,888 cubic feet, or some 7 per cent.; and minor forest produce by Rs.32,730, or some 11 per cent.

The increase under timber occurs chiefly in the Sundarbans and Singhbhum Divisions, the timber being removed by the purchasers. The Sundarbans Division also accounts for the increase under fuel, removed by the same agency. On the other hand, the increase under minor forest produce is fairly equally distributed among the different Divisions.

The introduction to a small extent of Government agency export works has about doubled this form of outturn for both timber and fuel.

The protected forests yield about 10 per cent. of the total timber outturn and a little more than half of the total fuel outturn.

Form 61 gives the financial results as follows :—

	Rs.
Receipts	11,61,175
Charges	5,55,464
Surplus ...	6,05,711

Both receipts and charges are higher than in the preceding year, and the surplus is better by Rs.85,151, the proportion of surplus to gross revenue being 52·16 per cent., as compared with 51·68 and 45·06 in the two previous years.

The total value lost to Government by free-grants, rights, &c., is set down at Rs.2,55,164.

As usual, the Sundarbans is largely responsible for the above results ; the receipts, charges, and surplus for that Division being Rs.6,34,644, Rs.95,401, and Rs.5,39,243, respectively. Eight Divisions gave a profit, and five Divisions were worked at a loss.

Commenting on the remarks recorded last year by both the local Government and the Government of India on the aptitude of Forest Officers for commercial undertakings, we note that the position is better this year than last. The Conservator hopes that the Divisional Officers in charge of Divisions showing a loss on the year's working will act up to the suggestions then made. We should suggest that the fixing of rates by schedules for each Division, and the auditing of the divisional accounts on those schedules is a custom that does not encourage Divisional Officers. Schedules of rates no doubt have their utility, particularly as a guide, but the Divisional Officers must be given power to go above or below the sanctioned rates as they think fit. For instance, we would suggest that the fuel coupes in Darjeeling be put up to auction. As a result it would probably be found that fuel rates would rise, and rates for fuel in different localities would automatically fix themselves, higher rates being given for the near coupes and lower ones for those some distance off. The same with other produce, and in other Divisions.

With regard to minor forest products, and even as regards major products, it is necessary that exporters should at the outset make profits. Whenever this occurs, competition is sure to arise, sending up prices all round, largely to the benefit of the Department. Thus, for instance, there are various systems of auction, which could easily be made to apply to the conditions prevailing in different localities.

Another question which might receive greater attention is the officering of the various Divisions. From an outside point of view, the employment of trained sylviculturists in such Divisions as the Sundarbans and Chittagong, appears to be a great waste of force. The work in these Divisions, we understand, consists almost entirely in supervising the revenue collections at Toll Stations, and for this purpose members of the Provincial service should surely be sufficient.

Under "General Remarks," the Conservator gives a short account of the damage done to the forests near Darjeeling by the storm of September 1899, and Mr. Wild's description is worth quoting :—

"The damage done to the forests was considerable, but markedly less than in the unwooded areas; it was confined mainly to the forests around Darjeeling, and the chief disaster was a most formidable landslip in the Setikhola jhora, which has subsequently extended up to the top of the Senchal hill. In the Tista river and its tributaries, the Rungnu and the Bara Rangit, the excessive rain caused roaring torrents, which brought down large deposits of silt, often 20 to 40 feet deep, and destroyed

or entirely washed away low-lying strips of forest on their immediate banks, while the beds of most streams were much scoured out and widened. Even so low down as the Jalpaiguri Division, a bed of silt was formed in the Apalchand Forest. It is estimated that 463 acres of forest in the Darjeeling Division, and some 450 out of 600 acres in the bed of the Balasun river, in the Kurseong Division, have been lost; but it is satisfactory to be able to state that the Setikhola and the Rungnu slips are the only ones likely to extend. These heavy floods brought down an unprecedented quantity of drift-wood, notably in the Tista and the several rivers in the Terai, the bulk of which lodged in that portion of the Tista over which the Rani of Bykantpur has the right of *jalkar*, though a very large amount stranded in the Terai, the revenue from which was a slight set-off against the damage done. The damage to roads and paths was, of course, extensive in the three Hill Divisions of Darjeeling, Kurseong, and Tista. Allusion has already been made to the former in paragraph 19, while in Kurseong and Tista the export of produce by the Tista Valley Road has been entirely prevented."

V.—SHIKAR, TRAVEL, &c.

Concerning Elephants.

In the January Number of the *Indian Forester*, LONG TOM sums up his curious article on "Cowardly Elephants," with the sweeping assertion that the elephant has always appeared to him to be "the slowest in thought of all animals that are trained by man, and to be absolutely lacking in reasoning power * * *." No doubt, a number of Forest Officers, who are friends of the patient beasts that do so much work for us, (and that I think with sufficient cleverness,) will come forward to prove, at length, that elephants are quite as sagacious and as capable of reasoning, and even more so than many domestic quadrupeds—like the horse—of whose intelligence we generally hold a high opinion.

Leaving such authorities on the subject to discuss the question to its right conclusion, I would like to just throw in a few observations of my own, in order to add weight to such arguments as may be forthcoming in favour of elephants and their decided ability to think. Perhaps LONG TOM does not mean his article to be taken seriously, and, probably, wrote it to relieve his feelings after that old "female elephant" had smelt another dead green pigeon. But now that I have begun to write, I may as well go on for the sake of argument.

Firstly, it is beyond dispute that wild elephants show much cleverness, which is more of the nature of *thoughtfulness* than of common *instinct*. The way they collectively aid, or defend their young; the practical manner in which they choose their feeding grounds and travel by well-selected permanent paths from one

ground to another, just, as it seems, at the right time ; the cunning manœuvres of fogue, – all go to prove this. So do the incidents befalling at any Khedda.

Then, in the tame state, can any other animals be found that are able to remember and understand so many different words of command as our working elephants ? Those who have seen elephants at work in timber yards, at any rate in Burma, will call to mind how cleverly they stack timber, although the methods of stacking may not be uniform. In rafting sunken timber, an elephant will readily, at command, hold a sinking log at the surface of the water until it is secured to some that are buoyant. In such cases, all that an elephant does cannot surely be put down to blind force of habit !

In the Andamans a few years ago, one of the forest tramways ended at a steep "shoot," leading down to a tidal creek that was used for floating out Padouk. The logs were large and far too heavy to be handled by men. So an old elephant, Bisheswar Prasad by name, was employed daily, when the timber was brought in from the fellings, in turning each log round on its truck until it was in line with the shoot, and then sending it off with a butt from behind. Often he did this without guidance from his mahout, and he would do it *accurately* every time. Another elephant sometimes helped to put up rough bridges, and would lift a beam to the required height, and *hold it there* until it was secured to the uprights. I do not say that this elephant knew that a bridge was being built so many feet above flood-level ; but he appeared to understand that his mahout wanted the beam lifted up and held in place for a certain time, and he patiently listened to and carried out orders without a mistake. There is no need to quote more instances of this kind, although there is no end to the variety of them. These two alone, with what I have written above, seem to me sufficient grounds for concluding that elephants either wild or tame are by no means "*absolutely* lacking in reasoning power."

GYOK-BIN.

VI.–EXTRACTS, NOTES AND QUERIES.

The Forests and Waste Lands of Ceylon.

By A. F. Broun, *Conservator of Forests.*

The area of uncultivated land in Ceylon exceeds 20,000 of the 25,365 square miles of country contained within the colony. The proportion of good forest in these 20,000 square miles is unfortunately small, the largest portion being taken up by scrub and by grass-covered stretches of country called *patanas,* which find their greatest development in the hills of the Province of Uva. The scrub is partly natural, especially so on the sea coast and in the arid sub-zone, and partly the result of a destructive

method of cultivation known as *chena*, which consists in clearing and burning jungle and in raising crops for two or three years on the area cultivated. Now that a careful control is exercised over this cultivation, nothing but small forest is felled; but not many years ago valuable forests were ruthlessly felled, and their ashes were utilised as manure for the crops which were raised; where such a system of cultivation has been in force, it takes years for the forest to take again a useful character. Usually a thorny scrub grows up, or, as is the case in the Eastern Province, a dense growth of thick grass (*Imperata arundinacea*) springs up, as in the moist districts; the ground gets covered up with *Lantana*; or, worse, because they are not soil-improvers, by *Hedyotis*, *Ochlandra stridula* or *Gleichenia linearis*.

The patanas were probably at one time covered with trees, such as will be described later on for the Park country, but fires and grazing have destroyed the majority of these, except in sheltered places, such as gullies or ravines.

The trees which are to be found on the patanas are, at higher elevations, *Rhododendron arboreum*, and from 4,000 feet downwards *Careya arborea* known in Ceylon as "Patana Oak." *Phyllanthus Emblica*, *Terminalia belerica*, *T. Chebula*, and *Pterocarpus Marsupium*. These are, with few exceptions, the only trees which can stand the heavy grass fires; but in the gullies, where they are more sheltered, other species, which are less robust and which are the same as those found in forests at the same elevation, are able to live and reproduce themselves.

In the backward state of the survey of the Island, it is not yet possible to state the area of the real forests, but they cannot much exceed 5,000 square miles, although the larger area is, for the present, set aside for reservation, which includes stretches of scrub and patana enclosed within the forests. The most important belt of forest stretches from the Northern Province, mostly between the centre line of the Island and the east coast down to the Hambantota district, but important blocks are also found scattered over the rest of the Island, chiefly in the Puttalam district of the North-Western Provinces, in the Western, Southern, and Sabaragamuwa Provinces, where are still to be found, in isolated blocks, the remains of what was at one time the extensive Singha Raja Forest.

The vegetation of the forests varies especially according to rainfall and elevation, and the forests can be classed according to the following zones and sub-zones:—

Dry Zones.—Rainfall, 35 to 70 inches.	Arid Zone.—Rainfall, 35 to 50 inches.
	Dry Zone Proper.—Rainfall, 50 to 70 inches.
Intermediate Zone.—Rainfall, 70 to 80 inches.	
Wet Zone.—Rainfall, 80 inches and more.	Low Country Zone, from sea-level to 4,000 feet.
	Mountain Zone, above 4,000 feet.

The Dry Zone.—This includes about three-fifths of the Island, *viz.*, the whole of the Northern, North-Central and Eastern Provinces, the Puttalam district and portion of the Kurunegula and Chilaw districts, the North-Western Province, the northern part of the Central Province, about two-thirds of the Province of Uva, the Hambantota district of the Southern Province, and the Kolonna Korale of the Province of Sabaragaumwa. The Western Province is therefore the only one of which no portion enters in the dry zone. The *Arid Zone* occupies the North-Western end of the Island in the Puttalam, Manur and Jaffna districts, and the south-eastern in the Hambantota district. The characteristic trees and shrubs of this sub-zone are *Salvadora persica*, *Azima tetracantha*, and *Acacia eburnea* near the coast, and *Acacia planifrons* on the Island of Mannar. The woody vegetation is usually shrubby and thorny, being represented by *Carissa spinasum*, *Zizyphus Jujuba*, *Z. Œnoplia*, *Z. rugosa*, *Randia dumetorum*, *Flacourtia Ramontchi*, &c. Further from the coast the forest vegetation is composed of the same species as of the forests of the dry zone proper, but the trees are usually smaller and the undergrowth is composed mainly of *Memecylon* and of *Stenosiphonium Rusyselianum*. The Palmyra palm (*Borassus flabelliformis*) is found on sandy soil both in this sub-districts, especially in the Jaffna Peninsula.

The forests of the *Dry zone* proper are the most important to the forester, not only because they are the most extensive, but also because they contain most of the valuable timber trees. The most important of these are satin wood (*Chloroxylon Swietenia*) found on sandy soils, and attaining its best dimensions in the Puttalam and Batticaloa districts; Ebony (*Diospyros Ebenum*), which prefers rocky, undulating ground, and which, although found occasionally in the wet, low country, is most abundant in the Northern, North-Central, and North-Western Provinces, and in the Erincomalee and Matabele districts; Palu (*Mimusops hexandra*), which is found on more clayey soils from the north to the south of the Island. It attains an enormous size, and grows best, if anywhere, in the Northern Province. It is one of the iron woods of commerce. Trincomalee wood (*Berrya Ammonilla*) is found in moist but well-drained places. It extends into part of the wet zone, but the trees are found in the eastern portion of the Province of Uva. Millu (*Vitex altissima*), one of the strongest Ceylon timbers, extends also into the wet zone, where it is not uncommon; but, like the Berrya, it is a much finer tree in the dry zone, especially in the Eastern Province. The same may be said of Ranai (*Alseodaphne semecarpifolia*), although it is not so common in the wet zone as Millu. The Ebenaceæ are (apart from Ebony) represented in this zone chiefly by *D. ovalifolia*, while *D. crumenata*, *D. oocarpa*, *D. Embryopteris* and *D. montana* are also found abundant in certain localities, and *Maba buxifolia* is a very small tree which is by no means uncommon even in the arid

zone. Of the Guttiferæ we have chiefly *Garcinia spicata Calophyllum Burmanni*, and near streams or in groves, planted before the memory of man, *Mesua ferrea*. The Dipterocarps, which are so characteristic of the low country wet zone, are almost absent, being only represented by *Vatica obscura* in moist soils in the Eastern Province and by *Hopea cordifolia* along streams in southern Uva and Sabaragamuwa. Among trees which are characteristic of this zone, the most common are *Polyalthia longifolia, P. coffæoides, Cratæva Roxburghii, Pterospermum suberifolium, Sterculia fœtida, Azadirachta indica, Waulsura piscidia, Pleurostylia Whightii, Schleichera trijuga, Nephelium Longana, Odina Wodier, Cassia Fistula, C. marginata, Bauhinia tomentosa, Acacia leucophlœa, Acacia ferruginea, Gyrocarpus Jacquini, Eugenia Jambolana, Barringtonia acutangula, Adina cordifolia, Canthium didymum, Bassia longifolia, Terminalia glabra* (near streams and tanks), *Strychnos Nux vomica, Cordia Rothii, Stereospermum chelonioides, Euphorbia antiquorum, Sapium insigne, Hemicyclia sepiaria, Michodon zeylanicus, Holoptelex integrifolia*, &c. The most common shrubs are *Polyalthia Korinti, Allophylus Cobbe, Ochna squarrosa, Cassia auriculata, Alangium Lamarckii, Webera corymbosa, Randia dumetorum, Gmelina asiatica, Memecylon, Glycosmis pentaphylla* and *Dimorphocalyx glabellus*. Creepers and climbers are not so well represented as in the moister zones, the most abundant being *Hugonia Mystax, Ventilago maderaspatana*, some species of *Vitis, Derris scandens, D. sinnata*, &c. The most beautiful orchids found in this zone are, without doubt, *Saccolabium guttatum* which is found in the Eastern Province, and *Vanda Roxburghii* and *V. spathulata* which are found chiefly not far from the sea. *Vanda parviflora* and *saccolabium Wightianum* are not uncommon, while a pretty little white ground orchid, *Habenaria pterocarpa*, is found in the rocky places. The ferns of this zone are not abundant, the *Adiantum caudatum* penetrating farther into the dry districts than any other, while *Hemionitis arifolia* and *Gymnopteris quercifolia* are found in dark and moist places, while on rocks grow *Cheilanthes mysorensis, C. laxa* and the tiny *Ophioglossum lusitanicum*.

In the *Intermediate zone*, trees of both the dry and the low country moist zone are to be found, such as *Berrya Ammonilla, Nephelium Longana, Mesua ferrea, Artocarpus integrifolia, Xylopia parviflora, Albizzia stipulata, A. odoratissima, A. Lebbek*, &c., and there are a few species which, although they are found elsewhere, can be said to be characteristic; these are *Filicium decipiens, Chickrassia tabularis*, and *Melia dubia*. *Terminalia belerica* attains an extraordinary size in this zone, in which are other gigantic trees like *Tetremeles nudiflora* and *Ailanthus malabarica*. Among the shrubs *Vitex Negundo* is probably the most characteristic. Another characteristic feature of this zone is the great abundance of creepers which cover the tallest trees and render forest operations extremely difficult. Some very handsome ferns grow in this zone,

the most noticeable being *Aspidium decurrens*, *A. subtriphyllum*, *A. cicutarium*, and *Adiantum lumulatrun*. The Park country of Uva can be included in this zone. It comprises the low lands of the eastern boundary of that province; and it has a quite characteristic flora, very similar to that of the Sub-Himalayan forests. The trees which are found here are found only on the patanas and occasionally elsewhere, the most noteworthy being *Anogeissus latifolia*, *Butea frondosa*, *Terminalia Chebula*, *T. belerica*, *Zizyphus xylopyra*, *Pterocarpus Marsupium*, *Miliusa indica*, *Sterculia colorata*, *Gmelina arborea* and *Diospyros Melanoxylon*. The undergrowth is, as in the Sub-Himalayan forests, mostly grass (*Imperata arundinacea*). Near water-courses the flora is that of the ordinary dry zone type.

The *Wet zone* includes the Western Province, the Province of Sabaragamua excluding the Kolonna Korale, the Galle and Matara districts of the Southern Province, the Hill districts of the Central and Uva Provinces, and about one-half of the Kurunegula and Chilaw districts of the North-Western Province, or, in a few words, the South-Western and South-Central portions of the Island. It is the portion which receives the full force of the south-west monsoon, and includes the higher lands affected by the north-east monsoon. The rainfall usually ranges from 80 to 200 inches, but it exceeds even this in some places, and rumour has it that in Eratere, to the south-west of Adam's Peak, it actually does not fall far short of 400 inches.

The low country wet zone is the country *par excellence* of the Dipterocarpus. In the Chilaw and Kurunegula districts and in the northern portion of the Colombo district, they are represented only by *Dipterocarpus zeylanicus*, but further south and east they increase in number and species until, in many cases, they form almost the entire forest. No doubt, several new species will have to be added, and ever since the first volume of Trimen's Flora has been published, fresh discoveries have been made, a case in point being the *Stemonoporus* (*? vatica*) *Lewisi*, which was found by Mr. F. Lewis of the Forest Department at about 1,000 feet altitude above Pelmadulla. The curious almost wingless fruit of *Shorea lissophylla* was also found near the Bintota river in the Western Province. The forest of this zone, where they have been saved, are to the eye the most magnificent of the whole island, the trees often reaching a height of 100 feet to the first branch. On this account the trees are often difficult to identify, and it is probable that many are still unnamed, especially as it is not always possible to hit on new species at the time when they are in flower or fruit. The most beautiful of these forests is probably the forest of the Hinidum Patu, in the Southern Province; in it the most important Dipterocarps are *Dipterocarpus hispidus*, which in the south almost replaces *D. zeylanicus*, *D. glandulosus*, *Shorea oblongifolia*, *Doona trapezifolia*, which extends up to about 3,000 feet above sea-level, *D. cordifolia*, *D. macrophylla*, *D. congestiflora*

which produces a valuable timber, *Hopea discolor* and *Vatica affinis*.

Vatica Roxburghiana is found near streams and in lands subject to inundation in the Western Province and in Sabaragamuwa, while *Vateria acuminata*, which also loves the neighbourhood of water, is found on more rocky ground. The Dipterocarps, which are able to ascend to an elevation of 4,000 feet, are *Doona zeylanica* and *D. Gardneri*, and *Stemonoporus Gardneri* which has been found up to nearly 5,000 feet.

Among the natural orders which are also widely represented, are the Guttiferæ, the Ebenaceæ, and the Sapotaceæ. The first-named is represented chiefly by the iron wood *Mesua ferrea* and *M. Thwaitesii* by *Calophyllum spectabile*, *C. Burmanni*, which extends into the dry country, *C. bracteatum*, *C. tomentosum*, *Garcinia Cambogia*, *G. morella* (the gamboge tree), *G. terpnophylla* and *G. echmocarpa*, which latter grows up to 6,000 feet elevation. The Ebenaceæ are particularly abundant in the forests of the Adam's Peak Range, and in the Pasdun and Hinidun Korales.

Ebony, as has already been mentioned, is found in small quantities in this zone, but the most important tree of this family, which is unfortunately almost extinct, the Coromandal or Calamander wood of commerce, *Diospyros quæsita*, is still found here and there in the Pasdun Korale and in the Hinidun Pattu. Attempts have been made for several years to obtain the fruit in order to propagate the species artificially, but, although rewards have been offered, none has been obtained.

The other most noticeable trees of this family are described by Mr. F. Lewis, who has made a special study of them. In the wet forests, extending from the mountain known as the Haycock into the Sabaragamuwa Province, the most noticeable example of the Ebenaceæ are *Diospyros posia*, *D. Gardneri*, *D. insignis*, and *D. Thwaitesii*. The first of these is found up to 3,000 feet altitude, while the last, though endemic,. is restricted to the areas of high rainfall. *D. pruriens* is found very sparingly in the wet forests towards Adam's Peak, and in one place in the Western Province. A remarkable species, possibly a form of *D. Ebenum* locally known as "Kallu Kiria," occurs at the foot of the Rakwana hills, and is conspicuous by its black lace-like heart-wood, but little is known of its flowers or fruit. One of the most common, but valueless, of the order is *D. insignis*, which extends up to 2,000 feet altitude in the west of Ceylon.

The Sapotaceæ are also well represented, especially in parts of the Matora district. The most important are *Chrysophyllum Roxburghii*, *Isonandra lanceolata*, *Bassia fulva*, *B. neriifolia*, which lines the banks of rivers, *Palaquium petiolare*, *P. grande*, which extends into the mountain zone, and *Mimusops Elengi*, which is also found in the dry zone. Among the more noteworthy trees belonging to other natural orders, the following are characteristic

of this zone :—*Dillenia retusa*, *Wormia triquetra*, *Cultenia excelsa*, *Elæocarpus serratus*, *Kokoona zeylanica*, *Canarium zeylanicum*, *C. brunneum*, *Lasinthera apicalis*, *Pometia eximia*, *Campnosperma zeylanicum*, which in places forms almost pure forest, *Pericopsis Mooniana* near water-courses, *Adenantheræ pavonina*, *A. bicolar*, *Pygeum zeylanicum*, *Carallia integerrima*, *C. calycina* especially in the Galle district. *Anisophyllea zeylanica*, *Homalium zeylanicum*, *Symplocos spicata*, the three Myristicas (*M. laurifolia*, *M. Horsfieldia* and *M. Irya*). Various species of Cinnamomum and Litsæa are also abundant, and, among the Euphorbiaceæ, *Bridelia retusa*, *B. Moonii*, *Aporosa latifolia*, *A. Lindleyana*, *Ostodes zeylanica*, *Chætocarpus castanocarpus*, and *Macaranga tomentosa* are the most common; while among Urticaceæ there are numerous figs, *Artocarpus intergrifolia*, *A. nobilis*, and *Trema orientalis*. Among the shrubs which characterise this zone may be mentioned *Humboldtia laurifolia*, *Mæsa indica*, *Agrostistachys longifolia*, *A. Hookeri*, *Ixora coccinea*, *Ardisia Moonii*, &c.

Most of the palms of Ceylon are found in the wet zone. The most important by far is *Caryota urens*, the toddy and sugar of which provide many jungle people with means of existence. The Talipot palm (*Corypha umbraculifera*) found in several forests, especially in the Kurunegula district, and is noteworthy for the enormous panicle of flowers which the male tree produces, and for its leaves, which are used for umbrellas, fans, mats, &c. The *Nipa fruticans* is characteristic of brackish waters, while several species of Calamus, with the help of their hooked tendrils, climb to the summits of the highest trees.

Among the characteristic climbers may be mentioned *Coscinium fenestratum*. *Ancistrocladus Vahlii*, *Entada scandens*, *Acacia concinna*, *Strychnos cinnamomifolia*.

The most beautiful orchid of this zone is the *Dendrobium macarthia*; and among the most interesting ferns may be mentioned *Gleichenia linearis*, which covers a large extent of country, *Blechnum orientale* and *Nephrolepis exaltata* which, after the first-named, are the most common. *Cyathæa sinuata*, which is only found in the Southern Province, *C. Walkerii*, the tree fern of the low country, *Thamnopteris Nadus*, the so-called Bird's-nest fern found growing generally on trees. *Asplenium rutæfolium*, *Diplazium lanceum*, *D. Schkuhrii*, *Aspidium Thwaitesii*, *Lastræa deparioides*, *Niphobolus Gardneri*, *Pleopeltis pteropus* (Varminor). *Toenites blechnoides* (in the Matura district), *Drymoglossum heterophyllum*, *Stenochlæna palustris*, *Polybotrya appendiculata*, *Gymnopteris variabilis*, *G. contaminans*, *G. subcrenata*, *G. quercifolia*. *Acrostichum aureum* (generally not far from the sea in swampy places), *Schizæa digitata*, *Angiopteris evecta*, *Ophioglossum pendulum*, and *Helminthostachys zeylanica*, *Botrychium ducifolium* and *Oleandra musæfolia* extend into the mountain zone.

The forests of this zone are by no means so large in extent as those of the dry zone; they usually occur in isolated blocks, covering ridges and separated by stretches of chena, or by paddy fields. The most important blocks are the forests that in former days formed part of the extensive Sinharaju forest; they are situated in the Galle district of the Southern Province, the Pasdun Korale of the Western Province, and the Kukulu Korale of the Province of Sabaragamuwa. The lower forests of the Adam's Peak Range also belong to this zone.—*Tropical Agriculturist.*

The International Congress of Botany of 1901. *

(*Specially translated from the "Revue des Cultures Coloniales" for* INDIAN GARDENING AND PLANTING.)

During the first and second weeks of October last an International Congress of Botany was held at Paris. This is the second Congress of the sort in which representatives of the botanical science from nearly all the civilised countries of the world have met in France. In 1867 the first Congress was held at Paris, and it was at that Congress that the laws of botanical nomenclature still in use were elaborated. These laws, well known to botanists under the name "The Code of 1867," constitute, after the creation of the binomial denomination of plants by Linnæus, one of the most important halting-places of the botanical system, because by means of them we are enabled to fix according to invariable rules the names to apply to the innumerable vegetable species.

Knowledge of the names of plants is assuredly not the whole of the science, but it is at least the commencement. It was the glory of the Congress of 1867 to have fixed these rules of nomenclature. Unhappily, several of these laws have given rise to diverse interpretations on the part of botanists, and the understanding has not been absolutely general.

The Congress of 1900 excluded these questions of nomenclature from its discussions, the greater part of its members not being competent to decide them; but it gave expression to a desire that an international committee should be constituted to examine, if there is an opportunity to revise the laws of 1867 at the next Congress (1905).

The Congress, presided over by M. de Seynes, the eminent Director of the Mycological Society of France, was organised through the zeal of M. Perrot, of the Superior School of Pharmacy. At the invitation of the members of the committee of organisation, the greater part of the French botanists and a

* At the International Congress of Botany, held at Paris in October last, Sir William Thiselton-Dyer represented Great Britain and Mr. J. Sykes Gamble, late of the Indian Forest Service, represented India.—HON. ED.

great number of foreign scientists attended. Among the latter we may mention as having assisted at the sittings:—Sir Thiselton-Dyer, Director of the Kew Botanical Gardens; M. M. Borzi, Professor, Director of the Palermo Botanical Garden; Britton, Director of the New York Botanical Garden; Chodat, the Senior (*doyen*) of the Faculty of Sciences of Geneva; Errera, Director of the Botanical Institute of the University of Brussels; Gallardo, Delegate of the Faculty of Sciences of Buenos Ayres; J. S. Gamble, Delegate of the Government of British India; Hochrentiner, *Attaché* of the Herbals of Geneva; Huber, *Attaché* of the Museum at Para; Istwanffi, Director of the Botanical Garden of Buda Pesth; Jaczewski, Inspector of Vegetable Pathology to the Minister of Agriculture, Russia; Dr. P. Magnus, Professor of the University of Berlin; Martel, Professor of the Botanical Institute of Turin; Pfitzer, Professor of the University of Heidelberg; de Wildemann, Naturalist of the Botanical Garden of the State of Belgium, and Official Delegate of the Congo Free State.

During the sittings the attention of the members of the Congress was taken up by two orders of work: on the one part, a certain number of propositions upon which the Congressmen had to pronounce opinion; on the other, the exhibition by their authors of new botanical researches or the presentation of recent Phytographic publications.

At the first sitting the members present voted the periodicity of the International Congress of Botany. This was fixed at five years; the next Congress will be held at Vienna in 1905.

II.

With reference to Cryptoganic botany, it was decided, on the proposition of M. Mussat, Professor of the School of Agriculture of Crignon, that the unity of the international measure in micrometry should be, from the 1st January 1900, the thousandth part of a millimetre (*pl*, a unity already recognised by the greater part of the botanists of the world.

On the proposition of MM. Lutz and Guguean, of the Superior School of Pharmacy, the cryptogamists and bacteriologists of the Congress came to an understanding for the unification of the methods of culture employed for the determination of *Mucédinées* and *Levures*. Those who are conversant with the interesting fermentations which remain to be studied in tropical countries, will applaud this measure which permits the obtaining in all laboratories of research, however distant they may be, comparative results.

The consumption of comestible mushrooms as yet has spread but little in the colonies. Nevertheless, in all tropical regions, during the rainy season, grow mushrooms belonging generally to the kinds spread over Europe, and some are excellent. In the French Soudan, for instance, we have eaten with pleasure a species of *Lepcola*, very common in the native habitations. It is to be desired that a recognition of the good species should become common. Unfortunately poisonous mushrooms are equally

common, in Europe at least, with the good kinds; and their style, form, and colours are apt to be confounded with the most common *Agarics* of the kind most valuable, as being good.

On the proposition of M. Rolland, the well-known Mycologist, the Congress, considering that all the cases of poisoning by mushrooms followed by death were always occasioned, in well-established cases, by species belonging to *Amanita* or *Volvaria*, gave expression to the desire that the recognition of these mushrooms should be made common by all means, and especially by coloured pictures and representations in relief distributed in profusion among the primary schools and public offices. The perfect exactitude of these should previously be controlled by competent scientists.

The Congress, moreover, requested the botanists of the different nationalities to interest themselves with their respective Governments in order that a commission might be constituted in each country so that the desire expressed should be affective.

III.

It is well known how much questions of variability, of breed and of selection, interest colonial agriculture. Nearly everything remains to be done in that domain. Very remarkable results, obtained in Java in the cultivation of Quinine-yielding trees, when there was question of increasing the capacity of this bark in the active principles, the interesting experiment at the Trinidad Gardens with a view to increase the richness in sugar of sugar-canes, show already how fertile the way might become. Still, before launching out in these researches, it would be very useful to know well the phenomena of variability of vegetable species, and to seek to make clear the laws in accordance with which that variability is effected.

The Botanical Congress received on this subject several extremely interesting communications. M. Kiasan presented a note on "The varieties, breeds and modifications" of species in botany. M. Philippe de Vilmorin gave an account of a very curious experience of selection commenced ten years ago by his father, M. Henri de Vilmorin, and continued by himself.

Following the labours of Alphonse de Candolle on the origin of cultivated plants, Louis de Vilmorin, wishing to demonstrate that the cultivated carrot was the issue of the wild carrot, set himself to the selection of the latter by cultivation. A few years later he had obtained by successive sowings of repeated selections a plant possessing a tubercle comparable to that of the forage carrot.

It was objected that that experience might have been tainted with error, for it was possible that crossings had been produced by the transport of the pollen of cultivated carrots to the stigmata of the plants under experiment; otherwise described, the products obtained might well have been hybrids or mongrels.

Henri de Vilmorin took up the researches of his father, but in order to secure himself from the same criticisms, instead of

beginning with a species of plant possessing already tubercles like the *Daucus*, he began with a plant of which all the representatives of the species had only slender tap-roots, the *Anthriscus sylvestris*.

It was necessary first to cause the plant, ordinarily annual to become biennial, in order to permit him to constitute in the root reserves for the winter. The individuals of each generation were cultivated in rich soil, and the individuals which had not moderately vigorous roots were always suppressed. After a few generations only, M. H. de Vilmorin had obtained an *Anthriscus* with a tuberculous fusiform root, not fit for food, but of dimensions altogether comparable to those of cultivated carrots. The part of the work of M. H. de Vilmorin, where he describes the frequent recurrence of individuals which, in these cultures, return to the type which served as the point of departure, is not the least interesting.

M. Hugo de Vries, the learned Professor of Amsterdam, distinguished with the greatest clearness the phenomena of *variability* and *mutability*. All parts of his remarkable note are worth quoting. The phenomena of variability follow the law of Quetelet. Selection occurs in a determinate direction. The digression is not transmitted integrally from one generation to another. There is always retrogression, that is to say, return of one part of the descendants to the ordinary type.

"This retrogression seems to be of a very constant value, independent of the nature of the variable character, and the same for man and the animal kingdom as for plants. M. Gallon has found it equal to $\frac{2}{3}$rds, that is to say, the chosen seed-bearers or stallions do not transmit to their descendants on an average more than the third part of their amelioration. The other two parts are lost. Solely, the variability continues, and radiating around a centre already improved, the extreme variants are better than the best individuals of the preceding generation."

Acclimatisation is a question of individual variability and of selection. Variability has for its principal causes heredity and the surrounding medium. It depends greatly on nutrition.

In contradistinction to variability, mutability manifests itself by jerks, by sudden and unforeseen changes. In a plantation of single *Dahlias*, one day there appeared a *Dahlia* with a double flower; this was a phenomenon of mutability. The new character apparent is variable like all the other qualities of plants subject to the law of Quetelet and to the principle of selection. If the character which has appeared is a deviation, is noxious or monstrous, it will not be able to maintain itself in the battle for existence without the intervention of man; if, on the contrary, it is advantageous to the plant, it may persist definitely to several generations. It is thus that the little species, called refined species of Jordan, have constituted themselves to the present day, according to M. de Vries.

To resume: "Mutations are produced spontaneously, it is necessary to wait and watch for their appearance; when they have appeared, it is only necessary to isolate and cultivate them. Variations are always present, one may commence selection when and how one chooses. But it needs much perseverance and often great talent to lead them to profit."

M. Angel Gallando, in studying the variable number of stamens in an abnormal breed of *Digitalis*, was led to formulate the law following which this variability is effected. By his researches he was induced to present the actual state of a *naissant* science, "Phytostatics," a study of biology and mathematics—a science which consists of applying statistical methods to the study of variation and correlation of characters by the influence of medium, heredity, evolution of plants, etc.

If in a disposition one takes lengths corresponding to the digression of observed variation and on the "abscisses" of the length proportional to the number of cases constituted by such variation, one obtains ordinarily the normal curve of variation which is often a curve simple, symmetrical and definite in the two senses, of which the dispositions follow the laws of the development of the binomial of Newton, of which the two terms are equal.

Often enough for plants the curve is "multimodal," or with several summits (*Pleiomorphes* of Bateson). In a word, variability does not effect itself by chance, but it is subject to mathematical laws.

The three pieces of work which we have just summed up bring a new light upon the complex problem of the origin of vegetable species and horticultural breeds; they show, besides, that the processes of selection in agriculture and horticulture after having rested upon empirical methods for a long time, tend more and more to repose on precise scientific bases.

IV.

Another science, born of yesterday, is "Geographic Botany." At first limited to floristic botany, that is to say, to the statistics of the vegetable species proper to each country, it tends to become one of the most important branches of Physical Geography; "it becomes a science more and more precise and has for its principal end and aim to make known the multiple relations of vegetation with the medium, however varied it may be."

Like all sciences it needs special terms; but the greatest confusion reigns, not only in the nomenclature of the "biological unities," that is to say, the nomenclature of vegetation itself, grouped in diverse manners, following the conditions of climate, medium, etc., but also in the designation and the subordination of geographical groups, such as district, region, province, words which have all an unprecise meaning, being borrowed from political divisions variable from one country to another.

M. Flahaut, the learned professor of the University of Montpelier, to whom these questions are familiar, applied himself to reduce the confusion to order. He demands that an understanding should be come to between botanists and geographers in order that a series of phytogeographical terms of very precise signification should be fixed in accordance with the principal languages of Europe. He proposed to the Botanical Congress that a commission should be appointed, charged with the duty of elaborating that nomenclature in conjunction with the commission appointed in 1899 by the Berlin Geographical Society with the same purpose. M. Flahaut was elected unanimously to arrange the commission.

M. Flahaut's communication placed in relief the advantage presented by the employment of precise terms by explorers in order to make known the vegetation of the colonies.

The names of stations, for example, have often a confused meaning. "The meaning of a 'Savannah'," said the speaker, "such as has been adopted and vulgarised by our travellers, comprehends, it seems, various stations which ignorance of botanical geography has caused to be confounded."

We may add that as much might be said of the meaning of "Brusa." In the Soudan alone it comprehends more than five different stations.

M. Flahaut is then of opinion that the native names should be kept when their exact synonyms in the language we speak is not known. In accord with M. Engler, he is desirous that photographic albums representing the principal stations and the diverse aspects of vegetation should be constituted. These photographs would serve as standards to travellers, and would enable them to bring back more easily exact notions of the botanical geography of the countries which they had travelled through.

V.

The Committee of Organization had placed on the order of the day the Comparative study of the flora of Central Africa. This is a question of interest at the present moment. It is in effect in this direction that the chief efforts of botanical travellers have been directed for the past twenty years; French, English, German, Belgian, Portuguese, all have furnished their quota to our knowledge of the flora of these regions and, despite of all, many new species probably still remain undiscovered.

M. Engler, the eminent Director of the Berlin Botanic Garden, prevented from taking part in the work of the Congress, sent a list of the principal publications elaborated under his direction, which have contributed to make known in Germany the flora of tropical Africa:—*Planzenwelt Ost Afrikas*, *Pflanzenfamilien*, numerous notes in the *Botanische, Jahrbucher*, the *Notizblatt der K. botanischen Gartens und Museum* are the chief of these publications.

Not content with having participated in these works, besides directing them, M. Engler is undertaking the publication of a *Conspectus* of all the vegetable species of the globe, with descriptions and illustrations.

The members of the Congress sent him a token of their admiration for this colossal work, of which the first part is already deposited in the bureau (a monograph on *Musaceæ* by Wœrburg).

M. de Wildemann, the acting collaborator of M. Th. Durand in the study of the flora of the Congo Free State, then exhibited the results of researches undertaken chiefly by the Belgians in order to make known the vegetation of that part of Africa. When in 1896, M. Durand published his *Studies of the flora of the Congo Free State*, the number of species known was 1,100; it is nearly double to-day, thanks to the numerous scientific explorations which have travelled the country since 1887. Heus, Demuere, Cornet, Thonner, etc., have reaped a rich harvest.

M. Em. Laurent, Professor of the Agricultural Institute of Belgium at Gembloux, brought back precious materials from two voyages in the Congo Free State, and devoted himself principally to the agriculture of Congo and to the useful plants of the country. He has published interesting information on the culture of coffee in Congo, for which he predicts a great future. M. de Wildemann dedicates to him a new species of coffee plant which he brought back from his travels, the *Coffea Laurentii*.

M. Alf. Dewevre also attached himself to the study of the economic flora of Congo. He was the first to publish a monograph on rubber-bearing creepers of the species *Landolphia*, which furnish nearly all the rubber exported by that continent. Unhappily he died in the course of an exploration.

M. Hua gave the history of the exploration of French botanists in tropical Africa and brought forward the actual state of our knowledge of the vegetation of the French colonies of West Africa and Congo. Adamson lived several years in Senegal in the middle of last century (nineteenth); he brought back important collections gathered by him, by Jussien, by Lamark, etc.

From 1820 to 1840 Senegal was the objective of fruitful botanical explorations on the part of the gardener Richard, the chemist Lipriem, the travellers Perottet et Hendelot. In 1830 the *Flora of Senegambia* was commenced, a very important work at that time, which unfortunately remains unfinished (the first volume, containing nine parts, appeared).

These botanical researches, abandoned for nearly fifty years, were taken up again at Senegal in 1880 and extended into the interior as far as the French influence had established itself. Dr. Noury was first entrusted in 1884 with a mission to study the plants which furnished rubber. He was followed at a later period by M. Paroisse, Dr. McLand and Dr. Miguel. The most recent exploration is that of M. Chevalier which lasted eighteen months,

whose researches were carried on in particular on the Niger and in the region of Timbuctoo.

The Ivory Coast has been principally explored by the administrator Pobeguin. Dahomey is still unexplored at the present hour, from a botanical point of view; the kingdom Oware (now dependent on the British colony of Lagos) was explored by the Palisot and Beauvais in 1803.

The botanical exploration of the French Congo is more recent, and by reason of the richness of that tropical region much less advanced.

M. Edelstan Jardin, Commissary of Marine, brought back plants from the mouth of the Gaboon (1845-48). R. P. Duparquet made herbalistic studies on the Gaboon in 1862. M. Griffin de Bellay made experiment in cultivation on the banks of the Gaboon during the years 1863-64. His important collection, which at first made part of the permanent museum of the colonies, came to the museum in 1895.

Since 1880 the herbal of the Museum was enriched with plants collected by M. Leroy and MM. Jackques de Brazza. Thollon, Dybowski, H. Lecomte, Dr. Viancin, R. P. Kleine. Thollon chiefly made abundant cultivations in several regions of the French Congo. His death, which happened four years ago at Libreville, was a great loss to colonial botany.

The study of materials brought from the French colonies of tropical Africa is unfortunately less advanced than that of the very neighbouring regions, made specially in England, in Germany, and in Belgium. In French literature only the following publications can be mentioned as works of importance among those of the last 50 years:—

1. *Etudes sur la Flore du Gabon*, published by Baillon in *Adansonia*, Vol. V. to XII.

2. *Etudes sur la Flore du Senegal*, published by J. Vallot in the *Bulletin de la Société Botanique de France* in 1883 (a work abandoned after the publication of the first part).

3. *Contribution à la Flore du Congo Français*, by Frauchet, published in the *Bulletin de la Société de Histoire Naturelle d'antim*, in 1895 (only the part on Grains has appeared).

4. *Notes on the Plants of the Congo* by Mr. Pierre, published some years ago in the *Bulletin de la Société Linneenne de Paris*.

5. *Notes on the Flora of the tropical African colonies*, with a description of some new species, published by M. M. Hua five years ago in the *Bulletin de la Société Linnœenne de Paris* and in the *Bulletin du Museum*.

M. Aug. Chevalier next exhibited the results of his Travels in the Soudan from the point of view of geographical botany, and introduced the characters of the vegetation of the region of Timbuctoo showing the great analogies which it exhibits with that of Abyssinia and Nubia. As in the latter country, the Nile pours richness on the lands where its inundation extends, so the Niger carries

fertility into the valley where it takes its course. That valley, already covered with fine cultivation of sorghum and cotton, may well become one day the garden of French West Africa.

The number of vegetable species increase year by year, as the flora of tropical countries are better studied. Nearly a hundred thousand species of Phanerogamous plants are already described, and the list grows by several hundreds each year.

The general *repertoires* where the methodical enumeration of known plants are found are deficient or incomplete. The most important work of that kind is the *Index Kewensis*, published a dozen years ago, thanks to the generosity of Charles Darwin. Such a work cannot be edited, except at long intervals, and, at the time of its appearance, cannot be up to date.

On the other hand, descriptions of new plants are found in numerous scientific publications. In consequence, descriptive botanists, who have discovered new plants, find great difficulty in finding out whether such a plant has already been named and are exposed to the risk either of losing considerable time in bibliographic researches, or to create a name which may give rise to useless repetition in the science, if the species is not really new.

In order to remedy these inconveniences, M. Hua proposes the creation of an international periodical organ for the publication of new names in the science of Botany.

"This publicity," says the author of the project, "would benefit at the same time the authors of novelties who would see their work made known to the entire world, as soon as it appeared, and to workers interested in recognising these novelties, who would be rapidly informed of their publication."

The Congress was favourably disposed towards the proposition of M. Hua, and was unanimous for the organising of such a publication.

This vote terminated the series of work in the general orders of the Congress, and before separating the members prayed the Committee of Organisation to remain in office until the next meeting at Vienna in 1905.

(This *resumé* of the work of the Congress is from the pen of Aug. Chevalier.)

Political Famine.

A Plea for Forest Conservation.

It is a curious thing that, while famine recurs periodically in India, and each successive instance of it covers a wider area, and afflicts a larger number of victims, symptoms are not wanting of the establishment of similar conditions elsewhere under our rule. Thus Lord Cromer recently had to report, in his optimistic account of the condition of Egypt, that the Nile flood, on which the prosperity of the country so largely depends, has failed beyond all former precedent. But he assumes that this ominous fact need

not be characterised in any stronger terms than those of "temporary inconvenience." It would be reassuring if one could share this optimistic view. As Lord Rosebery once said, "The Nile is Egypt, and Egypt is the Nile." If the result and necessary consequence of the Pax Britannica in Egypt is the drying up of the Nile, then the remedy of peace is worse than the disease of anarchy. Peaceful starvation has not much to recommend it, in the long run, above turbulent, if fluctuating plenty.

We have recognised the existence of the serious danger involved in a dwindling Nile, and the great dam which we are constructing at Assouan is a proof of the recognition. This great work is a conscientious attempt to meet a great danger. But it only deals with a symptom, and does not attempt to cure the disease. It is obvious that if the Nile flood reached the levels registered in Pharaonic times on the rocks at Silsilis, there would be no need for the dam. Ample supplies of water would reach every part of the delta, if the torrents which filled Old Nile again brimmed from bank to bank. But the one fact which comforts us is this: That the supply is steadily dwindling, and that, if the causes of the desiccation are not ascertained and removed, some day the river will follow the example of rivers further east, will flow below the surface of the ground, and will no longer fertilise the country the population of which has destroyed its sources. This has already happened in the Sahara, where the courses of the rivers are only to be seen in an occasional oasis, where the unseen current is near enough to the surface to nourish a few palms and thorns, and the scanty herbage beneath them. Even so late as Roman times, North Africa was the granary of Rome; showing that the moisture and fertility of the country were in excess of what may be found there now.

The Congo, with its bed as yet protected by dense rain-condensing forests, recalls the conditions which once used to fill the Nile. Vegetation there has baffled the natives with their ineffective tools, and the river is probably as full to-day as ever it has been since man lived on its banks. But this condition of things is nearly at an end. The stone age is over, and tons of axes and hatchets of iron and steel are pouring into the country. The demand for rubber, for timber, for fuel for railways and river seamboats, and for the endless wants of this iron age, is consuming the forests. At present they seem inexhaustible, and merely a bar to the spread of civilisation. The Belgian rulers of the Congo Free State are in the position of a spendthrift heir, with a vast heritage before them, to waste and do what they like with, in the primeval forest which covers the land, and shields it from the rays of the sun. Sooner or later, the present system of piracy and plunder must give way to agriculture, and the enormous profits to be secured by working virgin soil, enriched with the fallen leaves and trees of thousands of years of decay, will attract millions of prosperous cultivators. As long as the balance is

preserved between clearings and forest, and the precipitation of enough rain from the clouds continues, the people will do well. Then the greed for arable land will, as in India, encroach on the forest minimum, and scarcity, due to the "temporary inconvenience" of a diminished rainfall, will set people wondering why the rain no longer falls in due season. But the denudation, which is the cause of tropical drought will, if permitted to go on, be followed in orderly sequence by the repulsion of the rain clouds. Then the phenomena of alternate drought and flood will take the place of seasonable moisture, and our successors in Africa will find themselves at the same pass as we find ourselves in India, with famine sweeping off a redundant population at one time, and with a deficiency of labour at others.

Famines in India are by some attributed to bad government—to the "tribute," so called, of the home charges unjustly wrung from the Indian Exchequer—to improvident marriages, to a restricted currency, and such economic causes. But it is obvious that these and similar factors cannot be said to cause famine. They only intensify its evils. The one sole cause of famine is the want of rain. If the monsoon falls in due season, the crops are sure and food is locally procurable. But if the rains fail, or, falling, rushes off in great floods, leaving the land dry, a prey to the sun's rays, then drought kills the crops, and produces famine. This can be mitigated by the importation of food; but the only cure is the re-establishment of the periodical rainfall. And this is only possible by the conservation of forest.

The best thing that could happen for us in Egypt now, would be the discovery of a productive coalfield, within easy reach of the Nile. The use of coal as fuel for railways, river steamers, machinery, and for domestic purposes, would give us a respite. It would stay the suicidal destruction of the tree life, which is drying up the sources of the Nile. If the Egyptian Administration could establish a fresh department on an adequate scale, and afforest the waste places left by the Mahdi, both along the Nile and along its affluents, it would be laying the foundations of physical well-being deeply and soundly. But if the lesson is not learnt, if the waste of timber, which is the unfortunate condition of too much of the earth's surface, is allowed to go on unchecked, then our successors will find themselves with beggared provinces on their hands, and the Pax Britannica will brood over depopulated deserts. The French, like the Germans, have a scientific appreciation of the facts, and we may hope, when French Africa has settled down, that a process of reclamation by scientific forestry will be applied to the Sahara itself. The task is not impossible. Then rivers, long lost to sight, would rise to the surface, and bring fertility to what now appears to be hopeless desert. It would be a reflection on our methods if we permitted Egypt to be gradually converted into desert, while the French restored the Sahara to productiveness.—*Birmingham Daily Post.*

Osier or Willow Culture for India and Ceylon.

The cultivation of Osiers, *i.e.*, species and varieties of willow which are specially adapted for basket making, should prove successful, if not a profitable industry, in the hill districts of India and Ceylon. Considering the importance of this industry in Europe, more especially in France and Germany, where it gives employment to many thousands of persons, it is not surprising to hear of fresh interest being manifested in its development in America and Australia. The U. S. Department of Agriculture, Division of Forestry, has lately issued a pamphlet on the subject, dealing with the cultivation and use of Osiers, together with notes on their geographical distribution and characteristics.

Willow-ware should win popularity in India, where the best of timbers are affected by the climate, becoming expanded in wet, and contracted in dry weather. Considering also the universal habit of the natives in carrying everything on their heads which, with even field and factory labourers, is practically the only mode of transport, and the immense number of baskets which must consequently be used in the various agricultural and other industries, light willow baskets, should, in certain districts, find a ready demand. Though bamboo or rattan wares, perhaps, answer the purpose equally well, these are not everywhere easily procurable, and in some localities their cost is probably more than what the willow article could be supplied for. Besides transport baskets, tea baskets, manure baskets, etc., the flexible willow shoots are fitted for a great variety of useful and ornamental articles of wicker work, the making of which should prove a favourable and remunerative occupation for many natives.

Willow cultivation involves but little care or expense. A marshy soil by the side of streams or rivers or round lagoons, such as is unfit for other agricultural pursuits, is the most suitable. No manuring is required, and a renewal of plants is seldom necessary. Propagation is usually effected by cuttings, which should be about 15 inches long, and planted in lines 2 feet apart. A crop may be expected in the second or third year. Planted on sloping, swampy land, willows should also save the purpose of binding the soil and preventing it being washed away in heavy rains.

Among the best willows for basket-making are *Salix amygdalina*, *S. viminalis*, *S. purpurea*, *S. lucida* and *S. Caprea*.—*Indian Gardening.*

Conifers as Rain Gauges.

According to a recent number of the *Revue Hoerticol*, M. Felix Sahut has lately communicated to the Congress des Sociétés Savantes observations respecting certain plants that act as registering rain gauges. "Mention has already been made of the influence of certain more or less severe droughts in the French

Mediterranean upon Pinus Laricio of Corsica, and Cephalonian Fir. The lengthening of the branches of these two species is always proportionate to the quantity of rain falling during those months of the year when it is most profitable to them. Co-efficients have been established indicating what the degree is for each month of the year. The co-efficients enable the relationship that exists between the amount of rain fallen, and the greater or less intensity of the vegetation which it has encouraged to be determined. It is shown that, under these conditions, it is possible to judge approximately the quantity of rain which has fallen by measuring exactly the length of the leader, or of the branch produced yearly on these species of pine, and if the estimate is not absolutely proportionate to the quantity of rain registered by the raingauge, it closely approaches to it; and a still closer estimation may be made by taking into account the relative value of the results produced by rain in the several months of the year. It is, therefore, possible, to a certain extent, to use plants specially selected for this purpose as actual registering rain gauges."—*Revue Horticole.*

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Wood Circular.

February 4th, 1901.

EAST INDIAN TEAK.—The deliveries for the month amount to 815 loads in comparison with 518 loads in January 1900, a welcome increase to start the new year with. The market altogether has looked a little brighter, and sales have been at some slight increase on the autumn rates. The stock in London remains at about previous level, but being freshened by some recent arrivals, is more attractive than of late. The demand for cargoes for arrival might be better, the high level of prices making buyers nervous of committing themselves far ahead.

ROSEWOOD—EAST INDIA.—The demand shows no improvement, and sales are very difficult to effect.

SATINWOOD—EAST INDIA.—Shipments are arriving too freely, but moderate sales have been made at very fair prices.

EBONY—EAST INDIA—Is wanted, and would bring good prices.

PRICE CURRENT.

Indian teak,	per load	...	£10-10*s.*	to £ 16-10*s.*
Rosewood	,, ton	...	£5	,, £9.
Satinwood	,, square foot	...	6*d.*	,, 12*d.*
Ebony	,, ton	...	£9	,, £13.

Denny, Mott and Dickson's Wood Market Report.

London, 4th February 1901.

TEAK.—The landings in the Docks in London during January consisted of 404 loads of logs and 401 loads of planks and scantlings, or a total of 805 loads, as against 893 loads for the corresponding month of last year. The deliveries into consumption were 337 loads of logs and 442 loads of planks and scantlings, together 779 loads, as against 547 loads in January 1900.

The Dock stocks at date analyse as follows :—

7,903	loads of logs as against		6,485	loads at the same date last year.		
4,959	„ planks	„	2,737	„	„	„
—	„ blocks	„	8	„	„	„
Total 12,862	loads		9,227	loads	„	„ „

The market has been very quiet as shown by the above figures, but with exceptionally small floating supplies, and the continued high rates for timber in Burma and Bangkok, prices continue to be firmly maintained, and there is nothing to add to our very full examination of the position on 1st January last.

Market Rates for Products.

Tropical Agriculturist, February 1901.

Cardamoms	...	... per lb.	2*s.* 3*d.* to 2*s.* 4*d.*
Croton seeds	...	... „ cwt.	30*s.* to 40*s.*
Cutch	...	... „ „	23*s.* to 35*s.*
Gum Arabic	...	... „ „	23*s.* to 35*s.*
Do. Kino	...	... „ „	90*s.* to 107*s.* 6*d.*
India-rubber,	Assam	... „ lb.	2*s.* 10½*d.* to 3*s.* 0¼*d.*
Do.	Burma	... „ „	2*s.* 3*d.* to 3*s.* 3*d.*
Myrabolams,	Madras	... „ cwt.	6*s.* to 7*s.*
Do.	Bombay	... „ „	5*s.* 6*d.* to 6*s.*
Do.	Jubbulpore	... „ „	4*s.* 3*d.* to 7*s.*
Do.	Bengal	... „ „	4*s.* 6*d.* to 6*s.*
Nux Vomica	...	... „ „	7*s.* to 10*s.*
Oil. Lemon-grass	...	... „ lb.	3*d.*
Sandalwood Logs	...	... „ ton	£20 to £50.
Do. Chips	...	... „ „	£4 to £8.
Sapanwood	...	... „ „	£5 to £5 10*s.*
Seedlac	...	... „ cwt.	51*s.* 6*d.* to 59*s.* 6*d.*
Tamarinds,	Calcutta	... „ „	15*s.* to 16*s.*
Do.	Madras ...	... „ „	7*s.* 6*d.* to 11*s.*

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The Late Baden Henry Baden-Powell, C.I.E.

"We regret to record in our pages the death of Mr. Baden Henry Baden-Powell, C.I.E., which took place on the 2nd January, at his residence, Furley's Lodge, Oxford. Mr. Baden-Powell was born in 1841, and was the eldest son of the late Oxford Professor Baden-Powell, and the half-brother of General Baden-Powell, of Mafeking fame. He was educated at St. Paul's School, and in 1861, at the age of 20, entered the Bengal Civil Service, of which he continued a member until 1889. During the first eleven years of his service he filled various appointments, such as Assistant Commissioner, Judge of the Small Cause Court, officiating for a while as Postmaster-General of the Punjab, and organising the Lahore Economic Museum. In 1870 he joined the Indian Forest Department as Conservator of Forests in the Punjab; from 1872 to 1874 he was acting as Inspector-General of Forests to the Government of India; he remained in the Department, with short interruptions, until 1881, when he was appointed successively a Divisional Judge, Commissioner of a Division, and finally a Judge of the Chief Court of the Punjab.

"Mr. Baden-Powell, while in charge of the Lahore Museum, published a valuable book on the Economic Products of the Punjab. Later on, when a member of the Forest Department, he wrote his book entitled "Jurisprudence for Forest Officers," a second edition of which appeared under the title of "Forest Law." During that time he also published his "Manual of the Land-Tenures and Land-Revenue Systems of British India;" a second and considerably enlarged edition appeared in 1892 as "The Land-Systems of British India," a monumental work in three volumes. Subsequently he published a primer on the same subject, specially designed for the use of Indian Forest Officers, and other works. He also wrote on religious and other subjects.

"The Indian Forest Department is under a great debt of gratitude to Mr. Baden-Powell, who edited and helped to pass the Indian Forest Laws through the Legislative Council.

"In conjunction with the late Dr. Leitner, he was largely concerned in the establishment of the Oriental University at Lahore.

"Since his retirement from India he lived in Oxford. In 1894 the University conferred upon him an honorary M.A. degree, and he became at the same time a member of Worcester College. From 1891 to 1896 Mr. Baden-Powell came to Coopers Hill once a week to lecture to the Foresters on Law. He was a most interesting and accomplished lecturer, who carried the students with him to such a degree that they actually volunteered to write essays on forest-law between every two lectures.

"Mr. Baden-Powell was a man of the highest integrity, imbued with deep religious feeling, and of great benevolence. He spent his money unsparingly on any good purpose which came under his observation. Of late years he was active with the Dean of Christ Church and others in establishing and maintaining the Oxford Eye Hospital, of which he was, up to the last, the valued Honorary Secretary."

We extract the above obituary notice from the *Coopers Hill Magazine*, and would add our own testimony to the loss which the Department has sustained in the decease of Mr. Baden-Powell. He was one of the originators of the *Indian Forester*, and throughout his career in India remained one of our most valued and esteemed contributors. His knowledge of Forest Jurisprudence was unique, and the Department will long deplore his death.

Forests and Famine in Bombay.

I.

Results of the experiment of bringing cattle from Guzerath to graze in the open and closed forests of the Thana district during the famine of 1899-1900.

By G. M. Ryan, *I.F.S.*

In all about 16,208 cattle were imported into the Thana district from Guzerath, 15,208 head having been brought mainly by private subscription or with the aid of Government advances under Government supervision, and the remainder entirely by private owners at their own expense.

A certain number of cattle also came to graze in the eastern portion of the district from the Nasik and Poona districts; but about these particulars are not given here.

Fifteen thousand head came to Palghar and Dahanu stations, and were drafted thence to forest areas in the Dahanu, Wada, and Bhiwndy talukas of the Thana district, mainly in the Central Thana Forest Division; of these, 11,000 went to Palghar, and 4,000 to Dahanu stations; 10,267 arrived at the grazing areas

30 miles from Palghar Station; the rest died on their way owing to their weak condition, or strayed because their attendants had deserted them.

Six thousand six hundred and four of the above were from Broach (146 miles), 2,512 from Ahmedabad (252 miles), 764 from Panch Mahals (261 miles), and 387 from Kaira (230 miles). The Broach cattle were chiefly bullocks, in charge of owners or servants. From other districts came cows and calves, in charge of Rabarees. Some buffaloes also were sent from every district.

The Broach cattle on arrival were in good condition; the others mostly in poor condition. The death-rate was large from the beginning. Up to the week ending 5th November 1899, 117 died; by the week ending 12th November, 165; by 24th November, when all the 10,267 had arrived at the grazing areas, there were 379 deaths. Many of the deaths resulted from sore feet and from animals eating more than they could digest. At the end of November rinderpest appeared in one area. It was contracted from the village cattle. Disease was not imported from Guzerath. In spite of all efforts, such as segregation, &c., the disease continued up to the end of March, by which time 3,900 cattle had died. The disease appeared or increased in one area as it decreased or disappeared in another. Foot and mouth disease was also rife, and was aggravated by the hilly nature of the ground to which the cattle were unaccustomed.

Unaffected cattle kept fit till the beginning of the hot weather, the Broach cattle remaining best of all. After the hot weather set in, though disease had disappeared, mortality continued; the Broach cattle lost their condition and appeared very poor.

The Panch Mahals cattle fared best through the hot weather.

The mortality averaged about 200 a week steadily, though rinderpest disappeared by the end of March. Finally, 1,202 head were sent back by rail: 541 to Ahmedabad, 323 to Broach, 20 to Kaira, and 296 to the Panch Mahals. But 3,964 had already been returned to the owners who came for them. These were mostly Broach cattle. Therefore, of the 10,267 head, 5,166 were returned. A good many of the returned cattle probably died on their return as they left in bad condition. Of the 4,000 head sent to Dahanu, 1,500 were finally returned.

Water and grazing were sufficient everywhere for the animals in the Thana district. Of 1,000 head which came from the Ahmedabad district to graze in Thana independently of Government aid, not one animal is said to have returned.

I am indebted to Mr. Monteath, *I.C.S.*, for the above particulars. He was actually in charge of the cattle all through the famine, and was placed on special duty for the purpose, having under him Ranger Bhadbhade of Wada, a smart and intelligent Range Forest Officer, who received his training at the Poona College of Science.

The cattle were brought down as the result of a Conference in September 1899 at Palghar, in the Thana district, at which the Commissioner, the Hon'ble Mr. Lely, Mr. Mollison, the Deputy Director of Agriculture, Mr. Metha, *M.R.A.C.*, Mr. Wood, Collector of Thana, Mr. Dodgson, Deputy Conservator, Central Thana, and myself were present.

It was felt at the time that the experiment was risky, but it was thought best to undertake it to settle once and for all the vexed question whether imported cattle would live in Thana. Apparently if foot and mouth disease and rinderpest had not broken out (both these diseases were contracted, according to Mr. Monteath, in the district), the mortality among the animals might not have been so high. The change of air and conditions of soil *and water*, especially the latter, had a great deal probably to do with the high mortality among the animals. Many natives who come down from the Deccan and Guzerath get ill immediately with fever* and often die when they first arrive in the Konkan. Similarly it is thought animals must suffer.† Many, however, believe that the inferior fodder was the important factor in increasing the mortality. They say it was palpable from the beginning that Guzerath cattle would not thrive in Thana for the same reason that Yorkshire sheep do not thrive when taken south to graze, and so on. But Thana grass has for a long time had an evil reputation, and Commissariat Officers in 1897, during the famine of that year, at first declined to accept it for their Government animals, because it was alleged to be unfit for fodder. Necessity, however, made them consent to its use, and since then the previously evil reputation of the grass has been considerably modified. It is now and has been for many years very largely exported to Bombay by merchants, and many of the forests are commencing to be robbed in consequence of this demand. A large quantity, both green and dry, was sent to Guzerath in 1899-1900, and kept cattle alive in the cattle camps that were established there as well as in villages, and further large quantities were sent to the Deccan both for Government horses and cattle and for private animals.

* Abdul Rasool, a very fine man physically, and an excellent Ranger when I knew him (he is now Extra-Assistant), when he came down from the unhealthy part of the Khandeish district to assist in the famine-fodder operations in the western part of the Thana district, was rendered *hors de combat* almost immediately after his arrival with fever and had to be sent back to the Deccan. He soon recovered and rendered Mr. Pearson, the Divisional Forest Officer, West Khandeish, great help in the grass operations which had ultimately to be started there.

† In seasons of deficient rainfall, in the Deccan, cattle from Poona and Nasik are imported by private owners into the eastern hilly parts of the district to graze in the forest; but these are not known to suffer, inasmuch as the climatic change is not marked. The eastern portions of the district, moreover, during the greater part of the year are known to be healthier than the western and central parts of Thana. Annually many hundreds of bullocks are imported by Wanzaras now into the eastern talukas to supply the demand for the carriage of firewood and charcoal from some of the coupes, and I have repeatedly observed that these animals keep in excellent condition on Thana fodder.

In spite of all efforts to save the Guzerath cattle, however, which are a very fine breed of animals, generally about 70 per cent. of them are alleged to have succumbed during the famine. The cattle camps are said to have been a success, and would have been augmented but for the want of sufficient fodder. What to do during the next famine if one unfortunately occurs is, therefore, a problem which the Famine Commission is endeavouring to solve. Some authorities suggest storing grass in the Thana district in *hermetically sealed* sheds to meet a future calamity, and they have, it is believed, seriously recommended this measure. The only practical remedy apparently is to import three or four times the quantity of grass into the famine-stricken areas, and this can be done by increasing the price within which grass is to be landed in the famine area. During the famine the Bombay Government sanctioned a charge of Rs.13 per 1,000lbs. all round as the cost of grass delivered at railway stations in the famine area. Mr. Wroughton, who organized all the arrangements, thinks that the actual cost will probably work out to something less than this.

In a future famine, therefore, the Departmental operations could be considerably extended by increasing the sanctioned rate of supply, say, to Rs.15 or Rs.20 per 1,000lbs., and by utilizing in addition some of the Cotton Presses in Bombay to press grass. The latter was done during the Egyptian war of 1885, when I superintended the pressing of about 4,500 tons of grass in the various presses there, and the work of pressing into bales was both swiftly and excellently performed without much supervision.

The Thana District Forests, both open and closed, could supply, it is estimated, about three or four times the quantity of grass *for export* * that was obtained from them during 1889-1900, and probably other districts could double their quantities, which means that instead of losing 70 per cent., the lives of that number of animals would probably be saved. Departmental operations could be conducted in the interior parts of the district by means of hand-presses, leaving the areas near the railway line for feeding the stream-presses in Bombay with loose grass. The latter arrangement would be expensive no doubt, but if the lives of animals are to be saved, the extra cost must be borne. This and well irrigation in Guzerath are the only means, it is thought, through which the larger proportion of the agricultural stock of Guzerath and the Deccan can be kept alive during a future famine. Perhaps other Forest Officers in the Bombay Presidency

* The total quantity of grass exported for famine purposes from Thana in 1899-1900 was 10,333 tons; a large quantity (5,320 tons) was sent to Guzerath, also from the Khandeish (Deccan) district, and a further large quantity was imported into Guzerath and the Deccan from the Central Provinces. What the latter quantity is I do do not know. The Southern Forest Circle, Bombay, supplied about 2,666 tons. The total exports from the Bombay Forests to the famine areas was therefore about 18,319 tons.

or such experienced men as Messrs. Bagshaw and Fernandez, outside the presidency, might offer their opinions on a subject which is of paramount importance for Guzerath especially. In connection with the scheme of export of fodder on a large scale, a number of metalled feeder-roads with tramways might be laid down in Thana for tapping the interior parts of the district. A regular working-plan would have to be adopted for the construction of such roads, the total length to be completed, say, in thirty or forty years. These roads would benefit the Thana district immensely, enhance the value of the material in the existing coupes, and, in addition, a large forest area (Mokhada) would be tapped, which has always been and may always probably remain otherwise unexploited, because of its inaccessibility. This scheme, if considered only from a famine or forest point of view, may seem Utopian, and because of its cost practically impossible of completion, but when considered in conjunction with more immediate forest interests as explained above is well worthy the attention of the Hon'ble Mr. Nicholson, who, as a member of the Famine Commission, has taken such a deep interest in the cattle question. Internal communication in the Thana district, away from a few of the main metalled roads, is in a lamentably unsatisfactory state. It takes three or four days for carts laden with forest materials to travel 12 miles, in most instances along some of the important highways, and when hundreds of carts laden some with charcoal and others with firewood and timber, have to travel along these thoroughfares now one can imagine how dilatory would be the progress of any future famine-fodder operations if conducted on a large scale in the interior of the district. A system of well laid out roads, with tramways to be added later, must, therefore, it is thought, run *pari passu* with any large scheme for saving the lives of cattle in Guzerath and the Deccan in a future famine. In 1899-1900, all or nearly all the grass exported from Thana to Guzerath and the Deccan was brought by head-loads to the grass depôts at railway stations to be baled. As Thana is such a vast fodder-bearing tract, and as the rainfall, even if deficient, is not likely to affect its grass-supply (as was proved in the past famine year), *permanent plans* for carrying out extensive famine-fodder operations might safely be laid down for the future as suggested. I was questioned by the Famine Commission about this matter, which is my excuse for taking it up.

II.

Notes on the use of the Seed of the Bamboo (Dendrocalamus strictus) as Flour.

By W. A. Wallinger, *Bo. F. S.*

It would not appear to be very generally known that the seed of the bamboo is not only fit for consumption by man, but

that, in this corner of India, it is being collected and so consumed to an extent sufficient to ameliorate a very pronounced local scarcity. The *Dictionary of Economic Products, Vol. I.*, contains interesting information on the topic, and the fact that the seed is edible is also referred to in *Agricultural Ledger, No.* 17 *of* 1900. But the following remarks may, nevertheless, be of some general interest :—

Territorial extent of the seeding.

How far outside the Dharwar district the seeding is taking place I am unable to say. It undoubtedly extends some distance into Kanara. Here two talukas are alone involved. In them it is rarely possible to meet with a single culm not undergoing the process. The approximate area may be stated at 75,000 acres, extending 50 miles from north to south, along belts 3 to 8 miles broad.

Effect of the seeding on the population.

It is generally admitted in this area that but for this prolific seeding, owing to the great scantiness of the rainfall during the past two seasons, the poorer classes would have been hard-pressed. The fact that there has been an unprecedented deficiency in the rainfall over a tract of country which is almost invariably well favoured in this respect, leading in its turn to a sudden seeding of the bamboo, is significant and of interest; but with this aspect of the question I am not at present concerned, except in so far as to incidentally draw attention to the old Brahmin saying: "When the bamboo produces sustenance we must look to Heaven for food." The purely local inhabitants are not the only ones who are taking advantage of the present situation. The news has spread far and wide into territories where forests do not exist, and the influx of people represents a serious factor in the preservation of the reserves from fire. It is a common thing to see cart-loads of bamboo grain plying along our roads where but a short while back grain in any form was at a premium. As it seemed doubtful whether any attempt to place a check on this wholesale removal would succeed on the one hand, or be desirable on the other, no action is being taken to arrest it.

Method of collection.

When the seed is ripe, a very slight shaking of the already dry stems is sufficient to induce it to fall plentifully. The ground is either cleared by firing, if the likelihood of being detected is slight; or the seed is collected in cloths spread on the ground to receive it. A very considerable number of the minute pericarps that drop, however, contain no grain; and I have noticed men and women removing these in the reserves by the well-known process of holding baskets over their heads and then pouring the grain slowly on to the ground and allowing the breeze to do the rest. Some bamboo clumps are abandoned altogether as affording insufficient seed for the labour involved.

Subsequent process.

The collected seed on being brought home is pounded in order to remove the husks. The accompanying specimens may be of value for educational purposes at the Forest School. The original seed is marked No. 1. No. 2 is the husk removed after beating; and No. 3 the seed after this primary process. No. 3 is slightly damped and roughly ground, resulting in the sample No. 4 and the bran No. 5. Finally the coarsely-ground seed (No. 4) is re-ground and results in the cooking flour No. 6.

Cooking.

This flour is either mixed with rice or "jowari," or eaten by itself, prepared into the ordinary flat cakes of the country, termed "chapatis." It is said by the natives to be sufficiently nutritious; and the mere fact that it is so largely collected shows it so to be. Nevertheless it would be of interest to ascertain what percentage of proteids the flour contains, and where it would stand in the scale as a nourishing form of diet.

General.

It has been found that two women can collect about 8lbs. of the seed in the day, which, after the removal of the husk and bran, is reduced to 6lbs. This quantity will make 30 cakes 7″ in diameter, or sufficient, it is said, to feed an able-bodied man for six days.

It is interesting to note that the flour is being bartered in local markets by the poor for "chillies" and other condiments; but there is, so far, no recognized market rate.

My horse, bullocks, goats and sheep refuse to touch the bran referred to, even when mixed with their ordinary grain. The seed is eaten raw under protest, but when cooked is more appreciated.

Swamp Forests in Dehra Dun, N.-W. P.

By Upendranath Kanjilal, Assam Forest Service.

In the district of Dehra Dun there are three detached bits of swamp forest possessing great botanical interest.

The most important of these is the one near Mothronwala within three miles of Dehra Dun, which is the chief town of the district, and stands at an elevation of about 1,900 feet. There appears to be a clay-bed cropping up here, which extends northward all the way to the foot of the Himalayas, underlying the immense mass of gravel deposit that forms the northern flank of Dun valley. The tropical rainfall of nearly a hundred inches in the year, which infiltrates through the gravel extending over perhaps 40 square miles, oozes out here in a series of deep but narrow ravines, giving rise to a number of streams, which uniting into a few main channels pour into the Suswa, a river which is all but dry above the swamp. Where two or more of such streams meet, the bed widens to some extent, and the increased sluggishness of the current causes a deposit of earthy matter to be formed

which has given rise to low islands only a few inches above the level of the water even during the driest season.

In their upper portions the ravines are deep and narrow, alternating with equally narrow spurs cut out of the original gravel deposits. On the tops of these spurs and even some distance down their sides, there is sál with almost all its usual companions. Consequently, to one stationed but a few yards from the edge of the forest on the flat fields or grass-lands that surround it, it has all the appearance of a typical sál forest. But as one draws nearer one sees through the straight trunks of the sál the deep-green foliage of the Ban oak (*Quercus incana*), this tree finding in the cold clayey soil and moist damp shade of the narrow ravines factors of locality somewhat similar to those prevailing in its proper habitat, which is a zone between 3,000 and 8,000 feet in the hills. As if to keep company with the oak, two climbers characteristic of the above zone, *viz.*, the ivy (*Hedera Helix*) and *Ficus scandens* also occur, very often clothing its grey trunks with their evergreen verdure. Lower down in the ravines are found quite a number of most interesting species which only occur in marshy localities or at higher elevations, the chief among these being *Cocculus laurifolius*, *Acronychia laurifolia*, *Olea glandulifera*, *Cyclostemon assamicus*, *Phœbe lanceolata*, *Machilus odoratissima*, *Machilus Gamblei*, *Litsæa lanuginosa*, *Celtis australis*, *Toddalia aculeata* and *Glycomis pentaphylla*; while in the beds and along the edges of the streams, as also in the low islands, prevail *Bischofia javanica*, *Cudrania javanensis*, *Salix tetrasperma*, *Acer oblongum*, *Glochidion lanceolarium*, *Ficus glaberrima*, *Citrus medica*, *Elæagnus latifolia*, *Trachelospermum fragrans*, *Callicarpa macrophylla*, etc., interrupted only by canebrakes of *Calamus tenuis* where the current is perceptible, or by banks of *Typha elephantina* and *Typha Laxmanni* where the water is stagnant. The water-edge is lined with various kinds of weed, chief among them being Ferns, Sedges and Tyhpas.

The next swamp worthy of note is between the Dehra-Hardwar Road and the Song river, at Nakraunda, where it gives rise to a large tributary of that river. This seems to owe its origin mainly to obstruction of drainage by the Nagsidh hill, but possibly there is also an outcrop of clay-bed similar to the one at Mothronwala. With the exception of *Machilus odoratissima*, *Litsæa lanuginosa*, *Olea glandulifera*, *Acronychia laurifolia*, and *Quercus incana*, all the other species mentioned above as occurring in Mothronwala are also found here. But as a set-off the following are seen which are unknown in that swamp, *viz.*, *Carallia integerrima*, *Marlea begoniæfolia*, *Berchemia floribunda* and *Trema orientalis*.

The last noteworthy swamp or group of swamps is that near Khairi, at an elevation of about 1,200 feet. In respect of grandeur of forest, growth this excels by far the other two swampy areas. On the outskirts is a dense lofty evergreen belt composed of

Diospyros Embryopteris, *Putranjiva Roxburghii*, *Holoptelea integrifolia*, *Ficus bengalensis*, *Ficus glomerata*, etc., with as dense an undergrowth of *Murraya exotica*, *Murraya Kœnigii*, *Adhatoda vasica* and *Glycosmis pentaphylla*; while inside the swamps, which are open and sunny, is the usual canebrake in which, however, wild plantain, *Pterospermum acerifolium*, *Bauhinia Vahlii*, and occasionally sál and *Alstonia scholaris* are inextricably mixed.

Rotation and Possibility in Selection Forests. *

By F. Gleadow, *I.F.S.*, *F.R.M.S.*

With reference to my article on the above subject in the March Number of the *Indian Forester*, Dr. Schlich has written to the *Revue des Eaux et Forêts* a paper which may be translated as follows:—

"Under the title '*Une catachrèse forestière*,' M. Broilliard has published an article in the *Revue des Eaux et Forêts* for October 1900. In this article, M. Broilliard once again recommends the possibility by area in Selection forests, and attempts to show the inutility, or worse, of using the term *rotation*. On the first point I am entirely in accord with M. Broilliard. My experience of more than forty years has shown me that whenever the possibility is fixed by volume, the result has been either that—

"(1) Conscientious and prudent Forest Officers always undervalue the yield for fear of exceeding it, or

"(2) Those who are not too conscientious habitually exceed it.

"In both cases the result is loss. Hence the sole way of assuring a durable working-plan for Selection forests is to adopt a possibility by area.

"On the second point M. Broilliard appears to go too far. Without doubt the different annual fellings differ more or less in outturn, but in every case the object should be to reduce them all to the normal condition, so as to assure, as far as possible, a sustained yield.

"Thus the fellings in open crops must be made with a light hand, and with a heavy one when the crop is heavy. But this is not all. Supposing that we have to deal with a forest which yields perfectly regular annual fellings, the question will nevertheless always arise, "How much to cut?"

"In the first place, the laws of sylviculture must decide, and they prescribe:

"(1) The cutting of all mature trees that do not show a satisfactory rate of growth.

"(2) The cutting of all sickly or deformed trees that can be spared from the crop.

"(3) The cutting of all young trees whose room is culturally preferable to their company.

* Vide *Indian Forester*, Vol. XXVII., No. 3, March 1901, page 121.

"Now it may happen that a felling made in accordance with these prescriptions would be so severe that there would be nothing fit to remove on the next return of the fellings after a certain number of years. M. Broilliard himself, in his allusion to the forest of Pout-à-Mousson, has shown how undesirable this is. In order to avoid the prospect of such inconvenience, it is necessary to lay down a rule that no more than a fixed proportion may be cut at once. Take, for example, a coppice-with-standards: '*fell one standard out of four*,' what does it mean? Supposing the coppice is cut at thirty years old, the four standards will be all cut in $4 \times 30 = 120$ years, and four new oaks will have replaced them. Here we have actually a rotation of 120 years, or if we include the age of the coppice, 150 years. This little calculation always passes through the brain of the Forest Officer, whether he is definitely conscious of it or not.

"In cutting one standard out of four he is fixing the rotation; that is to say, the number of years allotted for one crop to be replaced by the next. It is the same thing in selection. On the average, the crop is replaced by a new crop after a certain number of years, which is the rotation. The length thereof is determined by the quantity cut at each felling. Why then this aversion to the term rotation? It seems to me so harmless.

"In France, foresters have declared war against the application of mathematics to Working Plans. After all, what is the working-plan but an exact and systematic application of sylviculture? No treatment can be correct if it is not based on this fundamental principle. At the same time a working-plan, if it has any regard for a sustained yield, cannot possibly attain its objects without the application of the elementary rules of mathematics. When foresters distrust mathematics in working-plans, the fault can only lie in the application, and not in the principles. Mathematics must be the handmaid, rather than the mistress, of sylviculture."

When such doctors differ who shall decide? Truly it is possible with Dr. Schlich to deduce, *on the average*, a rotation, but it is a rotation on paper. It must also be conceded to M. Broilliard that for any given standard or tree of the crop the actual age of felling will in many or most cases not coincide with the paper rotation.

Deodar Insect Pest in Bashahr, Punjab.

By G. G. Minniken, *I.F.S.*

This subject having attracted some attention in recent numbers of the *Indian Forester*,* it may be of interest to add a few more notes to the information that has already appeared. The insect is approximately identified as a Scolytus, a beetle

* Vide *Indian Forester*, Vol. XXVI., No. 12, and Vol. XXVII., Nos. 2 and 3.

well known to Foresters. Louis Figuer in his book on insects says that in 1837 they were obliged to cut down in the Bois de Vincennes twenty thousand feet of oak trees, aged from thirty to forty years, completely ruined by the ravages of the Scolytus. Its occurrence in Bashahr was first noticed by myself last August in one of the forests of the semi arid tract of Kanowar, which has an annual rainfall of 22 inches. The forest occupies a N.-N. W. to N.-N. E. slope at an altitude from 7,500 to 8,000 feet, and its soil is very rich, the rock being a gneissoid granite. Its growing stock consists of thirty to thirty-five years old poles, for the most part deodar, and contained, until thinned out in 1888, a large admixture of Pinus excelsa. At the present time the poles are vigorous, and there are no sickly trees to be found among them; but the decayed stumps of the thinning operation remain, and suggested the idea that the Scolyti might have bred in them. The beetle collected turned out, however, to be quite different. C. F. M. in the December Number of the *Indian Forester* describes the beetle observed by him in decaying trees as belonging to the genus Cerambyx; but it has no connection with the deodar pest, and as far as I know only frequents rotten timber. Mr. Stebbing, from a specimen sent him, thinks it belongs to the tribe of Longicornes (*Cerambycidæ*). But an enquiry regarding all points likely to throw light on the outbreak is still proceeding, and as it may be possible, later on, to determine with accuracy some of the factors mainly responsible, it would at this stage be mere speculation to attempt a solution. It is, however, probable that the partial failure of the rains in 1898 and the abnormal light snowfall of the following winters in the infested localities have had much to do with its development. No traces of the pest has been found west of Wangtu, in Lower Bashahr, where the annual rainfall is 60 inches; nor on mature trees; so the natural inference is that the insect does not flourish in moist and damp localities, that it prefers pole forest on dry sunny slopes, and that heavy rain and snow might lessen its attacks or effectually eradicate it. But it was considered unsafe to rely upon the disposition of rainfall and snow for effecting a cure; so preventive measures were taken at once. The infected poles were felled, and those not given to villagers or extracted departmentally were burnt outside the forest. The bark was peeled off the stumps and also burnt, and with a view to prevent dispersion of the larvæ and beetles, trenches were dug round the patches from which diseased trees had been removed, but whether this was of any practical use is unknown, as no insects or larvæ were found in them. Watchers were posted to report fresh cases, but though prior to the felling of the poles the attacks had continued to extend to individual poles here and there in about an acre of forest, no more were touched after the preventive measures were completed. The scraping off of the bark was tried, and as the insects live and breed in it, their destruction is inevitable if the work be done thoroughly

and the bark burnt afterwards: but its application is only practicable when the tree can be saved. Associated with the larvæ of the Scolytus I found in large numbers a pink coloured larva, much larger than the scolyti larvæ, which the Inspector-General thought was a parasite, and this has since been confirmed by Mr. Stebbing, who informs me that it belongs to the family of beetles called Cleridæ and probaby feeds on the scolyti larvæ and eggs. If this turns out on further observation to be correct, it will be an important discovery, and may account for the pest not spreading with its usual rapidity, and to its depredations being restricted at present to small areas and groups.

It is by no means certain that the ravages of the Scolyti have ceased, and if they should reappear in the spring and with the Cleridæ, it would be an interesting experiment to breed some of the latter as enemies of the pest. The Pinus excelsa is also attacked by a beetle regarding which I hope later to send a note.

Borggreve's Formula.

BY GNUSHWE.

Borggreve's Formula for the increment per cent. of single trees and of whole woods, and its practical application by means of Pressler's borer.

I—DEVELOPMENT OF THE FORMULA.

i. Single trees.

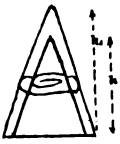
Let b = breadth of last annual ring in inches.
„ c = circumference at breast height in inches.
„ d = diameter of section „ „ „
Then last year's increment per surface of section

$$= c \times b$$
$$= a\pi \times b$$
$$= a\pi \times \frac{1}{n}, \text{ where } n \text{ represents number of rings per inch diameter measured from periphery of stem.}$$
$$= \frac{d\pi}{n}$$

Hence, if h = Increment % (volume).

$$p : 100 :: \frac{d\pi}{n} : \frac{d^2\pi}{4} *$$
$$\therefore p = \frac{400}{dnc}.$$

* The yearly surface of section increment is proportional to the yearly volume increment. Proof as follows, (f = form factor):—



$$\frac{d_1^2\pi}{4} \times h_1 \times f_1 : \frac{d_2^2\pi}{4} \times h_2 f_2 :: d_1^2 : d_2^2$$

For 1 year's growth $h_1 f_1$ may be taken $= h_2 f_2 (= hf)$.

$$\text{Hence } \left[\frac{d_1^2\pi}{4} hf - \frac{d_2^2\pi}{4} hf\right] : \frac{d_1^2\pi}{4} hf - :: \left(d^2 d_2^2\right) : d$$

i.e.,—Diameter or surface of section increment is proportional to volume increment.

ii.—For a number of trees.

Let $d_1\ d_2\ d_3$ ..... be the diameters of the several trees.

" $n_1\ n_2\ n_3$ ..... as before (for the several trees).

Since, Increment % for single tree $= \frac{400}{dn}$

$\therefore$ Actual Increment per single tree $= \frac{d^2\pi}{4 \times 100} \times \frac{400}{dn}$

For, $p : 100 :: 1 : V$

$\therefore I = \frac{V}{100} \times p$

and V is proportional to sectional area.

Hence, $= 1$, the increment.

$$p : 100 :: \overbrace{\left[\frac{d_1^2\pi}{4 \times 100} \times \frac{400}{d_1 n_1} \times \frac{d_2^2\pi}{4 \times 100} \times \frac{400}{d_2 n_2} \times \ldots\ldots\right]}$$

$= V$, the volume.

$$: \overbrace{\left[\frac{d_1^2\pi}{4} \times \frac{d_2^2\pi}{4} \times \ldots\ldots\right]}$$

$$\therefore p = \frac{100\left[\frac{4}{n_1} d_1 \times \frac{4}{n_2} d_2 \times \frac{4}{n_3} d_4 \times \ldots\ldots\right]}{d_1^2 \times d_2^2 \times d_3^2 \times \ldots\ldots}$$

Or, written shortly—

$$p = \frac{100 \Sigma \frac{4}{n} d}{\Sigma d^2}$$ = Borggreve's Formula for the increment % of a whole wood, n being as above.

II—Application of the Formula.

For a whole wood.

A number of trees representing averages of the whole are selected, and the diameters measured (in inches) and recorded. Cylinders of wood are also extracted by Pressler's borer, and the number of rings are counted in one inch of diameter, measured from the outside, not including bark. It is most convenient to keep the cylinders and count the rings subsequently, recording the corresponding diameter.

The calculation is then made as follows, the first two columns representing the data :—

Diameter of stem d (cm.)	No. of rings per cm. diameter., n.	d^2	$\frac{4d}{n}$
41	13	1,681	12·62
24	18	576	5·33
30	8	900	15·00
		3,157	32·95

Then Increment % $= \frac{32{\cdot}95 \times 100}{3{,}157} = 1{\cdot}04.$

In practice, a fairly large number of measurements are necessary in order to ensure greater accuracy.

The Forests of Arrakan, Burma.*

By E. P. Stebbing, *I.F.S.*, *F.E.S.*

Dr. Schlich's report established in 1870 the following facts:—

The reasons against the Reservation of the Arrakan Forests in 1870, compared with those that have since cropped up in favour of a reconsideration of this decision.

1*st*.—That the quantity of ironwood timber of all sizes in the Arrakan forests was very great.

2*nd*.—That the present rate of consumption was very low indeed when compared with the yield he estimated the forests could produce.

3*rd*.—That the character of the timber generally was against any large trade being done in it. Beyond local purposes there was no demand for it, and what export trade there was, had entirely died out.

4*th*.—That there was no demand for other classes of timber.

In the face of these facts the Local Government, in their resolution on the report, held that no case had been made out for the reservation of the Arrakan forests. I have already promised to show how since this conclusion was arrived at conditions have materially changed, and that what was doubtless a correct decision in 1870, is perhaps not applicable to the altered state of affairs in 1900.

In a letter No. 200F., dated 14th March 1871, from the Government of India, Public Works Department, to the Chief Commissioner of British Burma, the Governor-General's conclusions for not conserving these forests are given, and in it the management to be instituted is decided upon. I will take these conclusions separately and endeavour to show how time and progress have, to some extent, subverted them.

The Government of India commence by saying that it does

1. The cutting and export of Pyinkado.

not appear from Dr. Schlich's report that there is any certain prospect of increase in the present rate of local consumption of ironwood, although there is plenty of it, nor was it probable that the export trade, which had entirely died out, would revive. The character of the timber, no doubt, militated against its real usefulness, it being hard to work, and it apparently did not find favour with Railway Companies for sleepers. The question now before us is, therefore, how far are these reasons applicable to the altered conditions of the present day? The wood is still as hard as it was in the days of yore, and it is probably still as abundant, but conditions have changed. The Assam-Bengal Railway has appeared on the scene, and this Railway's track is chiefly laid with Pegu Pyinkado sleepers brought from Rangoon. These sleepers are landed at Chittagong at

* Begun in February Number, 1901.

Rs.2-4-6 per sleeper, this rate including the expenditure incurred on unloading, turning for passing and stacking. The Railway at present requires about 12,000 sleepers per annum, and will take a good many thousand in the years to come. My reason for stating that this number will be large is that the line, which is still under construction, or portions of it, is only now being metalled and the sleepers put down about nine years ago or so, having spent that time lying in a mud bed instead of in a metalled track, are already showing signs of wear and deterioration, and will require replacing. It should be possible to provide this supply from the Pyinkado forests of Arrakan, and this alone would, I think, justify a re-inspection of these forests and a reconsideration of the judgment passed on them in 1870. I have already stated that such an import has commenced, 60 tons of Pyinkado sleepers having been brought in in 1898-99. In addition, beams, posts and planks of Pyinkado are exported, as a reference to Appendix B. will show.

It would appear that the demand for ironwood in the market is on the increase. The following remarks on this timber are extracted from the *Agricultural Ledger* (1899 No. 11):—

In Burma and Bengal Pyinkado has been largely employed for making railway sleepers and telegraph posts. Between 1865 and 1868 inclusive, 70,377 sleepers were obtained by the East Indian Railway Company from Arrakan. The Burma State Railway was laid with sleepers of this wood in 1877, the majority of the sleepers were still good in 1894. In 1876-77 Major Seaton reported that 10,000 sleepers from Arrakan sold in Calcutta at Rs.5 each, while in 1884-85, 17,631 were sold there at Rs.2-1-0 each (compare with Rs.2-4-6 paid by the Assam-Bengal Railway at Chittagong for Pegu sleepers). The cost of cutting and freight was said to have amounted to 12 annas per sleeper. (In addition, we have the 60 tons of sleepers imported into Chittagong in 1899-1900.)

In 1885-86, 81,569 sleepers were removed from Burma by Government Agency, of which 75,000 went to Madras and the remainder to Calcutta. The profit which accrued from the works in the Pegu Circle amounted to 36 per cent. A certain amount of scantling is also turned out of the mills in Pegu for building purposes and railway keys. Trees of 3 to 4 feet girth are used as house-posts and bridge-piles. For these purposes it is said to be unequalled owing to its durability.

It has been found to be a most suitable wood for street paving, and one mill in Pegu is supplying planks 9 feet by 3 inches for paving blocks for England.

With a view to making its qualities in this respect more widely known, under orders from the Inspector-General of Forests some good samples of ready-cut paving blocks of Pegu Pyinkado have been sent this year (1900) to Paris to be exhibited at the Paris Exhibition.

In South Tenasserim and Pyemnama the Burmans make houses and bridge-posts and oil presses from the wood, also harrow teeth and yokes for buffaloes.

During the last few years a new interest has attached to the Pyinkado timber trade in consequence of the refuse of the sleeper works in Burma having been found to be astringent and useful for leather manufacture.

2. The cutting and export of timbers other than Pyinkado.

At the time Dr. Schlich wrote his report no other wood save Pyinkado had any export value, and therefore the subject of these woods was not touched upon by the Government of India in their letter above-quoted. Conditions have changed since then, and at the present time a larger demand has arisen for the wood of the jarool, khoira, garjan and, to a lesser extent, of other trees. I have already shown that boats (dugouts), beams, planks, scantlings, &c., of these woods are exported to Chittagong, Barisal, Chandpur, Narainganj, and other places in Eastern Bengal.

3. The amended rules of 1865 and the method of working them as regards Toungya cultivation and conflagrations.

The amendments to the rules of 1865, as proposed by Dr. Schlich, were agreed to by the Government of India, and especially so with reference to the Toungya cultivation and to conflagrations. North of the Kolandyne the enforcements of these rules cannot apparently be carried out, this fact being evidenced by the numerous clearings and areas covered with a small scrub jungle (both the result of the Toungya cultivation) everywhere apparent, and by the number of fires seen burning over the hills at night. An inspection of the large Pyinkado forests to the south would not improbably show a very similar state of affairs, since without the most careful supervision it is impossible to stop this sort of destruction.

4. The staff to be employed to carry out the amended Rules.

Whilst agreeing that any system of forest conservancy involving a large outlay was not advisable, and that the forests should remain at present under the supervision of the civil authorities, it was agreed by the Government of India in 1870 that a Ranger should be appointed, under the control of the Deputy Commissioner, for the southern forests to see that the rules were put into force and obeyed. Dr. Schlich had proposed a staff of one senior capable officer with three clerks and fifteen subordinates to help him. It is hardly probable, therefore, that this one man could alone have ever made much headway in forest conservancy, and, if he is still entertained, it is probable that at the present day he is doing more harm than good to the forests under his charge. The export of Pyinkado from these forests, which has apparently restarted, would, at any rate, seem to demand an enquiry. It is doubted whether a Ranger would ever be required for the forests in the north of Arrakan. It is from these very forests,

however, that the cutting of trees other than Pyinkado is now taking place, and bids fair to increase largely and develope into a fair export trade. It however requires careful watching, and it is probable that the forests will easily repay the extra amount expended on the supervision.

Summary of reasons for considering it advisable to reconsider the decision of 1870 against the Reservation of the Arrakan Forests.

From the above arguments, it will be gathered that since the opinions formed on these forests in 1870 were arrived at, a great change has taken place in their position from a commercial point of view. From being isolated and considered useless as reserves, they have now acquired a commercial value, and the extent of this value demands an enquiry.

A Railway has appeared in the vicinity, a Railway whose track is laid principally with Pyinkado sleepers, the sleepers at present in use being imported from the Pegu forests in Burma. It is not improbable that the Pyinkado forests of Arrakan will soon attract the attention of the contractors who are already at work in the north, and they will at once snap at the chance the present arrangements would give them of competing with the Pegu sleeper trade on such, to them, favourable terms. That a start has been made in this direction is proved by the import into Chittagong of 60 tons of Pyinkado sleepers from Akyab. Beams, planks and posts of this wood are also being exported from Akyab. Before this export is allowed to expand any further, an inspection should be made by a competent authority, and if my surmises prove to be correct, it will be necessary to introduce a proper system for the management of the forests, and to exercise a good supervision over all contractors working in them. Dr. Schlich's report shows that there was a large surplus stock of wood in the forests in 1870. During the 30 years that have passed since then, this stock will have increased, and it is probable that a very handsome profit may be obtained from working the forests, whilst at the same time the growing stock in the woods themselves is being improved. Secondly, a brisk demand for jarool, khoira, garjan, and other woods has developed, and the northern forests of Arrakan are now being denuded to supply it. As a result the woods are suffering, whilst at the same time Government is not getting its full royalty on the timber.

Thirdly, the Toungya cultivators appear to have full sway over the forests, with what disastrous results is only too well known to the forester. Fires also appear to sweep unchecked over the forest-clad hills in the hot weather months, leaving ruin in their wake.

Conclusion.

My object in writing this note has been to redirect attention to these Arrakan forests with a view, it is true, to their being worked—but worked in a justifiable and profitable manner. To one and all, I suppose, save, perhaps, to those pecuniarily interested—the destruction of a

fine virgin forest, a forest that has grown up and occupied its present site during untold ages, must appear a melancholy proceeding, and to none more so than to the forester whose business it is not to clear forests off the face of the earth but to carefully tend, beautify and preserve them.

It is hoped that these Arrakan forests will be saved from the fate which would seem only too surely to threaten them, a fate which sooner or later befalls all forests left unprotected to the tender mercies of the lumber man and his methods.

II.—CORRESPONDENCE.

The Burma Forest Bill, 1900.

In an article on the Burma Forest Bill, 1900, published on pp. 63—67 of the February 1901 issue of the *Forester*, "F. G." remarks as follows:—

"In both the Indian Act and the new Bill the releases of property under attachment, when an offence is compounded, is ill-provided for. Both laws allow property seized to be released only "on payment of the value thereof as estimated by such officer." If a guard seizes a cart and pair of bullocks employed to carry off a small log, the Forest Officer can compound the offence for, say, Rs. 5, but he cannot legally release the cart and animals unless he deliberately and falsely values them at a few annas, which that offender must pay in addition. It cannot be the intention of the law, either that an officer should have to resort to such a subterfuge, or that a five-rupee offence should carry a hundred-rupee subsidiary penalty."

Presumably, the Indian Forest Act, VII. of 1878, is referred to above as the "Indian Act." If so, section 67 of the said Act runs as follows, the italics being mine:

"(1) The Local Government may, from time to time, by notification in the official *Gazette*, empower a Forest Officer by name, or as holding an office,—

(*a*) to accept from any person against whom a reasonable suspicion exists that he has committed any forest offence, other than an offence specified in section 61 or section 62, a *sum of money* by way of compensation for the offence which such person is suspected to have committed, and

(*b*) when any property has been seized as liable to confiscation, to release the same on payment of *the value thereof* as estimated by such officer.

(2) On the payment of *such sum of money, or such value or both*, as the case may be, to such officers, the suspected person

if in custody, shall be discharged, the *property, if any, shall be released*, and *no further proceedings shall be taken against such person or property.*"

This surely empowers a compounding officer to decide forest cases in one of the following ways:

(*a*) he may order a sum of money to be paid as compensation;

(*b*) he may order the payment of the value of property which has been seized as liable to confiscation;

(*c*) he may order the payment both of a sum of money as compensation and of the value of such seized property, and further, clearly directs that as soon as the suspected person shall have complied with the decision of the compounding officer, *e.g.*, by paying a sum of money as compensation, the property which has been seized as liable to confiscation shall be released, and no further proceedings taken against such property.

In trivial cases, then, the value of costly property, such as cart and cattle, would never be demanded.

JABALPUR,
Central Provinces. R. S. HOLE.

I regret that I am unable to see the justice of the view set forth by Mr. Hole, though he has quoted at length, and perfectly correctly, from the right Act. In fact, he quotes precisely what I asserted, and then proceeds to draw conclusions that are, I admit, commonly held, but are not justified by the law. Section 67 (*a*) permits a Forest Officer to take *compensation for the offence suspected.* Section 67 (*b*) authorises him to *release property that has been seized*, but *only* on payment of its value. There is no general permission anywhere given to release any attached property without exacting the payment of a value thereof. If Mr. Hole will permit me to refer him back to section 60, he will see that the act *empowers Government to authorise given officers* to release attached property. The power is one that has been generally neglected by Local Governments so far as I know, so that in most cases Forest Officers can attach, but cannot release without payment. Be that as it may, the *existence* of section 60 proves that section 67 does not contemplate the release of property without payment.

F. G.

The Coppicing of Unprotected Forests.

I was much interested in Mr. Long's remarks on "The Coppicing of Unprotected Forests" in the December issue of

the *Forester*, and hoped that others might have contributed their opinions in the January number.

Here in H. H. the Nizam's Dominions, many of our best forest tracts, though rapidly deteriorating, are alas, still unreserved, and in these the Forest Department has control over only fifteen species of trees. Every effort is made to coppice these species level, both the present and late Conservators laying great stress on this, but there is an appalling loss of coppice shoots both from fire and unrestricted grazing. Surviving coppice shoots, however, are undoubtedly stronger, straighter and more valuable than those which are produced from stools of various heights, and being merely branches, have no independent existence. Fires do considerable damage to these also, whilst the ubiquitous goat-herd has no scruples about cutting shoots of either description.

Still, all said and done, when one sees the deplorable results of high felling as conducted by ryots who are entitled to free timber of all species except the fifteen referred to, who use, besides poles, a great deal of large timber also, and who in unreserved forests fell trees just as they like (though with a pass from the Tahsildar), one cannot but think that level felling, in spite of all drawbacks, is the correct policy, excepting perhaps in the case of fuel fellings, where the cost of coppicing huge old stools is generally prohibitive. Reproduction from high fellings is most unsatisfactory here even as regards small poles, and another disadvantage of such fellings is the large percentage of windfalls.

WAVANGAL,
Hyderabad. W. G. GILMORE.

Destruction of Game in the C. P.

It is to be hoped the extract from the *Asian* given on pages 55 to 57 of the *Indian Forester* for January 1901, on the subject of the destruction of game in the Central Provinces, will, at any rate, induce some of the "D.C.'s" referred to, to give us their views on this important question; such men as "Long Tom" for instance, to whom, if I mistake not, we might look for enlightenment in this connection.

The writer holds the opinion, I see, that the idea of granting gun licenses to villagers for the protection of their fields from the ravages of wild beasts is more or less a mistaken one; and, furthermore, that this idea is at root responsible for a very large percentage of the gun licenses that are issued in the Central Provinces.

It is not, however, with the opinions expressed by the writer —held probably by a large majority of Forest Officers in India,— that I feel inclined to fall out; on the contrary, I agree with them in the main; but I should like to record a protest against the manner in which he has undertaken to defend them. Many of us who

hold similar opinions will, perhaps, feel inclined to murmur: "Oh! save us from our friends!" as we read our would-be champion's defence of our position.

We can all appreciate the harrowing picture he draws of the noble stag and gentle doe receiving a belly full of slugs at five yards' range as they limp to the muddy pool to slake their thirst in the hot weather; but when he goes on to refer to the incredible number of sambhur, cheetal and bison *murdered* for the sake of their meat (and this during the famine, mind you) and by way of thrusting home his argument in favour of a strict preservation of big game, favours us with statements of fact such as this,—"I know of one *shikari* in the Kalibeet district who shot three very fine bull-bisons besides several cows last hot weather, and yet there are scores of sportsmen who have hunted high and low throughout India and spent large sums of money in *shikar*, and yet have never been able to get a shot at a bison,"—one can but confess to a feeling of nausea. And again, "The game in Kashmere has been strictly preserved and only just in time. Surely the Indian Government would do well to follow a similar course in the C. P., . . ." Just fancy going up to Government with a quiver full of arrows such as these! Why, the very clerks would laugh in our faces, and we should deserve it too. Surely, a man who has the welfare of the denizens of our jungles really at heart, would do better to remain for ever mute than to propound such arguments as these! He kicks the ground from under his feet.

C. C. HATT,
Dy. Consr., Forests.

Jungle Folklore Stories: A Suggestion.

Some years ago I wrote to you suggesting that Forest Officers should give their experiences of *shikar* in the columns of the *Forester*. I think, sir, you will agree with me when I say that the response has been most gratifying. The stories sent have been interesting, both in a popular as well as from a natural history, and therefore from a scientific point of view. I have now another suggestion to offer, and that is, that Forest Officers who have unique opportunities of hearing jungle folklore stories in different parts "of the back of beyond" should, from time to time, send the most characteristic and interesting to you for publication, with full details of the tribe or people who tell the story. A comparison of some with European fairy tales would, I am sure, be of more than passing interest.

TAW KWE.

[We trust our readers will heartily respond to TAW KWE's suggestion.—HON. ED.]

Attacks of Hyblœa puera on Teak Trees.

MR. E. P. STEBBING, in the February number of the *Indian Forester*,* gives reasons for thinking that the caterpillar which did the damage to teak in the forest nursery near Poona was not *Hyblœa puera*, but *Paliga damastesalis*: for the following reasons, however, I believe the former is the name of the moth and not the latter:—

1. There can be no doubt whatever that the moths sent for identification to Dehra were the imagoes of the pupæ found in the rolled-up ends of the teak leaves, for these pupæ were put into a bottle, and the imagoes sent were those that emerged from these pupæ.

2. I did not see any of these moths flying about in the day time in the nursery; the only ones I got were those which came out in the bottle.

3. The larva was not like that of *Paliga damastesalis*.

4. The imago was not the least like that of *Paliga damastesalis*.

5. MR. STEBBING writes that the pupa of *H. puera* is found in a flimsy cocoon which is often attached to dead leaves on the ground, and that it is never found in the rolled-up edges of the teak leaves. It seems, therefore, curious that in the Poona nursery the pupation was done, at any rate in the cases I noticed, in the edges of the teak leaves; but this can perhaps be accounted for by the fact that the teak seedlings in the nursery were only about 4″ high, and that there were no dead leaves on the ground.

L. S. OSMASTON.

[MR. STEBBING, after reading the above letter, agrees with MR. OSMASTON that, failing to find dead leaves upon the ground, but only bare soil, the larvæ would be obliged to attach their cocoon to the living leaves, the ends of which in a 4″ seedling would to all intents and purposes be on the ground. MR. STEBBING would advise that when the larvæ of this insect make their appearance in a nursery of young plants, dead leaves should not be removed from the soil. The grubs will pupate amongst the dead leaves, and when the defoliation is seen to have ceased, the leaves should be collected or swept up and burnt This will greatly reduce the danger of a second generation appearing in larger numbers later on. There are known to be two (and may be a greater number) generations in the year both of *Hyblœa puera* and *Paliga damastesalis*.—HON. ED.]

Damage to Deodar Seedlings by the "Cut Worm" (Agrotis ypsilon.)

In the February number of the *Indian Forester*, a note under this title made its appearance from the pen of MR. B. O. COVENTRY, Deputy Conservator, Rawalpindi Division.

The observations recorded by MR. COVENTRY on the habits of this moth are most interesting and valuable, since they tend to prove that the cut worm is double-brooded, *i.e.*, that it has two generations in the year.

* *Indian Forester*, Vol. XXVII., No. 2, February 1901. Also see Vol. XXVI., No. 10, October 1900.

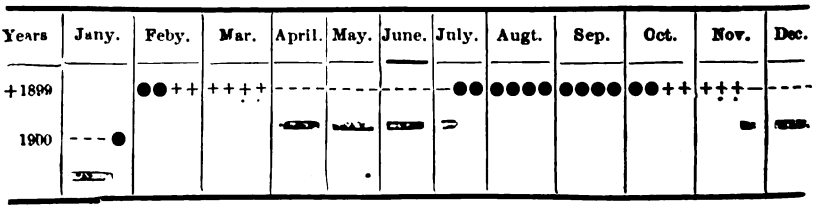
I hope to publish shortly a monograph on what we know of insects injurious to our coniferous trees, and a full life history of *Agrotis ypsilon* will be included therein. Meanwhile, I think it will prove interesting if I supplement MR. COVENTRY'S note by giving a short account of the first generation or brood of this insect.

In the article in question it is stated a moth emerged in the middle of October. Now it has been observed in other parts of India, North-West Provinces and Bengal, that *A. ypsilon* larvæ appear in November (presumably from eggs laid by the October moth) often in vast numbers, and gnaw off hundreds of young plants close to the ground. These they drag to their burrows, or dropping them *en route* to lie and wither, proceed to attack fresh ones.

Scott in his Opium Reports for 1874, 1877 and 1878 describes the pest as specially destructive to young crops in dry seasons, often stripping bigha after bigha of plants in a few nights.

The November larva forms an earthen cell in the ground at a depth of from 2″—8″ sometime during February, and spends rather less than a month in the pupal stage. The moth is to be seen on the wing in February, and on to the middle of March, often appearing in vast numbers. The eggs from this moth produce the summer larvæ, whose destruction has been recorded by MR. COVENTRY, whose pupæ were obtained during the middle of July and imagoes in October.

This life history may be shown diagramatically as follows, it being remembered that the exact periods at which the different stages of the metamorphosis would appear vary slightly with the climatic conditions of the insect's environment.



Explanation :—
+ Egg stage.
— = Larval stage.
● = Pupal stage.
+ = Imago stage.
——— = Period during which the insect is injurious to growth.

It will be interesting if MR. COVENTRY will let us know whether his deodar seedlings suffered during December and January last, unless the climatic conditions at Gora Gali are too severe for the *A. ypsilon* larvæ to be at work during these months.

E. P. STEBBING.

III.—OFFICIAL PAPERS AND INTELLIGENCE.

The Best Season for cutting Bamboos.

In para. 2 of the Proceedings (Forest) No. 255, dated 24th June 1898, of the Madras Revenue Board, the Conservator was requested to arrange for a series of experiments with regard to the effect of cutting bamboos at different seasons.

The Collectors of the marginally noted districts were asked in July 1898, to instruct their District Forest Officers to carry out such experiments and report the results. Their replies are noted below :—

Nilgiris.
North Coimbatore.
South Coimbatore.
South Malabar.

Nilgiris, 30th June 1899.—Bamboos were cut in all the Ranges, except Ootacamund, a few days before and after new moon and full moon, and kept separate from each other. Some were smoked, and others were soaked; with the result that, if cut in dark nights and immediately soaked or smoked, the bamboos are not attacked by the borers. The period the bamboos were smoked or soaked was two months. From the experiments conducted in the different ranges, it is noticed that the bamboos felled during dark nights have not been attacked to such an extent as those felled during bright nights. It has been observed that soaked bamboos fared much better than those that were not soaked, though they were in two cases found attacked, which may probably be due to the fact that immersion was not quite complete. As soon as the bamboos are cut, they should be fully immersed in water for some time, or properly smoked in a shed, as otherwise they are liable to be easily attacked by insects. As soon as the bamboo is cut, the mother beetle lays her eggs in it when the flow of sap in the bamboo is not abundant, and the result is the formation of larvæ, which in their turn become transformed into pupæ; and the young beetle therefrom cuts its way out, with the result that the bamboo is reduced to little more than powder. So the best method is to soak the bamboos as soon as they are cut, which not only prevents the deposition of eggs, but also renders the bamboo unsuitable for the sustenance of the young larvæ. Smoking has also a good influence over the bamboos; but those merely stacked on the ground have suffered considerably, particularly those that were felled during the bright nights.

North Coimbatore, 24th August 1899.—A series of experiments were conducted in Satyamangalam Depôt. During each week of the month one head-load of twenty-five bamboos of two kinds: (1) dry solid bamboos known as *Karanai*, and (2) green hollow bamboos known as *Varai*, were set aside and marked. Dry bamboos appear to withstand the attacks of insects better than the green. In every case the ravages of insects appear to begin with the bamboos on the inside of a bundle, *i.e.*, when not exposed

to the light. The result of the experiment has been that the moon has no effect on the bamboos; and that bamboos exposed to light and air are less liable than those that are not so exposed. Comparative results of the experiments conducted were separately recorded in statements received with the letter.

South Coimbatore, 18th February 1899 *and 1st November* 1899.—A series of experiments were made on two occasions at Mount Stuart; one from the 2nd August to 1st September 1898, and the other from 10th March to 12th April 1899.

On each occasion ten large bamboos *(Bambusa arundinacea)* and ten small *(Dendrocalamus strictus)* were cut daily. Each bundle of ten was labelled, and the bundles were all laid out in a row. Those cut on the first occasion were examined one by one on 2nd February 1899, with the result that the influence of the moon has not much to do with the presence or absence of the borer.

On the second occasion half the length of each bundle was covered with mats, and the other half was left uncovered. This was done in order to try the effect of shade also; the bamboos were examined in the beginning of October. This has shown that bamboos attacked by borers in the covered portion are about double the number of those attacked by them in the uncovered portion; that is to say, that borers do not attack them so much in the sun as in the shade.

The following is the comparative statement on both occasions:—

	Percentage attacked by borers on the first occasion.	Percentage attacked by borers on the second occasion.
Bambusa	50·53	34·33
Dendrocalamus	39·47	41·66

It will be seen that there is only a slight difference in the Dendrocalamus cut on the second occasion; whereas in Bambusa the percentage is 16·20; showing thereby that bamboos cut in August 1898 were more liable to be attacked by borers than those cut in March and April 1899.

South Malabar, 4th October 1899.—A series of experiments were made from 2nd August 1898 to 7th April 1899, at full moon and new moon days. On each occasion a bundle of twenty-five bamboos was soaked in mud and water and a bundle of twenty-five each was simply stacked. Bundles of ten each were also tried on two occasions similarly. The experiments have shown that neither soaking nor felling at any particular stage of the moon has any marked effect in preserving the bamboos from the attacks of borers.

There appears, however, to be some virtue in the bamboos felled during January, February and March, which are not attacked by borers. Stacked bamboos have invariably been attacked except those felled during this period.

The above is only a shortened form of the district reports, and cannot be called a précis of them. Any attempt to do it will only alter the subject matter. As far as it can be seen, the opinions of the District Forest Officers differ as noted below briefly :—

South Malabar.—Neither soaking nor felling at any particular stage of the moon has any marked effect in preserving the bamboos from the borers; but those cut from January to March are less attacked than those cut at other seasons.

Nilgiris.—Bamboos should be cut two or three days before or two or three days after new moon, and should thoroughly be soaked in water for some time; or properly smoked in a shed. The latter is considered to be the best.

North Coimbatore.—The moon has no effect on the bamboos. Those exposed to light and air are less liable than those not so exposed.

South Coimbatore.—Bamboos left in the sun are liable to less attack of borers than those left in the shade. Bamboos cut in August were more liable to be attacked by borers than those cut in March and April 1899.

[Communicated by Mr. A. B. Jackson, I.F.S., Deputy Conservator of Forests, Madras Presidency.]

Forest Pests. *

I.—Teak Tree Pests.

Arctiid Moth.—In July 1898, through the Director, Imperial Forest School, Dehra Dun, from the Deputy Conservator of Forests, Kurseong Division, were received, in the Indian Museum, specimens of a moth said to be doing considerable damage to teak trees in the Bamonpokri plantation.

The Deputy Conservator of Forests wrote :—

"The caterpillars first appeared in August last, and by October they had completely stripped all the trees of their leaves, and again in January last they destroyed the young leaves."

The insect is an Arctiid moth, but the specimens sent had been so badly rubbed and broken that it is quite impossible to identify the species; they, however, appeared to be a new teak pest, and differed widely from the two known species previously recorded in the pages of these notes.

2. *Hyblæa puera, Cram.*—In June 1898 some moths were forwarded to the Museum by Mr. T. T. Bourdillion, Conservator of Forests, Quilon, as doing immense damage to teak plantations of Southern India.

* Indian Museum Notes, Vol. V., No. 1. Office of the Superintendent of Government Printing, India, 1900. Price one rupee.

The specimens were identified with *Hyblæ puera*, Cram., a common teak pest in India.

The following is an extract taken from a report furnished by the Forest Ranger :—

"The attacks generally begin in April, when the teak tree has put on its new foliage, and they last for about six weeks, when the caterpillars begin to disappear, but one or two may always be found on the teak if a search be made for them. The wet weather probably prevents the moth from increasing, and very little is seen of it until September or October, when, if the north-east monsoon is light, its caterpillar may again attack the teak, the attack lasting about a month. Both very dry and very wet weather seem detrimental to the spread of the insect.

"When the caterpillar begins to pupate, it suspends itself by threads at either end to a leaf, not necessarily a teak leaf, spins a cocoon round itself, and folds the leaf over, so that it is quite snug.

"The caterpillar will eat the leaves of some jungle plants as well as teak, and it has been found in the jungle.

"The caterpillar, when it has once begun feeding, never leaves the tree, though it may shift from branch to branch when its food is exhausted in one place. It does not drop by a thread to the ground when it wishes to change its skin, and, therefore, the system of tarring the stems of the trees employed in Germany to prevent the caterpillars re-ascending them, is inapplicable."

3. *Paliga damastesalis*, Walk.—From Mr. R. S. Hole, Divisional Forest Officer, Damoh, were received in September 1898, specimens of the larva, pupa and imago of the Pyralid moth, *Paliga damastesalis*, Walk., as injurious to teak trees in the forest of Damoh.

The insect has previously been recorded as attacking teak in the Rangoon district, *vide* Indian Museum Notes, Vol. III., No. 2, p. 94.

The following notes have been furnished by Mr. R. S. Hole regarding the pest :—

"Full grown caterpillar is about ¾ inches long, of a greyish to yellowish green colour, dark above and lighter beneath. When young, the caterpillar is a light yellowish green.

"The caterpillars feed on the leaves of teak trees, devouring the leaf parenchyma, but leaving the vascular tissue untouched, and in this district the caterpillar does a great deal of damage, principally during the rains, from June to October. Teak trees on a whole hill-side may frequently be seen which are absolutely defoliated. The caterpillar pupates on the back of the leaves it has been feeding on, the pupa being kept in position in a hollow of the leaf by a weft strung across it. I have watched the caterpillars making this, they swing their heads quickly from right to left and left to right as they attach the thread on each side, and draw it across to the other. The pupa falls to the

ground with the dead leaves, but I do not know where the eggs are laid ; I fancy somewhere on the trees, for I have frequently seen very young caterpillars, apparently just out of the egg, feeding on the leaves. I also fancy this insect must have two generations in one year, for frequently the second flush of leaves put out towards the end of the rains is also destroyed by the caterpillars.

"The trees which receive most damage are those on dry stony hill-sides, particularly if the teak there is nearly pure. Trees in moist situations, especially where the growth is luxuriant, seem to be little damaged. Whether this is due to the effect the locality has on the insect and its life history, or to the fact that the trees are better able to repair or withstand the damage, I do not know."

II.—Sâl Tree Pests.

Leucoma diaphana, Moore.—In February 1898, Mr. J. Campbell, Deputy Conservator of Forests, Assam, Golaghat Division, despatched to the Museum two varieties of caterpillars which had been defoliating sâl trees on a very large scale in the forest of Dubri.

The insects were (*a*) some larvæ of a Noctues moth of the species Leucoma diaphana, Moore; (*b*) small caterpillars, apparently the larva of a Bombycid moth, but as the specimens were decomposed, nothing could be made of them.

(2) *Bombycid Moths.*—In June 1898, the same officer forwarded specimens of moths defoliating sâl in the forest of Dubri.

These belonged to the following species, but as the specimens were so much rubbed and damaged, the identifications are to a certain extent doubtful: (1) five specimens of a moth *Lymantria grandis*, Walk.; (2) one specimen of *Trabala vishnu*, Lef.; (3) one specimen of a moth *Dasychira, sp.*

Casuarina Tree Borer.

In February 1898 the Director, Imperial Forest School, Dehra Dun, forwarded particulars and specimens to the Museum of an insect found boring into casuarina trees in the forest of Nellore.

The worms proved to be the larvæ of a moth, probably one of the Hepialidæ, the specimens being insufficient for further identification.

The following is an extract taken from a report furnished by the District Forest Officer, Nellore :—

"So far as I know, as yet the borer is doing no great damage, especially as the trees are used for fuel and not timber. But in matters of this kind—and the more so in plantations where only one species of tree is grown—it is well to take advice at as early a stage as possible, not only with a view to providing a remedy against the attack itself, but to be on one's guard against other possible complications which may arise from the vigour of the trees being interfered with."

IV.—REVIEWS.

Forestry in H. H. the Nizam's Dominions.*

In order to understand the present position of forestry in Hyderabad, the Administration Report of the Forest Department for Fasli 1307 (1897-98) calls for consideration. In that year three small reserves were created and 13 remained pending. Fire-protection was attempted under very great difficulties. Grazing-fees in different reserves were assimilated to one another; those for reserves being collected by the Forest Department, and those for open forests by the Customs Department. The revenue was Rs.3,67,721, the highest on record, having more than trebled in nine years. The expenditure was Rs.1,28,438, leaving a surplus of Rs.2,39,283. In the year 1307, the mowra revenue in reserves was collected by Revenue officials, and it was not credited to the Forest Department. In spite of every effort, permission to appoint the small newly *sanctioned* establishment could not be obtained within the year, much loss being thereby caused. In justice to the Board of Revenue it should, however, be added that in its review of this statement it points out that sanction was sent in Fasli 1308, after the close of the year 1307.

At the present moment the forests consist of eleven '*Reserves*' and much '*Open Forest.*' In the latter only 16 species of trees are protected, and people generally may help themselves to whatever they please. At least 600 square miles of *open forest* ought to be reserved at once, and every year's delay assuredly means, as the Conservator pointed out, increased loss and difficulty. There are boundary disputes with Jagirdars all round, and settlements are exceedingly difficult to obtain. Some of the best forests have been included in '*Shikar Reserves*,' and the interference of the *shikari* establishment has been very detrimental to progress. The Forest Officers ought to be able to show as good sport as any professional *shikaris*, and the latter should be entirely excluded from reserves, as far as any interference with management is concerned. The Forest Department can provide plenty of cover, but not always in the same places. It is the *shikari's* business to find out where these places are, and how the animals approach them.

The sixteen reserved species are:—

1.	*Santalum album* ...	... Sandal.
2.	*Tectona grandis* ...	... Teak.
3.	*Dalbergia latifolia* ...	... Shisham.
4.	*Diospyros Melanoxylon*	... Ebony.
5.	*Chloroxylon Swietenia*	... Satinwood.
6.	*Hardwickia binata* ...	... Eppa.

* Observations on a perusal of "The Administration Report of the Forest Department in H. H. the Nizam's Dominions for the Fasli year 1308." A. Venoogopaul Pillai & Sons, Printers to H. H. the Nizam's Government, 1900.

7.	*Terminalia tomentosa*	... Nallamaddi.
8.	*Pterocarpus Marsupium*	... Byatal.
9.	*Stephegyne parvifolia*	... Buttigampu.
10.	*Soymida febrifuga* ...	... Somi.
11.	*Anogeissus latifolia* ...	... Dhaura.
12.	*Cleistanthus collinus* ...	... Kodarsa.
13.	*Acacia Catechu* ...	... Sundra.
14.	*Adina cordifolia* ...	... Bandara.
15.	*Schrebera swietenioides*	... Mokub.
16.	*Lagerstræmia parvifolia*	... Chimangi.

Besides these, it has been recommended that the myrabolan (*T. Chebula*) should be included. When sufficient reserves have been constituted, it will be possible to abandon all protected species in open forests, except teak, sandal, dhaura, maddi and eppa.

The people get everything they want free, or at nominal fees, and are exterminating bamboos over large areas. The Board, when asked to introduce restrictions, replies that bamboos are a necessity, and the people must have them; but the Board does not go on to explain where the people are to get them from in the immediate future, and how they will manage about the "must have them" when there are none left in the forests.

The Proceedings of the Board of Revenue on the Annual Forest Report for the year 1307 give a clue to the attitude of H. H. the Nizam's Government. The Board is not absolutely unfriendly to forests, but it is terribly dilatory. It seems to think that while it is holding back from action, the people are also holding back from destruction. It permits its Revenue Officers to defy and act in contravention of its own orders with impunity. The retention in service of the Tahsildars of Edlabad, Gurmatkal, and Chincholi, for instance, is an administrative scandal, and must be interpreted by all to mean either that the Nizam's Government is too feeble to enforce its orders, or not sincere in issuing them. Unfortunately the Nizam's Government can point to a strictly parallel state of things in British India—a fact that is clearly brought out in the *Indian Agriculturist*, * which is not a forest journal.

Jagirdars too are allowed to procrastinate or defy orders in the matter of demarcation. So long as a jagir is not demarcated, even though it contain nothing bigger than the wrist, the jagirdar can sit down at the receipt of custom and issue passes for timber which he knows and intends will come out of the adjoining Government Forest.

There are many thousands of goats in reserves, the property of residents; but in the open forests they are innumerable and browse freely throughout the best areas. The result is deplorable

* Vide *Indian Agriculturist* of May the 1st, 1899.

and disastrous. The Chinur forests used to be quite the best in Bidar, but have deteriorated badly. Bijasal trees, 3 to 7 feet in girth, worth Rs.15 each, were felled by hundreds by herdsmen for fodder during the scarcity, the establishment being quite inadequate to check the evil. The general attitude of the Nizam's Government, in fact, is one of procrastination and obstruction. The Forest Department is not allowed to take the management of forest matters out of "revenue" hands, because the weakness of the forest staff would cause inconvenience to the people. The forest staff cannot be increased, because 43 per cent. of forest revenue is already devoted to forest expenditure! As if that had anything to do with it! Surely, if the Nizam's Government had due regard to its responsibilities, it would see that its duty to the State requires it to spend the whole of the forest revenue, and in all probability even additional subventions, now and for years to come.

Another scandal to which attention must be drawn is one relating to the zamindar of Mallur Mangapet in Warangal. Certain land had been supposed to be the jagir of a Gond, but he turned out to have no claim to it. The land reverted to the State, but the State officials were far from informing the Forest Officers of the matter, though the land was a magnificent forest. On the contrary, the zamindar of Mallur Mangapet, whose land adjoined it, cut every large tree to be found, and was about to sell them when outside information reached the Forest Officers. Damages were assessed at Rs.12,150; but the case has already been postponed three times by the Board, and apparently still remains unsettled; and as the Conservator very naturally remarks, "doubtless the timber has greatly deteriorated."

In Medak and Indur there is a sinful waste of small poles, to the ruin of the forests. It appears that the people tie up the sugar-cane to these poles. About 7,000 poles are required for one acre, and the poles last two or three years. That is to say, that each acre of cane absorbs the total annual production of several acres of forest, which is more than any system of economy can submit to. No less than 214,460 of these poles were sold in Medak alone during 1308 Fasli for the insignificant sum of Rs.1,117 or 1 pie each. In other parts of India, people tie up the cane in bundles like wheat sheaves, to keep it upright; but, no doubt, where poles are to be had for the asking, they are absolutely necessary, in the same way as *rab* is perfectly indispensable in places where there happens to be State forest.

The Chief Engineer for Irrigation in his Annual Report lays stress on the necessity for reserving all the forests on the Medak hills, the gradual denudation of which has led to the silting up of tanks, besides proving prejudicial in many other ways to the interests of Government from an irrigation point of view.

"Nearly five years ago I proposed that the *T. Chebula* (the "myrabolan tree) should be included in the reserved list; but the "question still remains unsettled. I understand that the matter

"was referred to the Subedars for their opinion, which has, "perhaps, not yet been received."

"I much regret to state that the Forest Law, which was "originally submitted to Government some six years ago, is still "unsanctioned. I have repeatedly pointed out how impossible it "is to enforce the rules of the Department aided only by the "Circulars of Government through which the Department is at "present worked, and which do not provide for the punishment "of offenders, who are quite aware of the fact that they can evade "or violate departmental rules with impunity."

Such is Hyderabad administration, and it is difficult to believe that any experienced English forester would agree to serve the State with his eyes previously opened to the existing state of affairs.

Report on Forest Administration in Assam during 1899-1900.

The report this year has been compiled by Mr. J. A. McKee, the Conservator, and sets forth clearly and at considerable length the various directions in which progress has been made during the year under report. There are many points of interest, but space prevents any but the more noticeable features being dealt with.

The area under the Forest Department consists of 3,609 square miles of *Reserved Forest* and 2,062 square miles of *Unclassed Forest*. This seems to be a very large area over which to exercise adequate control, but it appears that of the Unclassed Forests more than half are blank grass uplands, or lowlying treeless areas that by no stretch of the imagination can be considered forests. This being so, and provided there is no necessity for, nor intention of, doing anything with such areas, it would appear to be advisable to remove them from among the lands under the control of the Department.

Settlement made small progress during the year, and much work remains to be done in this direction. The longer this important item is delayed, the more difficult and expensive it becomes, besides hindering to a very great extent the introduction of systematic working of the Reserved Forests.

Much demarcation remains to be done, and far too much importance is being paid to the inspection of reserve boundaries by Divisional Officers. For instance, the Divisional Officer, Kamrup, is said to have inspected personally no less than 270 miles of his demarcated boundaries, and this fact is thought of sufficient importance to include in the report under review. Probably the Divisional Officer would have been more usefully employed inside his reserves, and certainly he might have been better occupied than in drawing up a return showing in detail what he had done in this direction.

Working-plans are confined to small parts of the Garo Hills and Goalpara Divisions. In the latter division the year's coupe yielded some 6,000 sâl trees, which were used for the production of sleepers, but in the Garo Hills the coupe was leased out to a contractor who failed to remove more than a moiety of what should have been cut under the working-plan.

It is said that there is little necessity for working-plans in Kamrup and Nowgong Divisions, as they are all exhausted of timber, and require nothing but protection. It is just such areas which require a working-plan. Even if the plan says that nothing is to be done, it is most necessary to have it, otherwise a new Divisional Officer appears and, differing from his predecessor, straightway commences to cut. If the working-plan says he is not to cut, nor do anything else, he cannot very well go far wrong, and it is to be hoped that this will not be lost sight of in Assam.

During the year there were 361 Forest offences, compared with 347 during the previous year. The number is not large, but this is as it should be in a Province where the agricultural community obtains grazing as well as timber, fuel, and grass without payment from extensive areas of unclassed forest.

Fire-protection in Assam is successful and inexpensive: 619,890 acres were fire-protected (97·6 per cent. successfully) at a cost of Rs.11-12-0 per square mile; but its success in future years will depend to a great extent on the solution of the labour problem, which at present is causing great anxiety among Forest Officers in Assam. In some places the people are now refusing to work at line clearing and other forest works, even when paid the usual daily wage, which has recently been raised to 6 annas per day. The most feasible plan seems to be to make the people understand that their privileges as regards free wood and grazing will be curtailed, or even withdrawn, unless they assist in the measures which are being taken entirely for their own benefit.

"An area of 9,680 acres have been incorrectly exhibited in "recent annual returns as under fire-protection in the Darrang "district, the Divisional Officer now reporting that since 1883-84 "this area has been given up for tea cultivation, and of course "thrown out of protection. It is not creditable to the Forest "Officers who have held charge, or to the office Head Clerk, that a "mistake of such dimensions should have been allowed to remain "undiscovered and uncorrected for so long a time."

The above exemplifies the usefulness of returns, but it is rather hard on the Head Clerk whose draft return has been so often approved and accepted. The report, by the bye, does not state whether the Head Clerk of the Divisional Office is meant, or the Head Clerk of the Conservator's Office, where the return was so often checked, passed and accepted as correct.

The rubber-tapping operations in Assam have already been dealt with at length, and it suffices to say that the operations throughout the year were successful, and that the rubber sent to

London for sale "was the finest stuff ever seen in London from "Assam, and that if it could be delivered in larger quantities and "with regularity, it would realise a price still nearer to the rate "paid for fine Para."

"It has been customary to treat under this head (selection "fellings) the fellings of mature timber in all Divisions, and as pur- "chasers, as a rule, decline to take any but the largest trees available "and are restricted to trees 4½ feet girth and upwards, there actually "prevails a system of rough selection that, perhaps, justifies the "practice."

If this practice is to be considered a selection felling, then it is a system very general throughout India; every license-holder or woodcutter takes the best tree he can find, irrespective of whether it is the one which ought to be cut out or not. The area, therefore, in India under "selection fellings" is enormous, and there is apparently no necessity for the fervent haste which is being made everywhere to introduce working-plans. The Assam Forest authorities cannot, however, take credit to themselves that they are ahead of their neighbours in this respect.

Forest Administration in Hyderabad Assigned Districts during 1899-1900.

The severe and prolonged famine which affected Berar during 1899-1900 has not been without certain good effects, inasmuch as it has proved beyond doubt that a well-protected forest is of the utmost value to the people, and is a great standby in time of scarcity. The Berar forests were the means of not only saving a considerable proportion of the villagers' cattle, but they afforded a means of livelihood to several thousands of people during the months when the famine was at its worst.

During the year the normal work of the Department was greatly interfered with, as the staff were frequently engaged on relief-measures, and expenditure was curtailed in every possible direction. The attention of the Department was greatly given to supplying fodder to indigenous and foreign cattle and, wherever possible, free access was given to the forest for both men and animals.

The area under the Department is 4,176 square miles, of which, 555 square miles are timber and fuel reserves, 89 are grass reserves and 2,531 square miles are grazing reserves. Of this area 725 square miles are already under permanent working-plans, and 3,079 under provisional plans; so that little remains to be done towards placing the whole of the reserves under some sort of systematic treatment. The provisional plans are reported to be satisfactory in the main, and this being so, it should not be a matter of much time or difficulty to introduce permanent plans throughout the Province.

As is almost invariably the case, famine was accompanied by an increase in the number of forest offences and a decrease in the

number of forest fires. The former is to be expected and cannot well be avoided, the latter is a source of congratulation to those concerned.

The demand for grazing was unprecedented and was met to the fullest extent by means of reduced rates and concessions. The grass reserves early in the famine were absolutely cleared of grass, and it was the more valuable reserves, which are not ordinarily open to grazing, that were the means of bringing a percentage of the cattle through a famine the like of which has not been experienced in Berar during the last century.

Apart from free exports of grass no less than 212,074 tons of fodder grass was cut and removed under permit from the various reserves. The departmental operations in connection with fodder grass were also on a considerable scale, but resulted in a very considerable book-loss, but their value as an example to the villagers was very great.

The prolonged drought had a very disastrous effect on tree growth in many parts, and the casualties are said to have been enormous. *Hardwickia binata* and curiously enough teak are reported to have enjoyed comparative immunity.

The Conservator, Mr. Bagshawe, has given expression to his appreciation of the work of most of the officers working under him, and the success of the year's work is an indication of his own administrative capabilities.

State Forest Administration in South Australia for the year 1899-1900.

The annual report upon State Forest administration in South Australia for the year ended June 30th, 1900, has been compiled by Mr. Walter Gill, F.L.S., F.R.H.S., Conservator of Forests. The areas of forest reserves and plantations under his charge total up to 215,434 acres, or 337 square miles; and of this total area, 13,459 acres are "enclosed for planting and encouraging the natural reproduction of trees in the indigenous forests."

Planting operations, in fact, appear to absorb a great deal of the attention of the Department, and with excellent results. The total number of trees planted during the year was 123,113, and of these 70,791 are estimated to be alive, or 57½ per cent. The heaviest losses are attributed to grasshoppers. At Ayers, the grasshoppers are said to have come in swarms and to have destroyed the greater number of trees, leaving only about 20 per cent. to survive. The former invasion took place in 1890, or ten years previously. Rabbits are also responsible for much damage. This pest has increased very suddenly in these districts, and special means are being adopted to check their ravages in future.

The trees planted are *Eucalypti*, *Pinus insignis* and *Pinus laricio*. Some excellent results were obtained with two of the best of the New South Wales ironbarks, *viz.*, the broad-leaved ironbark (*E. siderophloia*) and the narrow-leaved ironbark (*E. crebra*); and the Conservator paid a visit to some of the natural forest of New South Wales in order to obtain still further information regarding these trees by seeing them in a growing state in their natural "habitat," and observing the actual conditions under which they develop in the neighbouring colony.

A good idea of the progress and general condition of plantations may be obtained from the views, reproduced from photographs, given at the end of the report. Two views may be specially referred to, showing wagons loaded with piles felled in one of the plantations started in 1878. "The logs varied from 20 feet to 30 feet in length, were 10 inches in diameter at the smaller end, and contained a volume of from 20 cubic feet to 30 cubic feet per piece, their age being about 22 years." The sale-price obtained was £2-10*s.* per pile.

Experiments were also made with other exotics, notably with the camphor tree (*Laurus camphora*) and with the cultivation of the date-palm; and, indeed, the latter has already passed beyond the experimental stage. The camphor plantation was a complete failure, owing to the hot winds: but of the date-palm an excellent account is given. "I am glad to report," writes Mr. Gill, "that the date-palms in the Far North continue to develop in a most satisfactory manner. Progress has been especially marked in the seedling plantation at Lake Henry, as well as among the Algerian palms planted there. The seedlings are now from 3 feet to 5 feet high; and their general growth has been so uniform that a person working among them can only be partly seen. Many plants of either sex have also flowered. The Algerian palms have made great progress; some are quite 10 feet high. They have developed numerous suckers; and it is anticipated that some of these will soon be strong enough to transplant and thus increase the existing number. Sufficient fruit was borne by one or two this year to show that a fine sample of superior quality may be ultimately expected when they get into full bearing. Unfortunately the only one remaining of the two received from Algeria, which were marked as being male palms, has now turned out to be a female, and it produced a few dates this season. This is to be regretted, as had there been a male of exactly the same kind of date, the use of its blossoms as a means of fertilising the others would have rendered it highly probable that the fruit subsequently yielded by seedlings raised from the dates these palms produced would have shown little, if any, departure from the original excellent type of date. Fortunately, however, a parcel of fruit was obtained from Tunis last year, the dates from which are very similar in character to the

'Deglet Nour' date from Algeria, and as seedlings are being raised from this seed the loss sustained will be somewhat modified."

The total receipts for the financial year ended June 30th, 1900, came to £2,941-16-0, against an expenditure of £5,757-12-3. Salaries of Conservator (£450), clerks, surveyors and foresters came to £1,759-13-7; expenditure on planting and maintaining date-palms in Far North was £300; and in addition £300 were laid out in making improvements to the famous Naraworte Caves; "in the Victoria Cave existing passages and chambers have been enlarged, and three new chambers have been opened up by cutting through the low passages, so that visitors can walk easily through; and in the older caves necessary protection has been provided to prevent disfigurement of the walls, while steps and hand-rails have been provided where needed." In addition, the approaches to the caves have been much improved by the construction of roads; and "some valuable information was obtained regarding the most suitable appliances for magnesian wire, as a result of which a thoroughly good lamp has been secured, which has supplied a want long felt when conducting visitors round the caves." With all these improvements, the South Australian caves, though smaller in point of extent, now bid fair to rival the far-famed Jevolan caves of New South Wales. The Naraworte Caves are said to be quite as beautiful and attractive as those of the better known resort; and they have the advantage of greater accessibility, being situated within an easy hour's drive from the Naraworte Railway Station. This alone should cause them to rank amongst one of the indispensable "sights" of Australia.

V.—SHIKAR AND TRAVEL.

The Story of a Whistle.

Among Central Indian sportsmen, Kathawari will always rank as the king of shooting places, the gem of all the many sporting centres in the Highlands of Central India. Imagine an ancient mango grove, situated on the edge of a thickly wooded stream, just where it widens out into a large deep pool. It is but a small oasis in the midst of a vast extent of jungle, which goes to make up the Bhowarghar forest reserve. On the opposite side of the stream a sheer precipitous cliff rises straight up towards the heavens, crowned by the now dismantled fort of Bhowarghar, for many years an impregnable mountain fastness. Nigh unto the camping ground is the little forest village of Kathawari, the ruler of which is Jabli, the Gond, *shikari*; and with him dwells none other than his kith and kin, all keen sportsmen and real junglemen. Kathawari is, in fact, a Government forest village *par excellence*, and Jabli and his men exercise a despotic control over this

corner of the Government reserve. Upon them devolves the duty of patrolling the forests; it is they who see to the upkeep of the boundary lines, and prevent the commission of offences; and, above all, it is they who most successfully fire-protect these vast areas. Moreover, their jurisdiction extends to an even greater extent over the wild animals of the jungle. With Jabli on one's side the Kathawari forest becomes alive with game; sambher, cheetal, and in the old days even bison, since exterminated by foot and mouth disease, come forth to meet one. A stranger, or Jabli against one, and at once not a living thing appears to ever stir through those forests. But the "*pièce de resistance*," "*the plat du jour*" at Kathawari was invariably tiger. It has long been renowned as the one place in India where tiger is a certainty, always supposing that one visits the place at Jabli's invitation. There are three trees to which the decoy young buffalo may be tied; there are three well-known beats; three trees on which one's "*machan*" may be constructed; and each stop knows his tree. No sooner is one tiger accounted for than a second takes his place. I have seen five tigers in one beat. I have shot seven tigers in one season off the same tree, the same beat. Not only this, but a "*king*" among Central Indian sportsmen, himself, for many years, Jabli's '*ma bap*,' could tell a tale of a severe mauling he received at the hands of two tigers he casually encountered.

Such is Kathawari, and it was with a light heart, already placing a tiger to my account, that I rode up to my tents on the morning of the 17th February 1893. Jabli and his retinue had already gone on to prepare the way, to tie up the three young buffaloes and to do the very necessary *pujas*. I was not surprised, therefore, on arrival, to hear that a tiger had killed during the night, and that the beaters would soon be collected together, and that the *machan* had been tied up to the same old tree. I at once started out with Jabli to prospect. The kill had been dragged into the wood, and a very cursory track round the area only confirmed our conviction that the tiger was lying up, as anticipated.

By this time the beaters had collected together and everything was ready for business. I soon found myself seated on my '*machan*,' the stops were duly posted, and ere long the joyful sound of the beaters came rolling towards me. The *tom-tom*, the ubiquitous kerosine-tin, that deafening din which never fails to send the blood coursing through one's veins, raising one to the seventh heaven of delightful excitement It is one of those things that one feels, but cannot explain; it is bred in the bone and can never be acquired. One often hears the uninitiated exclaim: "What pleasure can there be in sitting on a tree and having an animal driven up to one, to then loose off one's gun at him? Where can the excitement come in?" And, theoretically, this argument is irrefutable. But as soon as a "kill" is reported, and all arrangements for circumventing the tiger have to be made;

above all, as soon as the first shout of the beater is heard, a blissful, indescribable feeling of excitement takes possession of one, and all one's theories on the subject are scattered to the winds of heaven. "Where is the excitement, indeed? Can you not feel it? If not, I am sorry for you. I pity you from the bottom of my heart. You are unable to enjoy one of the passions that go to make life worth living." It is the same feeling which sways all true lovers of the terpsichorean art as soon as a dreamy valse is played. Or, again, it is the same impulse which drove the sporting parson of old, of whom we read—

"The village bells chime, there's a wedding at nine,
And the guests to the Church do repair.
At the altar side by side stand the swain and his bride
And the parson unites the fond pair.
Says he, for your welfare I'll pray,
But regret I no longer can stay.
Now you're safely made one
I must quickly be gone
For I must go a-hunting to-day."

But whilst we have been musing the beat has been approaching, the noise grows louder and louder, and one's excitement has been increasing to fever-heat, so that the whole body is in a quiver. Suddenly, however, the tiger is seen to be advancing stealthily, majestically, through the intervening strip of jungle. Walking along slowly, every few steps stopping to look back in the direction of the beaters. All one's mental excitement, one's fears as to the issue of the contest have now disappeared, and all one's attention is concentrated on the tiger. And, after what appears a multitude of ages, the tiger steps forth, and it is a case of now or never. On this particular occasion the tiger had come out a bit to my right, some 30 or 40 yards away, a lovely shot, but instead of standing, or continuing his slow walk, the tiger, at the critical moment, took it into his head to increase his pace, so that the shot had to be a hurried one. However, the tiger fell over, but before one could say "knife," he was up again and off at a canter. Action and reaction, so we are told, are equal and opposite, and the momentary dejection which followed the excitement just previously experienced, was painful to a degree.

It was, however, only momentary, for soon the beaters came alongside, and the *shikaris*, and my blood was up again. Revenge is sweet, and there was no thought left but for the blood of that tiger: and blood there was plenty about. So before long we were all tracking merrily along, hoping against hope that we should come on to the tiger at any moment. The tiger had taken a line over the hills. There was a dense crop of high grass, but otherwise very few trees, just a few scattered Boswellias and little else. And so we tracked along mile after mile, once or twice there was a "hurrush" and a glimpse was caught of the tiger disappearing over the crest of the opposite slope; but never a shot could be fired. After going along in this way for some three or four miles we found that the tiger had entered a deep, shady ravine, holding

water, forming a sort of well at this spot. It was very narrow, the hills rose up fairly steep on all sides of it, and the thickly covered portion of the ravine, in which water was to be found, was only a few hundred yards in length. There was no doubt then that the tiger had taken refuge in this haven, and Jabli at once suggested that I should go and sit up at the opposite end, whilst he would beat the tiger out. Accompanied by a couple of men, an assistant *shikari* and a beater, I accordingly made a long detour, and soon took up my position on the banks of the stream. I myself sat behind a bush on the edge of the stream where the bank was fairly high, whilst the two men were safely ensconced at the top of the biggest trees some little way behind me. Then the beat began.

It was not long before I saw that the time for the accomplishment of my "vendetta" had come. The tiger was walking into the trap set for him. He would soon be at my mercy. These were my thoughts as the tiger stepped out some 150 yards from me, looking very sorry for himself. He seemed to be dragging himself along with difficulty. There he stood for a moment in the middle of the stream, looking back in the direction of the beaters, merely prolonging the agony. Just at that moment a shrill, suppressed whistle broke out behind me, the tiger turned his head in my direction, a second whistle, and away went the tiger off round the corner and out of sight. It takes many minutes to relate, but it all passed in the flash of a moment. There was no time for a shot. I stood mute, dumb-founded; for a moment I was speechless with vexation and disappointment; then the floodgates of heaven were flung wide open, and a mighty torrent of choicest invectives descended upon the head of that poor grovelling worm and his relatives unto the third and fourth generation. *Fiat justitia, ruat cœlum* is the motto of my up-bringing. Justice was done, and the heavens thundered forth. "Saheb, I thought you had not seen it," was all the miscreant could utter.

And now the beaters came up; they had not seen a sign of the tiger. The shades of night were fast descending; nothing more could be done. And as we wended our weary way home, sad at heart, broken in spirit, dejected, full of disappointment, bursting with an unquenchable fire of anger, ever and anon a mighty oath would rend the air. Then, and for many weeks after, terrible were the curses that were hurled at the head of that whistling mass of iniquity.

"In holy anger, and pious grief,
He solemnly cursed that rascally thief!
He cursed him at board, cursed him in bed;
From the sole of his foot to the crown of his head;
He cursed him in sleeping, that every night
He should dream of the devil, and wake in a fright;
He cursed him in eating, he cursed him in drinking,
He cursed him in coughing, in sneezing, in winking;
He cursed him in sitting, in standing, in lying;
He cursed him in walking, in riding, in flying,
He cursed him in living, he cursed him in dying!—
Never was heard such a terrible curse!"

Next day a careful search was made, and again the day after; but nothing was evermore seen or heard of that tiger. It is presumed that he probably entered some fissure in the rocks, and there died a useless, worthless death—*Requiescat in pace.*

AMALTAS.

Mahseer Fishing.

With the object of acquiring knowledge as to the most favourable hours at which to catch mahseer, I have kept a record during the past year of the fish I have killed at different times of day. If some of your other readers will do the same, and will ask you to publish the results, we shall in time have some definite information on the subject.

My fishing was all done during February and November in the big rivers of Upper India, and almost all of it was by casting from the bank, the rest, less than 5 per cent., having been by trolling from a boat. In all, I was on the water sixteen days, or parts of days, and was actually fishing for a period of 80 hours. The biggest fish caught was 20lbs. in weight, and the smallest was 1lb. The following table shews the results :—

Time of day.	Hours spent fishing.		Number and weight of fish killed.		
	Blank days.	Successful days.	Number.	Weight.	Average weight of fish per hour.
Before 10 A.M. ...	1½	7½	4	16	2·1 lbs.
10 A.M. to 3 P.M. ...	13½	29½	26	197	6·8 „
After 3 P.M. ...	5½	22½	11	81	3·6 „
Total ...	20½	59½	41	294	...

It is generally held among fishermen in India that the middle of the day is the worst time to fish, but these figures tend to shew that this is not the case.

I would add that I fish with an 18' salmon rod and fine tackle, all of my fish having been killed on single salmon-gut, and most of them on "fine" trout line. Of the 294 lbs., 39lbs. were killed with a fly spoon, cast overhead; 227lbs. with an "ordinary" spoon, and 28lbs. with a phantom. I used no dead or live bait, because it was not procurable, and no "hogged" spoons, because I do not believe in them, save in slack water.

PISCATOR.

VI.—EXTRACTS, NOTES AND QUERIES.

Forestry in the Andamans.

A very interesting ceremony took place on January 21st in the public inauguration of the first steam tramway in the Andamans. The line is to run from Kadakachang on Brigade Creek at the north end of Port Blair harbour, seven miles north, until it reaches Shoal Bay, the first creek on the coast north of Port Blair. The object of the steam tramway is to convey Forest Department timber, which is now cut around Shoal Bay Creek, to Port Blair, where the finer "padouk" logs are cut into squares, and shipped to the London market, and the timber unfit for exportation is sawn up and devoted to the needs of the settlement. The day was a local holiday, and various launches conveyed the officials of the settlement to Kadakachang, from whence they proceeded on trolleys along the first two miles of the steam tram line to Wimberleyganj, where a building had been erected for the reception of the officials. The building had been tastefully decorated with flags and palms, and presented a most gay and picturesque appearance. The day was a delightful one, fine and cool, although the night before one of the sudden storms, to which residents in Port Blair are accustomed at all times of the year, had broken with its usual force, and it must have required the hardest work on the part of Forest Department officials to have prevented the decorations from being spoilt, and the whole place from being turned into a morass. The convict band was in attendance, and Port Blair was altogether *en fête*. At 11 A. M. the Chief Commissioner, Colonel Temple, drove up, and entered the marquee and ascended the platform. Mr. R. L. Heinig, the Deputy Conservator of Forests, then read an address, which had been tastefully printed on pink silk, thanking Colonel Temple for kindly consenting to open the steam tram line, and giving a history of the tramway operations in Port Blair during the last ten years, and explaining the present extension. At the close of his remarks the address was presented to Colonel Temple in a handsome silver casket designed in the shape of a log of padouk. Colonel Temple replied as follows:—

"MR. HEINIG AND GENTLEMEN,—Four years ago I had the pleasure of meeting and addressing you on the occasion of the opening of the Chatham Saw Mills, which marked a distinct advance in the progress of the Andaman Forest Department, and I need hardly tell you that it is with still greater pleasure that I meet you all here to-day to mark yet another advance in a department which is of such vital importance to the welfare of the Settlement. And I take this opportunity of repeating here what I had said on the former occasion at Chatham Island,—that it is to the Forest Department we chiefly look for making the Settlement eventually entirely self-supporting. Every step forward, therefore, to that

end is a matter of congratulation to all concerned with the local administration. The establishment of the Chatham Saw Mills effect a permanent saving in labour in converting the timber extracted from the local forests, and enabled us to send to the London market their exceptionally fine products with a greatly increased measure of profit and success. The establishment of the Wimberleyganj Steam Tramway will effect a permanent saving in labour in extracting forest produce, and will, therefore, achieve a further advance in the same direction. I need hardly remind many of those I am addressing to-day that all labour-saving apparatus is of importance here. Our labour supply is strictly limited, and there is so very much to do with it—so very many unavoidable things which must be done—so many which we have no choice but to do—that if we would achieve an advance in any direction of convenience or utility one can think of, we can only achieve it by devising or adopting some means of saving labour. Mr. Heinig has told you that I have all along fostered the particular scheme we inaugurate to-day. This is the reason for my action.

"In furtherance of the views I have to-day expressed, I would like to impress upon all the officials of the Settlement the urgent necessity here for devising labour-saving apparatus or schemes. I hardly know of any better service that any of you can perform beyond your fixed duties to the Government you serve, than in putting forward and pushing through to a successful conclusion a workable scheme for saving labour. I say a workable scheme advisedly, for I need hardly point out that nothing is easier to propose and in the end more unprofitable than an unworkable scheme. But if my remarks to-day result in firing the clearer heads among you to make proposals for saving labour that can be put into practice, this meeting will, on that account alone, not have been held in vain.

"We have just heard a short history of the tramway operations in Port Blair during the last ten years. Between 1890 and 1894 we purchased seven miles of line, which have been set up in three different localities in succession as the need arose, and now we are about to set up seven miles more, with this difference, that the first seven miles were worked by men and cattle, whereas these are to be worked by a locomotive. Now, I have been personally over all the lines that have been made, and can testify to the difficulties that have had to be overcome—difficulties that in the present instance have been enhanced by the necessity for providing easy gradients and curves and a good road for the locomotive. Some of you may remember that in my address on Chatham Island I congratulated the officials here on their self-reliance, their capacity for overcoming difficulties without assistance from outside, their power of adapting themselves to whatever work might be placed before them. The making of these tramways is, I am glad to say, another instance in point. As so many of us well know, it is no easy matter to align a road of any

sort—let alone a rail-road—through a jungle so dense as that of the Andamans, and yet, without asking for any assistance from experts whatever, it has in every case been done well enough for our practical needs. In congratulating Mr. Heinig, Mr. Buchanan, and Mr. Anderson on their share in these constructions, I have great pleasure in expressing my pride that this remote Penal Settlement should be so self-contained—that when the need arises, or the Government of India desires, I am able to say that the work required shall be done, knowing that with the help of those around me, there is no need to demand designs or plans or instructions, because between us the work will be carried through, whatever it may be—a huge building, a tunnel into the sea, a church, a tall chimney, a large reservoir for water, a railway, or a bridge.

"But, gentlemen, we must not stay our hands in order to find time to think back upon past achievements. A place like Port Blair cannot stand still, and we must be always doing. The Forest Officers here know well enough that the short line of steam tramway we are inaugurating to-day is but the mere beginning of one that will in due course have to be many times longer. And so it is with everything that we have to do. We must go on. As most of my hearers know, the demands of the Government of India during the last decade upon our ingenuity, our capacities, our power of work, have been very great, but in the decade to come they will be greater still. There is going to be no rest, and I ask you all to meet the demands that are coming as you have met those in the past. What may be called the second generation of those who have had the making of the Penal Settlement is fast passing away, and before long the whole will have left us. It has fallen to that generation to raise the Settlement out of its first beginnings, to bring about the great penal system that has been left to you to carry on, to construct the many works of which you have the benefit. And in speaking to the rising generation, before which are many years of service here, I would ask them to take stock of the houses they live in, the conveniences at their doors, the roads they travel over, the fields they travel through, the minutely regulated penal system they administer, and then think of what the old generations have done for them, and how well they served the Government that sent them here, with appliances far more meagre than now exist, and material and physical difficulties far greater. If you, younger officials, will ponder these things and profit by them, there can be no doubt that coming from the same race and made of the same stuff, you, too, will so bear yourselves in your time that it may be said of you, as it can be said of those now passing from us, that in these islands they have changed the face of the earth.

"And now, gentlemen, I will detain you no longer than to express my satisfaction at hearing from Mr. Heinig that Mr. Viney has cordially given him valuable assistance, and that good

work towards the present undertaking has been performed by the Deputy Rangers, Hassan Ali and Mohan Lal."

The close of the Chief Commissioner's speech was greeted with applause, and Mr. Man, Deputy Superintendent, called for three cheers for Colonel Temple, which were heartily given. After the locomotive had been inspected, all present adjourned to the Forest Bungalow at Wimberleyganj, where the whole station was hospitably entertained to breakfast by Colonel Temple.

A return by trolley and launch was made about 2 P. M., after a most interesting day.— *Pioneer.*

Development of Forestry in the Soudan.

The Anglo-Soudanese Government has taken up the question of the development of the vast Soudanese forests, which may be a very possible source of future wealth, and an export in forestry from Burma has been appointed to study and report on the best methods of introducing improvements and utilising this potential source of wealth. Mr. C. E. Muriel, Deputy Conservator of Forests in Burma, has, with the consent of the India Office, joined the Anglo-Soudanese Government for one year, the unexpired portion of his furlough. Mr. Muriel arrived in Cairo on Wednesday from England, and will shortly proceed to the Soudan.

Sir William Garstin, in his report on the Soudan, says :—

"It is very much to be hoped that a scientific examination of the Soudan forests may ere long be carried out under the superintendence of an expert. An Indian Forest Officer (from Burma for choice) might be deputed for this purpose. It is certain that much valuable information would be obtained from his report. Such an appointment needs no recommendation—its necessity is obvious. A trained Forest Officer could, moreover, render good service by advising the Government as to the best method of preserving the valuable fuel-supply which at present exists on the banks of both rivers."

Although it is only a little over a twelve month since the report was published, the advice has been acted upon, and it is to be hoped that some serious attempt will be made to restrain the enormous waste of most valuable trees that now goes on. The supply, although apparently inexhaustible, must speedily diminish, unless the cutting and felling of the areas is carried out upon some regular system which will permit of the young trees growing up and replacing those cut down. It is, of course, inevitable at present that the felling should be carried out in a wasteful manner. Fatigue parties are landed from the boats and are required to cut the largest amounts of wood in the shortest possible time. The men have no idea of the value of the trees, and naturally select those which are nearest to the water and easiest cut. Should this practice be continued, it is certain that a few years must see a great diminution in the belt adjacent to the river. On the Blue Nile, even the valuable gum-producing acacias are being felled for fuel.

The vast forests of the Soudan line the banks of the Upper Blue Nile and extend, in an easterly direction, to the Abyssinian frontier. In the Bahr-el-Ghazal Province also, particularly in the Bongo country, large forest tracts exist. The ebony tree (*Dalbergia Melanoxylon*) is met with south of Karkanj, on the Blue Nile, and again in the vicinity of the Sobat River. This tree does not, in these latitudes, attain to a very large girth, nine inches being apparently its maximum diameter. It must, however, be very common in these forests, as most of the principal houses in Omdurman are roofed with it. The vale of the Acacia Arabica, from which the white and red gum is obtained, is well known; while the other kinds of acacia, such as Acacia Nilotica (in Arabic, "Santh"), is the chief source of the fuel supply. The bamboo is met with in the ranges of hills to the south of Famaka, and, according to some, the mahogany tree is found in the forests round Fazogl and in the Beni Shangul country. The means of transporting such woods can only be by the river. Unfortunately neither the ebony nor the acacia will float in water, and, therefore, such transport is debarred in these cases. If a good and serviceable timber tree can be discovered in the Blue Nile forests, which can be floated down the river to Egypt, a large source of revenue will undoubtedly have been found. Extensive saw-mills might be erected at Assouan, utilising the power available at the dam, now under construction, and an important timber trade might one day rise.

On the White Nile, in the Bongo and Rohl districts, the India-rubber creeper (*Landolphia floribunda*) is found in great profusion. If the rubber yielded by this creeper be not of quite so good quality as that obtained from the India-rubber tree (*Ficus elastica*), it is still of sufficient value to be counted as an important asset in the future trade of the Soudan. This plant, which has large laurel-shaped leaves, and a white flower resembling a jasmine, requires several years to mature before yielding rubber in any quantity. The natives obtain what they require by tapping the stem, usually in such a reckless manner that the creeper dies under the operation. The India-rubber tree should certainly flourish well in most parts of the Soudan, more particularly south of Khartoum. Although this tree takes from twenty to thirty years to arrive at a girth sufficient to permit of regular tapping, its yield is so valuable (about 3l. per tree per annum), that its introduction into the country is well worth attempting. The above brief resumé fully shows the necessity of beginning a careful study of Soudanese forestry. It will be long before the Soudan will have a Woods and Forest Department organised on the Indian model, but the Anglo-Soudanese Government is to be congratulated on having secured the services of an expert, and we shall look forward to Mr. Muriel's report with great interest.—*Egyptian Gazette.*

[We are glad to be able to inform our readers that Mr. C. E. Muriel, I.F.S., is writing an article on his experiences whilst exploring the Soudan forests, for publication in our Magazine.—HON. ED., INDIAN FORESTER.]

A Year's Botanical Work in Madras.

In prescribing a revised Agricultural Department for Madras, the Government of India sanctioned a Government Botanist for that Presidency, and limited his term of office to five years, after which his services were to be made available elsewhere. The chief aim of his work was to make a systematic survey of the flora of the South in consultation with the Director of the Botanical Survey of India, in order that the work may be co-ordinated to the requirements of the latter's Department, and in furtherance of a programme of collection of specimens to be made for the Indian Museum and Imperial Institute, also to advise on subjects connected with economic botany. The officer loaned to Madras for this work was Mr. C. A. Barber, and his first complete year's work is recorded in full in the Operations of the Land Records and Agriculture Department of Madras for the official year 1899-1900. During the period Mr. Barber travelled from Tinnevelly to Ganjam, and made collections in seven Madras districts, adding some 2,000 specimens to the Herbarium at Ootacamund. His economic work, which was made subordinate to that of the survey, consisted of investigations into diseases affecting the sugar-cane plantations and sarghum fields and the causes of the alleged deterioration of the ground-nut trade of Madras. Among smaller matters in the same direction, he examined the parasites said to attack the roots of the older cinchona trees on the Nilgiris, and the presence of elivorius among seedling plants in the tea estates of the Wynaad, which Dr. Watt regarded from an alarmist point of view during his recent tour in the south of the Peninsula.

Economic work is undoubtedly the legitimate occupation of a Government botanist, but as the chief reason for his engagement in the present instance was the completion of the Imperial Botanical Survey of Southern India, he necessarily devoted most of his time and attention to the latter. But the experience of the year has shown that the collection of specimens may be carried on with equal efficiency by an Assistant, and it is, therefore, in contemplation to provide Mr. Barber with such an Assistant, after which he will be in a position to carry on both branches of his work simultaneously. Considering the great attention now paid to economic botany in all parts of the world, and the increasing keenness of competition in such industries as tea and coffee, much useful work can be done in this Department, and it would be a mistake to treat it as of secondary importance as first intended.

In the Department of Systematic Botany, Mr. Barber made excursions during his travels into the evergreen, the mixed and the deciduous forests of Madras, and thence obtained valuable additions to the Herbarium, and to the knowledge of the plants of the Presidency. He investigated the desert and the sea-side flora as well, thus covering a great variety of country, and collecting

the growths of all times of the year. Referring to what he gathered in the extreme south, he remarks upon the interesting fact that several plants of the island of Ceylon were met with on the mainland adjoining which had not previously been recorded for Southern India. The leafless sal forests, too, further inland and northward, that so exclusively take possession of the soil to the exclusion of undergrowth, yielded him as many as a dozen plants new to the Peninsula – the more striking this because the same ground had been worked over for a much longer period than he found it possible to devote to it by so competent a botanist as Mr. Gamble.

What little has been already done in such widely different regions, Mr. Barber thinks is promising, and he hopes that a fuller exploration of intermediate tracts will produce results of high scientific value. In the west and south of the Madras Presidency, Mr. Barber remarks there are masses of country practically unexplored which will afford him occasion for many visits at different times of the year. The actual work of classifying the 2,000 specimens he has collected in the field has not, he says, made great progress. This lot alone he estimates will fill 6,000 sheets, and as no more than 25 sheets at present can be examined and added to the Herbarium per diem, it will be seen, he thinks, that his work indoors is cut out for him for some considerable time.

The year has been one of much sickness among his working staff, all but one having suffered from malarial fever contracted by going into jungles at unhealthy seasons. He hopes in future, however, to have men habituated to the unhealthy tracts in which his work will be conducted, and thus to escape the hindrances he has experienced from this cause. Another difficulty to his work, to which Mr. Barber adverts, is the want of a good botanical library at Madras—similar to the one that exists at Calcutta. He deplores the fatal mistake made at the time, of permitting the late Mr. M. A. Lawson's library to be dispersed. A complete set of works on Indian Botany might have been secured had the Madras Government taken possession of the effects of the deceased; but the opportunity was lost, and the work of reconstructing a library of reference has now to be undertaken which will necessarily be slow, and retard much useful work meantime. It is of little use to have an excellent Herbarium, as the one at Ootacamund is fast becoming, unless it is supplemented by a good library. The Herbarium, however, has its use, but its errors, which cannot be avoided, cannot be rectified unless resort can be had to final reference in the form of a complete and efficient library. Mr. Barber, in speaking of errors in the Ootacamund Herbarium, the work of the late talented botanist, is careful to prevent any reflection upon the memory of Mr. Lawson, without whose labours, he says, the confusion in it would have been infinitely greater; as the alteration of a single specimen from one cover to another frequently entails hours of study and patient effort.

To prevent errors arising from the accumulation of difficult specimens from which the "plums" in the shape of new species may be expected to be drawn, Mr. Barber suggests that he should be allowed to make annual visits to the Government botanist at Calcutta. This is an excellent suggestion and one sure to be sanctioned, since the Madras Government has already assented to the principle of such visits.

Not the least interesting of the enquiries conducted during the year by Mr. Barber is that of the grasses of this country. He says that he entered into a correspondence with the Agrosolologist of the United States Department of Agriculture, and obtained from him specimens of some 180 named North American grasses, some of which being adapted to nearly all the countries of the world, from the sand-binding species of tropical seashores to those forming the verdure of temperate meadows, should have representatives in India. About 50 specimens of grasses have also been received from Mysore which enrich the Herbarium collection. As most of Mr. Barber's enquiries made into economic products have already appeared in the form of bulletins, it is not necessary to reproduce this part of his Report in this article. Enough has been adverted to, to show that Madras has in Mr. Barber a valuable acquisition—and that his labours are bound to prove of great scientific value to the Department of which he is a member.—*Pioneer.*

California's Big Trees.

The Forester of the Department of Agriculture, Mr. Gifford Pinchot, has just written a most interesting account of the "Big Trees" of California and the danger which menace them. Before the glacial period the genus called Sequoia flourished widely in the temperate zones of three continents. There were many species, and Europe, Asia, and America had each its share. But when the ice fields moved down out of the North, the luxuriant vegetation of the age declined, and with it the multitude of trees. One after another the different kinds gave way, their remains became buried, and when the ice receded just two species, the Big Tree and the Redwood survived. Both grow in California, each in a separate locality, the Redwood occupying a narrow strip of the coast ranges ten to thirty miles wide, and extending from Oregon to the Bay of Montery. The Big Tree (*Sequoia Washingtoniana*) is found in small groves scattered along the west slope of the Sierra Nevada Mountains. There are ten main groves or groups of trees, and the number of specimens figures up some thousands, but only 500 are remarkable for their size.

The Big Trees are unique; they are the oldest living thing, and are the most majestic of trees, and are extremely interesting from a scientific point of view as being the best living examples

of a former geologic age. Their vitality is remarkable, the fungus is an enemy unknown to it, and the best specimens have been found to be sound at heart when felled. These great natural curiosities have only been able to hold their own by reason of favourable climatic conditions. The Mariposa grove is the only one which may be said to be entirely safe, and most of the other groves are being destroyed. The finest of all, Calaveros Grove, which has the tallest trees, has been bought by a lumberman. The Sequoia and General Grant National Parks are eaten into by private claims. In brief, the majority of the trees are owned by men who have the right, and in most cases the intention, to fell them.

The Calaveros Grove was discovered in 1841 by John Bidwell, and by 1870 the majority of the big trees had been located. One of the largest examples in the Calaveros Grove was cut down in 1853; the bark was 15 to 18 inches in thickness, and after stripping this off the diameter of the trunk was found to be 25 feet at a height of 6 feet above the ground; it was 302 feet high. It was found to be impossible to fell it by ordinary means, so the trunk was bored by pump augers of large diameter. This occupied twenty-two days, five men being employed, and at the conclusion of their labours it was found that the tree would not fall, so two and-a-half days were consumed in driving in wedges; the men then retired for dinner, and a gust of wind blew it over, nature apparently wishing to prevent the hand of man from consummating this last act in a great tragedy of the forest. The bark was used to form a room in the old Crystal Palace at South Kensington. A cotillon party of thirty-two persons danced on the stump. Another tree, called "The Mother of the Forest," was 321 feet high and 137 feet to the first branch. It is estimated that there were 532,000 feet of sound inch timber in the tree. The "Father of the Forest" was about 400 feet high when standing, and its circumference at its base was 110 feet. A number of the living trees have been named, and most of them are marked with marble tablets.

There are 1,380 Big Trees in the Stanislaus or South Calaveros Grove, including "Smith's Cabin," in the charred hollow of which a trapper lived for three years, and where he occasionally also stabled his horse.

The "Canal Boat" is a decumbent tree. The upper side and heart have burned away; in the bottom thousands of young big trees have started. In the Mariposa Grove is a tree through which a road has been cut.

Unfortunately, the Big Trees are exquisitely proportioned, and are the noblest specimens which the botanical world can offer, and for this and by reason of their extreme age, they ought to be protected from Vandals. Many of the Big Trees are estimated to be 3 600 years old, and 4,000 rings have been counted. Under the most favourable conditions these giants probably live

to be 5,000 years old, and even more. They seldom die natural deaths; they seem to be exempt from the diseases which afflict other trees. Their worst enemy is man, then comes fire, lightning, storms, and the giving way of the ground on which they stand.

Fossils show the Big Tree to be the remnant of a once numerous family, it is a direct or collateral descendant of ancient species. Their ancestors formed a large part of the forests which flourished throughout the Polar regions, now desolate and ice-clad, and which extended into the low latitudes of Europe. The natural reproduction of the tree is slow, and the preservation of the race is dependent on maintaining the present groves intact. The Big Tree rejoices in five names, which have been given to it at various times; Sequoia Washingtoniana, however, which was proposed in 1898, will probably be the name under which it will be known. The big tree has been introduced into England and the Continent, and while it has done well, it shows that the existing climates do not suit it, and the Sierra forests need fear no rivals. It has been occasionally cultivated in the Eastern United States, where it does not flourish. There are two trees 35 feet high in a nursery at Rochester, N. Y.

The lumbering of the Big Tree is very destructive. The enormous size and weight of the tree naturally entails considerable breakage, and the brittle trunk is liable to be smashed by any inequalities in the ground. The loss from this cause is great, but it is only one of the sources of waste. The great diameter of the logs, notwithstanding the lightness of the wood, causes their weight to be so enormous that it is impossible to handle many of them without breaking them up. For this purpose gunpowder is used, and the fragments are often of wasteful shapes, and unless great care is used in preparing the blast, a great deal of the wood itself is scattered into useless splinters. At the mill, where waste is the rule in the manufacture of lumber in the United States, the big tree makes no exception. This waste, added to the other sources of loss, makes a total probably often considerably in excess of half the total volume of the tree. The big tree also stands, as a rule, in a mixed forest composed of many species, and the destruction caused by the fall of one of the enormous trees is in itself great, but the principal source of damage is the immense amount of *débris* left on the ground, a certain source of future fires. This mass of broken branches, trunks and bark, is often 5 or 6 feet thick, and necessarily gives rise to fires of great destructive power, although the Big Tree wood is not specially inflammable. The devastation which follows such lumbering is as complete and deplorable as the untouched forest is unparalleled, beautiful and worthy of preservation. Fortunately, much of this appalling destruction has been done without leaving the owners of the Big Trees as well off as they were before it began.—*Scientific American.*

Sport in Ceylon.

"*Sport in the Low Country of Ceylon*," by MR. ALFRED CLARK, of the Forest Department (A. M. and J. Ferguson, Colombo) is not the first work that has been written by this author, who combines a free literary style with a trained *shikari's* hands, eyes and instincts. The book is divided into 23 chapters dealing with every description of sport in the low country, the Game Laws, hints and "don'ts"—together with an Appendix. The book is most interesting from beginning to end, and though the author presents it to the public with the diffidence that becomes a true sportsman, he is well fitted for the task of explaining how and what sport is to be had, in that he has spent some twenty-five years in the forests he loves, and must necessarily have been in a good position to observe the habits of wild animals and birds, and learned the best, pleasantest and cheapest ways of obtaining sport. There are four full page illustrations "adapted" from photographs, in three of which the "adaptation" is very evident in the ghostly beasts which are depicted on the point of being shot. There is one hint which may be useful to those who are lost in the jungle, and that is, when you have exhausted your cartridges in firing off signals of distress at intervals, try blowing through the barrel of your gun, or rifle, using it as a horn. The art is not very difficult to acquire, and the sounds so emitted are audible on a still night a mile or two away. We need hardly say that a sportsman should invariably carry a compass, which can be "read" at night, one-half of the revolving plate being coloured black, and the other white. When night-bound in the trackless forests, it is useless to continue your efforts to find a way back to camp, for it is a hundred to one that you will go wandering about in circles, and become exhausted with fatigue, anxiety and thirst. MR. CLARK says it is much better to resign yourself to the prospect of a night in the forest, and to trust to your friends or followers to hunt you out the next day. Send your *shikari* to the top of the highest tree, and there let him fire signals of distress at fixed intervals, and when, as stated above, the cartridges are exhausted, sound the rifle-bugle as loudly as you can. If help does not come soon, await with composure the break of day ; light a big fire, and if you hear rain approaching, strip to the skin and place your clothes in the hollow of a tree, under a big stem, or in some other comparatively dry place, "for it is safer and less disagreeable to stand naked in the rain for a time than to spend the night in wet clothes." When rescued, take the earliest opportunity of having a hot bath, swallow a good big dose of quinine, followed by a long sleep, and the probabilities are that you will be none the worse for your night in the jungle. The book is full of useful "tips," and we can strongly recommend it to those who intend shooting in Ceylon, and in fact to all sportsmen.—*Madras Mail.*

VII.–TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

March 4th, 1901.

EAST INDIAN TEAK.—The deliveries for February amount to 1,258 loads as compared with 781 loads in February last year, making for the two months of 1901 a total of 2,073 loads against only 1,299 in the same period of 1900. There has been no change in prices, but this increased activity is welcome. Floating cargoes continue to be more difficult to sell at extreme market rates than for some time past, the only reasons adduced being the reduction in the prices of other shipbuilding material. Sellers are, however, unwilling to accept the analogy, inasmuch as there is no visible increase in the supplies, and a reduction in the cost of shipbuilding should stimulate the demand for Teak rather than the contrary.

ROSEWOOD—EAST INDIA.—No sales have been made, and stocks are more than sufficient.

SATINWOOD—EAST INDIA—Continues to arrive much too freely, and stocks are now rather heavy, with a very quiet demand.

EBONY—EAST INDIA.—Is asked for and would sell well.

PRICE CURRENT.

Indian Teak, per load	...	...	£10-10*s.*	to £16-10*s.*
Rosewood „ ton	...	...	£5	„ £9.
Satinwood „ square foot...		...	6*d.*	„ 12*d.*
Ebony „ ton	...	...	£9	„ £13.

Denny, Mott and Dickson, Limited.

WOOD MARKET REPORT.

1st March, 1901.

TEAK.—The landings in the London Docks during February consisted of 1,032 loads of logs, and 474 loads of planks and scantlings, or a total of 1,506 loads, as against 1,648 loads for the corresponding period of last year. The deliveries into consumption were 495 loads of logs and 501 loads of planks and scantlings, together 996 loads, as against 814 loads in February, 1900.

The Dock stocks at date analyse as follows:—

8,468	loads of logs, as against		7,140	loads at the same date last year.			
4,907	„	planks,	„	2,914	„	„	„
—	„	blocks,	„	7	„	„	„
Total 13,375	loads			10,061	loads „	„	„

The market has been very steady, as although the demand has lacked volume and landed stocks are ample, it is recognized that shippers are giving practical proof of their belief in prices by

shipping so sparingly to this market, being content with their Eastern market rather than depress f.o.b. prices by shipping more than is fairly needed to meet the likely European demand. If this policy is persevered in, any falling off in consumption should have little, if any, effect on prices, and steadiness will be the prevailing feature in Teak for all this year.

Business during February has shown appreciable improvement on that of January; but the present demand for consumption still lacks breadth, and the impression that the pendulum of trade is on the downward swing is deepening, notwithstanding the apparent contradiction to this view indicated by the Board of Trade returns for January.

Corrigenda, Vol. XXVII., March No.

Page	125,	last	line,	for 'Keating read 'Keatinge.'
„	129,	lines	6&28,	„ '*Heriticra*' read '*Heritiera.*'
„	„	line	28,	„ '*Periops*' read '*Ceriops.*'
„	130,	„	13,	„ '*Lagerstömia*' read '*Lagerströmia.*'
„	131,	„	6	from below, for 'Stap' read 'Stapf.'
„	„	„	4,	„ „ „ '*Cherizandra*' read 'Chorizendra.'
„	132,	„	4,	after '*Phyllanthu's*' insert ',' and for '*Cherizandra*' read '*Chorisandra.*'
„	143,	„	26,	for 'Mayelat' read 'Myelat.'
„	„	„	37,	„ '*Docinia*' „ '*Docynia.*'
„	148	„	34,	„ '*calcusata*' „ '*calcarata.*'

THE

INDIAN FORESTER.

Vol. XXVII.] June, 1901. [No. 6

Some First Impressions of an Indian Forester in Upper Burma.

By S. E. W.

It is easy to understand that the Forest Officer fresh from Cooper's Hill College arriving in Upper Burma on his first visit to the East, should be enraptured with the beauty of scenery and vegetation, and interested both in the new manner of life and in the other novelties with which he is surrounded. He lives an unfettered and peaceful life in the open air outside the stress and hurry of existence further West; he becomes accustomed to the equable, if unhealthy, climate; and he enjoys the feeling of superiority as he roams, the sole representative of European civilization, amongst the simple and respectable inhabitants of the jungle villages. He even adopts some of the customs of the country, and is influenced, perhaps insensibly, by the natural train of thought; in particular, is he prejudiced against the native of India—with the Burman a not unnatural sentiment when regarding the members of a race who were employed in the annexation of his country, who continue to garrison it, and who, thanks to their superior industry, may probably in the future people it,—a sentiment, however, without excuse in the case of an European who has no knowledge of the poor Indian beyond that gleaned in intercourse with his own domestics, generally taken from a class of men who would, with difficulty, find employment in India, and yet here command high wages. This misdirected dislike to the inhabitants of an unknown country has as its natural sequence a distaste to the country itself, and after a few years'—in very pronounced cases a few months'—residence in Burma the young official sturdily resents every attempt at uprootal from the locality of his first introduction to Eastern life. There can also be no doubt that the change at first would be sufficiently startling to him!

Let us consider the case from the other point of view. An Indian forester is suddenly transferred to Burma; for years he has been accustomed to tour the forests with what he there considered to be the bare necessities of his life and position, with two sets of tents, with horses, elephants, with a full complement of servants; there he prided himself on the simplicity of his surroundings; he finds it here to be unattainable luxury. His charge in India was more or less in working order: there was a suitable subordinate staff, roads, wells and working-plans; there was shooting, perhaps a little fishing; it was in the day's work to ride, well mounted, 20 miles or more in a morning to see that fire conservancy arrangements were in order, to visit the fellings and other forest operations in which he took a personal as well as a professional interest. He arrives in Burma; his charge is ten or even twenty times as extensive as in India; there is no staff to work it efficiently; there are no roads: the reserves are isolated blocks of rugged hills scattered over thousands of square miles of country; to visit them all the refinements of life must be abandoned, the forester must perch his scanty kit on two elephants and tramp wearily day after day through never-ending forests in which it is impossible to take a sustained interest, for they are valueless, uncared for, and contain little or no animal life. When to these conditions it is added that a want of knowledge of the language removes one of the chiefest pleasures in intercourse with an amiable and fascinating people, that an unaccustomed climate produces the usual inconveniences; when it is found that no expenditure can ameliorate the physical hardships of the life, that professional attainments can be put to little use, it may well be understood that the first impressions of the Indian forester in Burma fill him with despair, and with the fear that all the enjoyments of life, as he understands them, have been rended from him. In time he realizes that the joys of competition and emulation do not exist in Cathay; that the energy and progress of the West can cope but slowly with the good-humoured indolence of Burma, and that in a country where District Headquarters have weekly posts, and where an official can only crawl about at the rate of 10 miles a day, one must be content to do the best one can in the circumstances and happily cease from fretting if the best is not all that could be wished.

Having arrived at this suitable frame of mind, it is interesting to regard one's brother officers, who for the most part have never passed through this struggle. The persistent patience that actuates them in the discharge of their duties cannot fail to arouse admiration; but the still incompleted exploration of the country, the extension of reserves, the size of the divisions,—all these conditions coupled with, for the most part, the utter ignorance of subordinates, have induced a habit of continuous roaming common to all, in some so accentuated that a day's halt is irksome and produces a feeling of unrest and dissatisfaction. It will be

understood that in such circumstances detailed work in the forest is impossible, and that until the time arrives when an officer has leisure to become intimately acquainted with selected areas, there can be little advance in sylvicultural knowledge as regards the habits and requirements of the principal species, and little aid can be given to the improvement of the forest growth.

The country is sparsely populated, hence labour is scarce, and what is available is unwilling. When a man can till as much land as he wishes, and when the raising of one crop will maintain him for twelve months in what he considers to be comfort, it is not surprising that he should refuse to do a day's work even for the sum of eight annas which he does not want. For, with the Burman as with the European, money can as yet bring no perceptible increase in the luxuries of life. The result of these conditions as they affect the forest is, that works of improvement are difficult to carry out.

It must not, however, be imagined that so much stress is laid on the importance of these works as is the case in India. There the price of timber is regulated by the ease of extraction, and it pays Government to construct roads, slides, tramways, even, in the case of a sustained yield, railways, in order to obtain an enhanced price for forest produce. Here, on the system of monopolies granted for long terms to private firms, the opening out of forest communications by the State becomes unnecessary, and in consequence the price of good teak timber averages about 8 annas per cubic foot in the forest against 12 annas and more per cubic foot obtained for "sâl" timber from inferior trees in improvement fellings in Upper India. And such is the closeness of these monopolies that local merchants are not permitted to extract teak to be sold outside the limits of the upper portion of the province. By this absence of competition, by the omission to invest capital in the improvement of communications, the price of teak timber as paid to the Forest Department remains fixed for a term of years outside the fluctuations of the market, and interest in the State forests by the local population receives no encouragement. Yet the policy which removes the necessity for improvement of communications by the State does not interfere to minimize the importance or prevent the construction of inspection paths, the extension of fire conservancy, and the provision of suitable shelter for the staff. Rather must we explain the backwardness in this respect by the fact that the establishment is both inadequate and ignorant, and that the controlling officer, if these works are to be carried out, must give them his constant and personal attention to the detriment, perhaps, of other equally urgent business. In Burma one may hear the Forest Officer say that neither he nor his staff know anything about fire conservancy, house-building or rock-blasting, forgetting that these and similar occupations are part of the forester's work and education, and that this ignorance is a confession

that there is no time either to train the subordinates or to maintain and improve by practice the elementary knowledge acquired in a College training. On the other hand, the Forest Officer in Burma will spare neither time nor health in the carrying out of the work allotted to him. In girdling, surveying, demarcating, measuring timber he will sacrifice himself in a way that is often sad to contemplate when it is considered that his proper place is that of supervisor, and that most of this kind of work could be as well and more quickly carried out by a trained staff, better able also to withstand the exposure and inconveniences involved, whilst at the same time the educated forester would then be set free to direct those operations necessary for the improvement, in some cases even the continuance, of the already settled State forests. In the Burma Forest staff one often sees splendid material utilized much below its ability, but in the absence of working-plans, of well considered schemes for improvement, of a trained subordinate establishment, it is not surprising that the officers of the controlling staff have often to expend time and energy in carrying out what is really the legitimate work of their non-commissioned officers. Such are a few of the first impressions with regard to one's fellow-workers in Burma; yet more vivid than these remain others most ineffaceable and lasting—those of welcome and aid in a strange land, of kindly hospitality and of eager unselfishness in forwarding the welfare of the forests and of the Department.

The first impression produced on the new-comer by the forests of Upper Burma is that of vastness. From Mandalay to the boundaries of China they roll in interminable billows of vegetation; in the valleys you are buried in forest; from the hill-tops you see nothing but trees. The few thousand square miles of cultivation, the relatively small area of reserves are swallowed up in this sea of jungle. In one district it is calculated that there are about 2,000 square miles of cultivated land, about one-half that area of reserves, and the remaining 17,000 square miles is forest; villages are 6 and 8 miles apart; the population is about 6 to the square mile. Increase this population up to even 250 to the square mile over four-fifths of the district, and what would be the local demand in forest produce and the revenue from the remaining 4,000 square miles of forest? For, besides teak here grows timber larger by far and in quality superior to all but the very best in India—it grows and dies. Here, too, is soil and water as good as may be desired; all that is lacking is the force of man, sufficient and well directed; the effects of this force is even now evident on the hillsides around; they are patched with irregular areas of young growth marking the localities where shifting cultivation has been practised. Man destroys the timber, but is not yet numerous enough to eradicate the vegetation; the forest closes up behind him so soon as he retires with his fire and axe.

One's thoughts next turn to the unexampled opportunity of creating State forests that is presented in this country yet in its infancy. The forester has already taken the first steps by reserving and continuing to add to reserves the teak-bearing areas, by in some places restricting the practice of shifting cultivation where this threatens to affect the permanent water-supply in the valleys below. The work is progressing; it will be many years before it is completed, and then with the increase—happily also the influx—of population the time will also arrive when reserves of the less valuable timber will be settled; when arrangements will have to be made in this country of mountains to prevent the too rapid passing of the rainfall and the denudation of a thousand hills. If this work continues as it has begun, Burma will, fifty years hence, indeed, be a model province from a forester's point of view.

From generalities the forester turns to details; he examines with curiosity the state of the forest growth, especially in the areas already permanently settled; he is struck at once with the inequality of the stock. Trees of the highest girth class are frequently in excess of those in the next lowest class; they are also lamentably frequently unsound; reproduction is scanty, often wanting. He searches the reason for this unsatisfactory state of affairs, directing naturally his attention to the most valuable species. He learns that in the olden times the order to girdle so many trees in such a forest was transmitted by the prince to his deputy, thence through the village headman to the villagers, who killed the required number of stems within the smallest and most accessible area, to the rejection of those individuals whose unsoundness, size or other difficulty of removal rendered them unsuitable. Hence the pressure upon the sounder and smaller trees of the second class; whilst at the same time the advance growth suffered from the abstraction of myriad of poles so adapted to the style of house-building in Burma. The unsoundness of the timber the observer finds to originate from the base of the stems; it is due to the continued wounding of the bark by the succession of forest fires, which gain no height or intensity owing to the scanty undergrowth, but whose reiteration is still sufficient to injure the seedling and prevent recovery in youth or old age. The absence of teak reproduction is referable to various causes—in unprotected areas it is due to the yearly destruction by fire of the seed and the seedling; on steep and bare hill slopes to the deterioration of the soil by the removal of the undergrowth from the same cause, accentuated here by the reckless felling of the sound trees under native rule; in protected and moister forests the shade thrown vertically by the canopy of the mature stock forms a sufficient determent to the germination of the seed and continuance of the seedling; nor have the attempts at uniformly lightening this shade over the whole of any forest area yet had any beneficial effects. In bamboo undergrowth, so frequent in the forests of Upper Burma, teak will grow, but only where the clumps are sparse,

and thus do not continuously darken the ground with the dense lateral shade of the thick clumps. Frequently one observes teak seedlings under the shifting shade of the waving culms; they emerge from this shelter and are checked and distorted by the now nearer direct vertical shadow thrown by the foliage of some forest giant who should have no place in the scheme of working the forest. Plantations there are where teak closely sown grows, but rarely thrives; they are the play-grounds of wild elephants. In other places shifting cultivation is utilized as a means of extending the teak area; but this system so successful in Lower Burma will hardly affect the extension of teak forests in the Upper Province, where natural reproduction can surely be induced by protection and other aid.

The habit of teak in these hills is identical with that of many other forest trees in India. The mature stems stand more or less in groups; they permit of no young growth of the same species in their shade; the death or removal of a group of such stems should be the signal for the recommencement of another cycle of tree life, for the germination of a group of seedlings, for the gradual formation of another group of trees. If this impression is correct, we have an explanation of the fact already mentioned, that attempts at a uniform lightening of the canopy have no appreciable affect on the progress of regeneration; we have further a suggestion for the treatment of teak-bearing areas where reproduction is hampered by teak overgrowth, by miscellaneous species or by bamboo; for by letting in light in small patches scattered over the forest we shall be following nature and at the same time avoiding the disastrous consequences of clear felling over large areas.

The bamboo forests of Upper Burma are of the most beautiful; and, moreover, they supply the inhabitants with all they require in the hundred-and-one necessities of daily life; from the bamboo are fashioned with the ever-ready "dah," houses, bridges to flower baskets and lacquered boxes. But from a forester's point of view the bamboo is in excess and causes obstruction; they are difficult to remove, and yet must at times be got rid of in the interests of superior growth. The method of removal will doubtless form an interesting subject of investigation to the Burman forest officer; it is possible that the standing clump may be amenable to vital injuries by fire artificially applied, though we know by experience in "taungya" clearings that slow fires do not kill the roots of felled clumps satisfactorily.

There are yet other first impressions which will remain as treasured memories for future years; of monsoon trips on flooded rivers, bordered with the full luxuriance of tropical vegetation; of winter voyages on shallow streams with the cold mists obscuring the ruddy cliffs and shimmering sand banks; of fierce heat by day and night in the south and of dew and cold in the northern forests. Of these it needs not to write here.

First impressions soon fade in the monotony of things seen and heard for the hundredth time, yet to record them may be interesting to the reader as it certainly is to the person impressed; for, if correct, there is the satisfaction of having inferred rightly; and, if not, then the abandonment of first theories yet implies the acquisition of a maturer judgment and experience.

To the forester interested in his profession a visit to Burma must always be of the greatest value; it is not too much to hope that, in the future, every Indian forester may be given a chance of prosecuting his studies in this province, as well as that every Burman forester may have an opportunity of becoming acquainted with the methods and progress of sylviculture in India. Only let either be free from prejudice, with body strong to withstand and profit by the change, and with mind eager for the reception of new facts and new ideas.

Insufficiency of the World's Timber Supply.*

During the last 30 or 40 years there have been great changes in the conditions under which forest produce is brought to market.

Before the great development of canals and railways, which has been the characteristic feature of the latter half of the nineteenth century, the only economic means of transport was by ships on the sea or by boats and rafts on the rivers. As soon as it became necessary to go far from ports and rivers and make use of land transport, it was found that a very short lead soon ran up the expense to the full value of the wood. Timber, in fact, is weight for weight one of the cheapest materials and the most cumbersome to carry,. Forty kilometres (24 miles) is about the distance at which the cost of carriage equals the value of the produce when the latter is firewood. On mules, 20 kilometres is about the limit. For transport to greater distances it is necessary to convert wood into charcoal, thus economising four-fifths of the weight. Wood used for construction and industries, although its greater value permits of a longer lead, can still not be diffused very far when the transport has to be by road.

The result of this was formerly a state of comparative isolation and independence among the wood-producing countries. The distance and the cost of transport guaranteed them against competition each in its own markets. Each had its clients or constituents, varying in number and importance according as its internal means of transport were considerable or the reverse; great was the advantage if it possessed a large river system leading to a great centre of population.

This is no longer the case. Europe and North America are covered with a dense network of rail and canal that is becoming

* "*Insuffisance de la production des bois d'œuvre dans le monde*," par A. Mélard, Inspecteur des Eaux et Forêts. Published by the Ministry of Agriculture (Administration des Eaux et Forêts) of the French Republic. Printed at the Imprimerie National, Paris. Free translation by F. Gleadow, I.F.S.

closer and closer. Low railway rates allow wood to be carried to great distances. Ships, with their carrying capacity trebled by steam, now transport timber to the ends of the earth at remarkably little cost. So that the production and sale of wood is now subject to the general tendency which is fast bringing the whole world into a state of common solidarity. It is no longer sufficient for the forester, the wood-merchant, and the landowner to have a thorough and minute knowledge of the markets of his own locality, province, or even country. Henceforward their vigilance must extend to the markets of the other countries of the world.

From this point of view it is easy to see the importance of collecting data to assist in forming a sound judgment alike as regards the production and the consumption, the present and the future resources, not only of France, but of the entire world. The study is a dry one, for the necessary accuracy can only be obtained through the acceptance of figures and tabular statements, which are derived from the published official statistics of various States or derived from Consular reports. The importance of the matter is enough to salt the dryest of statistics.

In comparing the returns of the timber trade of the great industrial countries of Europe, such as England, Germany, Belgium, France, Switzerland, for different periods of their history, the one striking fact which dominates the whole is the great excess of imports over exports, and the rising and ever-growing increase of the excess.

Hence it must be concluded that the consumption of wood is continually increasing.

This conclusion is not in accord with the opinion of those people who superficially imagine that the use of iron, of steel, of coal, &c., must have reduced wood to a substance of minor importance, and forests almost to an economic nullity. Nevertheless, it is rigorously exact, as will be seen further on.

A very little reflection will arouse the conviction that though less wood may be used as beams, or burned as fuel, than before, there has been no reduction in the quantities required for flooring, joinery, cooperage, packing cases, &c., and that modern developments of trade and commerce have largely swelled the demands for wine-props, telegraph-posts, sleepers, wagons, wood-pulp, &c., &c.

On the other hand, the production of wood is not increasing.

There are, indeed, a very few countries where the forests are treated carefully with a view to increasing their productive capacity. Everywhere else there is a ceaseless destruction of forests. A timber capital whose formation required several centuries, is realised in a few years, and the future production is diminished to a corresponding extent. At the present moment the forest situation of the world is this:—

The consumption of wood is greater than the normal production of all accessible forests. The amount in deficit is being

made up temporarily by living on the capital, i.e., *destruction of forests.*

The situation is extremely grave, and deserves the most careful consideration, not alone of foresters but of economists and statesmen. The forest question, to-day hopelessly flat and uninteresting, is destined before many years to exercise with unpleasant urgency the minds of the now indifferent though civilised nations. It may be then too late.

The following rapid review of the principal producing and consuming nations will unfortunately establish the fact that there is no undue or alarmist exaggeration about the warning.

1.—ENGLAND.

The United Kingdom of Great Britain and Ireland (more generally called England), is very little wooded. There are only 1,229,000 hectares* (England 1,103,000; Ireland 126,000), whilst the total area of the country is 31,353,000 hectares. Consequently the proportion of forest to the whole, the forest coefficient, is less than 4 per cent. It is about a sixth of the coefficient for Germany (23·3 per cent.) and less than a quarter that of France (17·7 per cent.) For the existing population of 40,200,000 inhabitants, this amounts to no more than 3 *ares* ($\frac{3}{100}$ hectare = ·074 acre, or a tenth part of $\frac{3}{4}$ acre) per head, to satisfy all requirements of housing, fuel, proportion of railways, ships, telegraphs, papers, &c., &c., in short, to supply everything made of wood in the kingdom. England thus provides the merest fraction of the wood she consumes. Consequently her demands on foreign sources are heavy. Among the tabular statement at the end of this work will be found tables (1, 2, 3) giving detailed information as to the British external trade in common woods. The following are the most important points to which attention may be drawn.

It may be stated here that, in order to arrive at results comparable among themselves for different countries, it has been made the rule to include, among exports and imports, only the common woods, whether squared, split, sawn, or in the rough, fuel, and charcoal, and to exclude fine cabinet woods, furniture, wooden articles, &c., as likewise minor produce such as cork, resins, and tans.

I.—VALUE.†

Year.	Imports.	Exports.	Excess Imports.
	Francs.	Francs.	Francs.
1894	419,385,726	5,023,370	414,362,356
1895	390,253,007	4,696,947	385,506,060
1896	477,318,764	6,328,782	470,989,982
1897	579,811,381	6,336,096	573,475,285
1898	519,349,255	6,255,316	513,093,939
Averages ...	477,213,623	5,728,102	471,485,524

* 1 hectare = 2·47 say 2½ acres.

† 1 Franc = 10 pence = 10 annas.

II.—QUANTITY.*

Year.	Imports.	Exports.	Excess Imports.
	Metres Cubes.	Metres Cubes.	Metres Cubes.
1894	11,202,122	47,552	11,154,570
1895	10,566,509	50,405	10,516,104
1896	12,172,785	67,851	12,104,934
1897	14,117,316	58,125	14,059,191
1898 ...	12,500,438	60,569	12,439,869
Averages ...	12,111,834	56,900	12,054,934

The exports are insignificant. They consist almost entirely of the re-exportation of foreign or colonial produce. They only reach 1·2 per cent. of the value of the imports and 0·47 per cent. of their volume. The excess of imports, therefore, differs very slightly from the total imports. As seen from the above two tables, this excess has been, on the average of five years, about 12 million metres cubes, worth 471 million francs.

At least two-thirds of the total volume of the wood imported into England consists of converted or prepared materials, planks, scantlings, &c., the volume of which is net, and must be increased by some fraction in order to obtain the real amount grown in the forest. It will be an extremely moderate estimate to take this fraction as one-fourth for the waste. This brings up the total to 15 *millions of cubic metres* in the forest.

Large as these figures are, they will probably fail to carry any adequate picture or meaning to the minds of persons unused to such ideas. It is, therefore, desirable to institute a few comparisons in order that the subject may be seen in its true perspective.

In France, the Forest administration controls 3 million hectares, producing annually about 2,200,000 cubic metres of timber in the rough. The total area of all forests in France is 9,500,000 hectares, producing annually about 6 millions of metres cubes in the rough (firewood not included). The average annual excess of French imports over exports of common timbers from 1894 to 1898, allowing for waste as above, comes to 2,336,000 metres cubes in the forest. Consequently, the average excess of imports into England during the five years is equal to :—

(*a*) nearly seven times the production of the State and Communal Forests of a well-furnished and managed country like France;

(*b*) two and a-half times the production of the whole of the French forests;

(*c*) more than six times the deficit of production in France for the same period.

If instead of taking the mean of the five years, the excess for 1897 is taken (a year that was not, as was 1898, troubled by

* 1 Metre cube = 35·6 cubic feet.

obstinate strikes which hampered the whole industrial system), the results are still more alarming, for the figures *mount up to* 17, 600,000 *metres cubes*, of which 16,500,000 metres cubes are coniferous woods, *viz.*, deals and pines. This enormous consumption of coniferous wood is due partly to its comparative abundance in those countries that still possess forest resources, partly to their cheapness, to their lightness, which reduces cost of carriage, and to the ease with which they can be worked. It is an encouragement to grow spruce and silver fir in regions where the climate is suitable.

It may be suggested that the consumption of wood in England has reached high-water mark, and will now decrease. There is nothing to support such an hypothesis, for the consumption is a direct consequence of commercial and industrial vigour, which as yet shows no signs of decline. The future increase may doubtless be less rapid than that of the 40 years past, as shown below :—

	Metres cubes.
1860	3,850,000
1870	6,300,000
1880	9,100,000
1890	10,200,000
1895	10,500,000
1898	12,500,000

It is most desirable that the increase should receive a check, otherwise the figures will become fabulously large, and will result in the complete destruction of all forests and of the supplies of all nations. Nevertheless, it would be foolish blindness to reckon on any diminution of consumption so long as the economic development of England goes on as it is going. The total value of imports, 9 milliards 400 millions francs in 1875, in 1898 became 11 milliards 800 millions. The quantity has increased more rapidly than the value, because the general price of goods, taken as an all-round average, has decreased by 36 per cent since 1875.* The tonnage of merchant vessels, 6,088,000 tons in 1875, reached 8,975,000 in 1898, and the transporting power is even greater proportionately, owing to the replacement of sails by steam. Coal mining produced 134 million tons (metric) in 1875, while in 1898 the output was 205 millions. Lastly, it must not be forgotten that the population of England is increasing by 300,000 annually, and that the housing, employment, means of living, &c., of these new persons requires annually the creation of a new city larger than Bordeaux.

The countries which supply England with wood are principally Sweden, Russia and Canada, which are responsible for two-thirds of the supply, the remaining one-third being provided by

* According to the figures of M. Sauerbeck of the London Statistical Society, February 1899.

Norway, the United States, France, Germany and a few other nations whose contributions are very small in comparison.

[*To be continued.*]

II.—CORRESPONDENCE.

A New Phyllanthus in Madras.

In your March issue of the *Indian Forester* for this year, there is a note by Mr. Gamble on an interesting plant which Wight described as *Chorizandra pinnata*, and which has been wrongly included under *Flueggia microcarpa*, Blume., in Hooker's *Flora of British India*.

The plant is represented in the Madras Herbarium as *Chorizandra pinnata*, Wight. I also found it last year in the Vizagapatam district, where it occurs gregariously in isolated spots, and gave it provisionally Wight's name, as it was evidently no *Fleuggia*.

Mr. Gamble points out very justly that the correct name is *Phyllanthus Wightianus*, Mueller Argau, but there are difficulties in the way of finally adopting this name.

In the first place there is another *Phyllanthus Wightianus*, Mueller Argau, belonging to the very different Reidia group (see Hooker's *Flora*, *V.*, 303), and the duplication of names will entail considerable confusion.

It becomes necessary to examine the right of the Reidia plant to the name in question, and we find that this plant was issued as *Phyllanthus obliquus* in Wall. Cat., 7947, a fact that seems to have escaped Mueller Argau. Its correct name is thus *P. obliquus*, Wall. Cat.

We have then three courses open to us. Alter both the plants in Hooker's *Flora*, and call them *Phyllanthus Wightianus*, Muell. Arg., and *Phyllanthus obliquus*, Wall. Cat., respectively.

Or, secondly, if it is desired not to alter Hooker's naming of the Reidia plant, it becomes necessary to find a new name for the Chorizandra plant. I would in that case suggest, since this plant is the only one of its section, that the Chorizandra plant be placed in the section Chorizandra and called *Phyllanthus Chorizandra*. This will emphasise the peculiarities of the plant, confusion will be avoided, and a key will be given to its synonymy.

There is, lastly, much to be said for dropping the specific name *Wightianus* altogether. If this course be adopted, the two plants would stand as *Phyllanthus Chorizandra* and *Phyllanthus obliquus*, Wall. Cat., respectively,

C. A. BARBER,
Government Botanist,
Madras Presidency.

Lightning and its Effects.

The day after one on which a thunderstorm took place I came across a chir pine *(P. longifolia)*, which had then been struck. The tree was mature, standing on the top of a hill, and had no leader, which had evidently been broken or cut off in its youth. The lightning had struck one of the uppermost radiating branches and took a straight course for a short distance, when it encountered a branch which turned it off its course, and from this point the direction taken was a spiral one, the turns being closer together at the top of the tree, where there were more branches which the fluid avoided. About 5 feet from the ground the electric current encountered a swelling, evidently caused by the healing up of an old wound, and at this place it left the tree, joining it again about one foot from the ground. A strip of bark about 4 inches in width was removed the whole way down the tree where the fluid took its course. This strip was not removed in one broad piece, but in two slips of 2 inches each in width, for its full length, the division being exactly in the centre and quite clean. The length of the strips varied from 2 feet to 4½ feet in length, some of them being found on the ground, whilst others remained on the tree, usually being fixed to it at their upper ends, the lower ones being quite free and curling outwards. The outer rough bark was totally removed, not a single piece remaining on the strips mentioned above. It was found lying in small pieces under the tree. In no case were any actual signs of burning to be found, although the long strips of underbark were dried and curled up with the heat, and neither the bark on either side of the course taken by the lightning, nor the needles at the foot of the tree where the current entered the ground were damaged in any way. Both the inner and outer edges of the strips of underbark were quite clean as if cut by a knife.

Curious to relate, down the whole length of passage a thin narrow layer of underbark was left, exactly in the middle, firmly fixed to the tree; of the blaze where the separation of the two strips took place and at the foot of the tree where the electric fluid joined it again, two distinct courses could be traced as if the fluid had become separated in its leap.

The tree I had cut down, and it was examined carefully. Judging from appearances it would seem that the lightning threw off, simply by shock, the rough outer bark which opposed its passage, thus uncovering the smooth underbark, over which the fluid passed uninterruptedly. The great heat dried up this underbark and turned the sap underneath it into vapour, which forced it up causing it to divide at its centre, leaving the thin line of bark where the separation took place, caused also by the contraction of the underbark. The pressure underneath caused by the formation of steam, coupled together with the fact that the strips of underbark were quite shrivelled up and contracted, is quite

sufficient to explain the clear way in which they were separated from each other and from the bark on each side of the course taken. There would appear to be no doubt that lightning, if possible, will avoid all serious obstacles by going round them, and this being impossible, it will either remove that obstacle or be broken itself into two or more currents by trying to do so.

It would be interesting to know if in any other parts of India lightning has been observed to have had similar effects as the above.

Camp Choch, Mirpore,
JAMMOO:
February 8th, 1901.

E. RADCLIFFE,
Forest Officer.

Forests and Famine in the Hyderabad State.

A Creeper that saved Hundreds of Starving Lives.

Lately some interesting notes, contributed by a Forest Officer, appeared in the pages of the *Indian Forester*, regarding leaves and fruits used as food during the last famine. In those notes the writer has made mention of the profuse seeding of the bamboo *(Dendrocalamus strictus)*, and the extensive way in which the seed served to keep many hundreds of people alive and well. He has also added that the leaves of *Erythroxylon monogynum* were much eaten by the people. In the Sirpur Tandur Taluka, (H. H. the Nizam's Dominions) adjoining the Central Provinces, the same bamboo, having seeded gregariously, played a quite similar part. As for *E. monogynum*, called *Devidaru* here, it is very common in the eastern and south-eastern forests; but I cannot say for certain that their leaves were eaten in those parts to any great extent.

However, in this connection I venture to describe a creeper with which almost all forest officials must be acquainted. Its botanical name is *Rivea hypocrateriformis*. It is locally called *Boddi*. This creeper played an important part in the last famine. It is very common in the southern division of His Highness's Dominions. The leaves are thick and have no disagreeable taste. The stem is tough and flexible. Ordinarily it is used in tying head-loads of firewood or grass or in tying *tattis*. It was very much used by the coolies under me in tying leafy twigs to put out fire while the "fire-protection" works went on.

During the last famine, most of the poorest classes living in the forest villages used its leaves as their staple food. About the middle of July last, while in camp in the Koheer Taluka of the Beder district, I particularly noticed that hundreds of such helpless people maintained themselves and their families on these leaves. It was a very pathetic sight to see how these people

brought the leaves from the forest. To describe their condition in full would require volumes and this is not a place for doing so. However, I conclude this by describing the process in which the leaves were prepared and eaten. And it was thus. The leaves, after being sorted, were boiled in earthen pots, and once or twice the water was thrown away. The boiled leaves were then crushed by hand in flat pans. This done, a little *jauar* flour and salt were added and thoroughly mixed. The whole mixture was then baked on the fire in pans and eaten while moderately hot. Generally the *jawar* flour was mixed in the proportion of ¼th seer of it to 2 seers of the leaves. Many could not afford to have that much *jawar* flour even and hence ate the leaves after boiling them simply. If the mixture is allowed to cool down, it acquires an insipid taste. If an equal quantity of flour is mixed, thick bread can be made.

In short, it was thus that the *Boddi* creeper saved hundreds of starving souls at a critical time.

KRISHNAJI GANESH,
Asst. Conservator of Forests.

Chincholi Taluka, Hyderabad.

Girdling of Spruce and Silver Fir to secure the natural reproduction of Deodar.

The girdling of spruce and silver fir was commenced in Taroch State in 1892. There were two objects in view. The first, which was to set free suppressed deodar seedlings, has been attained. Seedlings formerly flat-topped have put out new leading shoots, and are now growing vigorously. The second object was to set free deodar seed-bearers by girdling the trees standing around and interfering with them, and thus to encourage the production of seed. The only result, however, has been a very dense growth of brambles, shrubs and herbaceous weeds, and any reproduction seems hopeless. I should be much obliged if any one would inform me whether reproduction will be secured eventually in spite of the dense undergrowth, and if not, what should be done. Sowing and planting could, of course, be undertaken; but, in the present case, this is out of the question; because, *firstly*, the area, some 100,000 acres, is too large; and *secondly*, funds and sufficient establishment for the purpose are not available. We have, therefore, to depend on natural regeneration, and it seems to me that the only way to secure it is to get rid of the undergrowth. It is not of much use to cut it; for it will all coppice again the following year; consequently the only thing I can think of is to allow the grazing of sheep and goats, although, to make much impression, a very large number will be required.

Perhaps it will be best to describe the forest briefly. It is known as the "Shilla block." It is situated in a well sheltered valley, which is surrounded on the W., N. and E. by high ridges with an elevation of 9,000—11,000. The opening is towards the south, but even from this direction it is well sheltered. The slopes are generally very steep and precipitous, but less steep in the lower portion. Nearly the whole forest is situated above 7,000 feet, and it extends to the top of the ridges. In 1878 the Conservator of Forests, School Circle, N.-W. P., proposed to lease this block from the Rana, but the latter preferred to keep it in his own hands. There was no system of forest conservancy at that time, and it appears from the reports of Messrs. Bagshawe and Moir that the lower parts of the forest were burnt nearly every year and the upper parts occasionally, the fire spreading from the grass-lands below. Also that the grazing of sheep and goats was rather heavy. From 1886 forest conservancy was introduced gradually into the Simla Hill States, and in 1892 this block was closed to the grazing of sheep and goats. Since that time a dense undergrowth has sprung up wherever the cover is at all open. Reproduction is very backward everywhere, but a few seedlings may be found on the warmer aspects, where the undergrowth is less dense. The stock consists for the most part of deodar scattered among spruce and silver fir, though patches of nearly pure deodar occur here and there on S. slopes. At the higher elevations deodar, of course, is absent. The trees are mostly of the upper diameter classes. Saplings and poles are very rare, having been destroyed by fires of past years.

In the remaining forests of this State, which are open to the grazing of sheep and goats, reproduction is generally satisfactory and is often very good. In a few cases, however, when grazing is excessive, the seedlings have been browsed and have assumed a bush-like form.

The bamboos (*D. strictus*) of the lower hill States did not put out any new shoots last monsoon, though the rains were heavier than usual. It would be interesting to know if the same thing has occurred in the famine districts. The natives' explanation, and it seems commonsense, is that, in 1899, the bamboos exhausted themselves in the production of new shoots, and that, owing to the failure of the rains, no reserve material was formed, so that no new shoots could be produced in 1900.

E. M. C.

A Protest.

While we all agree with the late Inspector-General of Forests in admiration of the services of the gentlemen he mentioned in his last official speech in India, it sounds a little strange to read them (it was quoted in the *Revue des Eaux et Forêts* for the 15th January), that only one of the four referred to for prominent service in India, is a Nancy trained man.

I understand that the Conservators of Forests in India are always the picked men of the service, and that a private official record of the nature of their work is necessarily kept in the Inspector-General's office. It is, however, somewhat invidious that among all the Indian Conservators of Forests only a few should be prominently mentioned by the Inspector-General, both in his final speech and in his pamphlet on *Forestry in British India*.

I doubt if such distinctions between their Commissioners are publicly made by Governors of Provinces in India, or by H. E. the Viceroy as regards Lieutenant-Governors and Chief Commissioners, and it cannot be conducive to further the influence of a Conservator of Forests with his Divisional Officers, to find that he is publicly pronounced by the highest authority in the Forest Department as inferior in ability or energy to some of his colleagues.

W. R. FISHER,
Cooper's Hill, England.

The Taungya System of Raising Forest Stock.

I have read with much interest Mr. E. E. Fernandez' observations on this subject, *vide* "*Central Provinces Forest Report of 1899-1900.*"

Although in no way connected with the Forest Department, perhaps as a life-long professional Agri-Horticulturist I may be pardoned for taking a perennial interest in forestry, and this may also be my excuse for making some observations on the system of raising stock (forest) on old lands, and which appears to bear the above name in Burma.

I have already found occasion elsewhere to observe that in this very system is a material point in re-establishing forest that ought to be much more widely known; and at the same time worth the attention of the cultivator on the one side and Government represented by the Forest Department on the other side.

Perhaps, I ought to say at once that I am writing from the Himalayas (Kumaon), and it was some years ago now since I was struck with a certain type of mainly oak forest seen in sundry places during rambles about the jungle, and very soon it was borne home on me that this particular type which I will presently characterize was associated with old-abandoned cultivation. Further observations abundantly confirmed this view: so that to-day whenever I come across this type of jungle I begin to cast about for evidence of old holdings, which is nearly always forthcoming. Even where the evidence is lacking, I still arrive at the conclusion, here was once cultivation.

With regard to the stamp of jungle found on these old holdings, it, in the first place, assumes a much more vertical habit as a rule; secondly, the boles of the trees run much taller and branchlessly so, and consequently as timber; and supposing instead

of comparatively worthless oak it were some more valuable kind, there can scarcely be two opinions. This kind is much the most valuable: it is quite true the boles are in very many instance smaller, but amply made up by straightness and extra length, and this is particularly the case with the karshu oak (*Quercus semecarpifolia*), and also to a less extent with the ban-oak (*Q. incana*). Another point to be noted is that (at all events, my observations confirm this view) although these trees on old cultivation run very considerably taller, they come down with gales, weight of snow, and such like causes, much less frequently than do those which have raised themselves in virgin lands.

In making a clearing in one place close to where was abundant evidence of former cultivation, I had a ban-oak cut carefully through with a saw in order to ascertain its age from the concentric layers, and found it to be ninety-eight years. I have in mind a small piece of jungle, evidently about twenty-five years old, or as the settlement period is just now on in the province, it may be assumed it was thrown out at the last settlement or about thirty years ago: the trees on that land are remarkable for vigorous, straight, clean growth.

I can quite understand how on the plains, with the rank grasses and abundant herbaceous vegetation that comes up in such a prolific manner in the rains, seedling stock of forest trees on virgin lands is subject to a ruinous competition in which the vigorous herbaceous plants come off much the best, to the detriment of the forest stock.

Here, however, in the Himalayas this evil is much less, and I do not think it by any means explains all about trees growing on old lands so much better than on virgin lands.

So far as my observations go, when a native throws up land it is, so far as agricultural crops go, worth exceedingly little, and a superficial observer might be forgiven for supposing it was worth very little for any thing; this, however, would be entirely a mistake so far as trees are concerned.

I am of opinion that the reason why—in the main—self-sown seed produces such fine trees and so quickly too, is due to the altogether superior start they get compared with those sown in virgin lands, and again there is no doubt that in old soils, cultivated and abandoned, the roots of the seedlings go down much deeper and more vertically; for example, the tree alluded to as having been cut through to ascertain its age, was situated where I desired to make a flat—it was a slope—and I found roots ten feet below the surface going down almost straight from the surface into the rock foundation.

At various times I have noticed many oaks which have blown down, in some cases there were obvious reasons, but in not a few examples it was not at once clear why such fine healthy trees should come down; but examination of the rootage upheaved showed that for some reason the rootage was very shallow and

much spread out, with what should have been a comparatively straight tap-root twisted and ill-formed.

I infer that this ill-formed rootage commenced in infancy, and never after righted itself properly, and that while the rootage found abundant nourishment near the surface, such trees stand at a disadvantage in gales, and when heavily weighted with snow.

It occurs to me, however, there may be another very considerable advantage in cultivated lands for raising seedling stock or planting it down permanently straight off. In opening up land of any kind that has for some length of time been permanently closed to any kind of cultivation, there can be no doubt the cultivator opens a stored mine of sorts.

By cultivation chemical changes and transformations ensue in the constituents of the soil; in oxygenating the soil alone, which perforce the mere act of cultivation must do, much more ensues than can possibly catch the eye; and ingredients of the soil previously locked up largely by reason of its impervious character become under a more abundant aeration soluble plant food: and I suggest it is very probable, particularly in the first year or two of opening, that much more plant food is rendered soluble than the crop requires; again a crop may be planted which only requires certain ingredients in quantity, and almost leaves alone what some other crop would absorb in quantity.

Meantime, however, the rains come, and if, as certainly happens, any of the new opened land is fallow, a great deal of soluble plant food is carried away by the rain; and it is a simple agricultural fact that the loss of nitrates on fallow soils is much greater than when under some kind of crop, and that in any case there is always a risk—I would say certainty—of some soluble ingredients of the soil being carried away in heavy rains, whether under crop or not, but very much more without crop than with it.

Now it is obviously not the business of the agricultural chemist to dive down into the earth after samples of soil from one to six feet deep, because, practically, all agricultural crops are essentially surface rooters, and it is essentially with the first foot of soil agriculture has to do, at all events, in its cultivation of the soil; and, moreover, it is at the surface where nitrification is constantly going on and not down below.

When, however, we come to forestry, we come at once to deep rooting subjects differing very materially from agricultural crops, as a rule, and I suggest distinctly that the sum total of plant food carried away from the surface does not necessarily mean that it is carried away altogether and passes into the drainage water pure and simple; but rather there is a considerable probability that not a little of it may well remain at a lower level in the soil—out of the way of agricultural crops to be sure—but none the less available to deep-rooting trees, particularly of the tap-rooting order: and if this is so, it would in part explain why trees on old and utterly exhausted surface lands give such a good account of themselves

and most certainly surpass those growing on virgin soils; another point is to be noted of great and obvious importance where a profit and loss account is in question. I refer to the much more rapid growth from cultivated lands over that of virgin soils; even in slow-growing trees like oaks, the difference is most marked.

Some four years ago I got a few seeds of several kinds of conifers, mostly pines. I sowed them in boxes, and transplanted them into a piece of land which had for three years been systematically cropped with vegetables and without manure, so that from the point of view of the cultivator the land was superficially exhausted, and without manure fit for very little: but the progress these young pines made in this superficially exhausted soil was truly remarkable.

A short time ago I planted them out into permanent places, and they are altogether finer and larger tress than a good many self-sown chir seedlings seen growing about in the jungle reserves which are to my knowledge older than these in question.

The practical considerations which arise out of this question present themselves to me in this way.

At every settlement there is doubtless in the aggregate a considerable acreage thrown out of cultivation, and the fatal error is that this land is generally considered no good for anything; whereas in my opinion, and based on the foregoing considerations, and substantiated with the great weight of Mr. Fernandez' opinion and experience, the bulk of this thrown-out and so-called worthless land would grow admirable forest produce, and not only grow it, but also in the minimum of time and at the minimum of expense to the Department. And this brings me to another aspect of the matter, in the case of the Forest Department promptly taking over abandoned lands for foresting purposes, other lands ought to be given out of equivalent acreage, if possible, consisting of jungle lands of low commercial value, but probably just as good for cultivation as valuable forest.

Another point is, whether it should not amply pay the cultivator to get hold of good virgin lands—for, say, five or seven years at a nominal or reduced revenue—on the clear understanding at the end of the lease, such short-leased lands reverted to Government here represented by the Forest Department.

I do not doubt for one moment if this were done many of the severe practical difficulties of raising forest stock would wholly disappear, and that the produce would be far superior to that raised on virgin land; and I could from direct practical experience produce a good deal of supplementary evidence tending to show that it is a practical mistake to plant many kinds of fruit trees direct into virgin lands, and I infer this by no means finds a limit at fruit trees.

Now if the above course was systematically adopted, the Forest Department could get rid of a large area of more or less rubbish of low commercial value, and at the same time there would set in

a system of planting trees of proved commercial value, with a total absence of the indigenous rubbish that comes up almost everywhere in a state of nature; and by reason of the superior start the progress would be such as to very soon prevent migratory seeds from the surrounding country from getting anything like a serious foothold.

And thus in time the forest reserves would become a solid acreage of commercial value, in which every tree would count for value.

But it is not very likely cultivators would go to the considerable work and expense of clearing, for, say, two or even three years, it ought to be at the very least five, and this latter period would give all requisite time for the total elimination of useless herbaceous vegetations of all kinds, and thereby greatly improve the prospects of forest plantings.

The proposition for bygone times was doubtless impracticable, but suppose that at this settlement period all abandoned land in Kumaon was promptly planted up with Eucalypts. In ten to fifteen years a wondrously pleasing feature in the landscape would be brought about, to say nothing of the very material increase in value over worthless slow-growing oaks and rhododendrons. An enormous area of this rubbish is reserved and protected, what for would seem entirely another question, seeing there is such a vast acreage that no man would ever touch even if Government gave him the offer for nothing, or even paid something to open it out.

I have heard it said it was necessary to protect the hillsides to avoid landslips; but I'll venture the opinion that the Government roads have been responsible for more landslips than all the cultivation in the province. The application of the arguments used in a station, say, like Naini Tal, where by the very nature of extensive building operations the whole course of nature is seriously interfered with, to the district cultivator or the hillsides which might be cultivation I regard as essentially erroneous, and more or less a bogy of the imagination.

None the less, however, the difficulties of getting land have been very greatly increased, as likewise the revenue, and for the rest Nature holds sway, this latter might be otherwise, I venture to think, to advantage.

Eucalypts do remarkably well; the seed is cheap, and known to keep its germinating qualities a long time; obnoxious vegetation on old lands is practically very little; and again those horrible goats, which some correspondent said some time ago in the public press, ate such a perfectly fabulous quantity of leaves, are no great nuisance.

I think this same correspondent said planting trees was also expensive. Very fine argument that! I believe ship-building is also very expensive; and so, too, is the best *jat* of champagne.

W. F. S.

III.—OFFICIAL PAPERS AND INTELLIGENCE.

Sample Plots.

Notes on the Collection of Data as to the growth of trees and tree crops by means of sample plots, with more particular reference to Oudh.

INTRODUCTION.

In the following notes attention is directed to the selection, measurement and up-keep of plots, established, primarily, for the determination of the rate of growth in diameter of the principal species occurring in the forests. Until the knowledge of the rate of growth in height, as well as in diameter, is much greater than it now is, very little progress can be made towards the determination of the increment in volume of single trees and whole crops. The subject appears to the writer too often to be given far less attention than it deserves. The current working-plans in Oudh for the timber forests are of necessity more or less preparatory in nature, but when they come to an end—within the next few years—it is anticipated that plans of a much more permanent nature will be possible. For such plans it is of the first importance that precise and complete information should be available as to the rate of growth of sâl. Perusal of these notes will show whether any of the existing plots can be improved, or whether they are sufficient in numbers; thus the notes may be of value both to Divisional Officers now and to Working Plans Officers in future.

Sâl is chiefly met with in Oudh in forests with all ages irregularly mixed up together. An initial difficulty met with in attempting to study its rate of growth is that there is an endless and ever-changing variety in the outside conditions under which the individuals are growing. It is assumed that there are limits —and fairly narrow ones too—to the effect on the rate of growth of the variations ordinarily met with. Special cases can be studied separately.

The way in which the rate of growth can be determined with sufficient accuracy for all practical purposes is indicated in the following notes:—

Parts I and II deal with the more important details of the plots.

Part III summarizes Parts I and II in the form of a set of rules on the subject.

Part IV is devoted to the treatment of felling coupes as plots with a view to the determination of the class-proportions giving the greatest yield in mature timber. Even if the conclusions arrived at are open to question, the subject is of sufficient practical importance to be worth discussion.

Part V contains a few suggestions for the modification of Article 87 of the Forest Department Code and for the collection in book form, every five years, for the whole of India, of all the information available as to the growth and utilization of trees and tree crops.

Several references are made to the sample plots in the Kheri Division, as the writer is acquainted with them. No unfriendly criticism, however, is at all intended.

The notes are not altogether original. They are gathered from remarks on the subject made by all the Divisional Officers in Oudh, although the writer is alone responsible for the opinions herein expressed.

PART I.

Selection of Plots and Trees.

Selection of Trees.—Should all trees of the important species standing in a plot be measured or only selected ones? The answer to this question in Oudh is that the trees should always be selected.

2. Before proceeding to discuss the above question, a few remarks may be made as to the past history of sample plots in Kheri. Countings of sâl rings yielded no satisfactory results; sample plots for periodical girth-measurements were started near Dudua in 1880 and 1881—

Plot 1, „ 2, „ 3, „ 4	¼ acre each	... Selected trees, although the choice was not confined to good trees.
„ 5	2 acres	... An enlargement of plot 4; all trees measured, to study the effect of fellings in 1874-75.
„ 6	...	... Forty selected trees in and around the Dudua compound.

Although the actual choice of trees made in 1880-81 is open to question, yet the principle of selection was in conformity with the suggestions made in 1880 * by Sir D. Brandis, as Inspector-General of Forests. In paragraph 33 it is remarked—

* Suggestions regarding the working of the Trans-Sarda Forests, Kheri District, dated Simla, 20th August 1880.

The best trees should be selected for measurement, and these should, as much as possible, be of different sizes.

Paragraphs 33, 34 and 35 of the "Suggestions" are of such general interest that they have been copied at length in Appendix A to these notes.

3. The Trans-Sarda Working Plan of 1892 represents another stage. Under its provisions the Dudua plots were set aside as not being sufficiently representative of the forests, and others were suggested. The exact sites were not fixed, and no mention is made in paragraph 64 as to whether all, or only selected trees, should be measured. The calculations made in paragraph 48 and Appendix D to the Plan are based on *all* trees. "Decayed" trees are said to have been omitted, but this term evidently only included trees that were nearly dead. Whatever may have been

the specific intention of the Plan, seven plots were subsequently started in which all trees are annually measured. Details of the plots are as follows :—

Sample plots—Kheri Division.

Situation.	Year when started.	Total number of trees measured, and still living : by classes.						Total number of trees at all healthy and suitable for measurement : by classes.					
		I.	II.	III.	IV.	V.	Total.	I.	II.	III.	IV.	V.	Total.
C-4	1897	6	15	70	131	..	222	...	5	16	41	...	62
C-7	1894	8	25	84	79	...	196	3	10	44	33	...	90
C-46	1894	5	15	42	66	...	128	1	5	25	34	...	65
C-65	1898	3	4	13	38	8	66	2	1	11	28	6	48
C-70	1898	18	2	38	111	3	172	2	1	33	58	...	94

NOTE.—The plots in C-45 and C-63 have not been detailed, as the numbers on many of the trees have been lost ; the latter plot was given up in 1897.

The figures given on the right hand side of the above table are based on the writer's personal observations for the plots in compartments 4, 7 and 46. It is not asserted that these numbers are absolutely correct, but that they are sufficiently so to make the inference very probable, that, when the plots were started, it was supposed that measurements of *all* trees would be required in the future. It is desirable, therefore, to invite attention to the subject.

4. The forests in Oudh may be looked upon as belonging to one or other of two main groups, *viz.*:—

(i) Timber Reserves—those capable of producing sâl timber of 1st class dimensions.

(ii) Fuel Reserves—those incapable of producing large sâl timber or which are principally required for fuel.

The distinction holds good in all Divisions more or less, although all the details may not yet have been finally worked out.

During the past 10 years "Improvement" fellings have been started in the "Timber" Reserves and Coppice with Standard fellings in the "Fuel" Reserves. The former only profess to be a preparatory measure, paving the way for the introduction of systematic "Selection" fellings in some form or other.

5. The case of the "Fuel" Reserves being the simpler, may be taken first. The "Standards" are intentionally the pick of the stock; hence it is obvious that only the best trees in the untouched coupes should be measured, so that only those trees may be under observation which will ultimately be worth retention as "Standards." As to the coppice crop, the quality of the young stock now growing up under protection will be far better than that it is replacing. It will hardly be denied, therefore, that this crop may be removed (in the second felling cycle) in the time that the better part of it takes to grow (in the first felling cycle). Healthy shoots should, therefore, be kept under measurement and not inferior ones.

6. It is taken for granted that in the "Timber" forests the mature crop may be removed in the time that the next lower class takes to arrive at maturity.

Underlying this is the assumption that the division into the accepted girth-classes of equal range corresponds so nearly to a division into equal age-classes, that there need be no fear of the younger classes not having time to grow up into the next higher classes. With sâl this may safely be assumed true for the practical purposes of working-plans in the immediate present, pending proof 10 to 20 years hence from the sample plots.

When the "Improvement" fellings prescribed in the current working-plans are completed, the forests will be in a vastly better condition than when they were started. Whereas now unsound timber forms the bulk of the material available for export, it is safe to say that sound material will then be far and away the most valuable part of the outturn. If the above statement is correct, then the rate of removal in the future may depend solely on the rate of growth of the healthy part of the stock; in other words, only healthy trees need be measured in the sample plots. Supposing that the diseased and unhealthy part of the stock does grow more slowly, no harm will be done. For example, assume that healthy class II trees grow to class I in 28 years, whilst inferior ones take 35 years. The felling cycle will be 28 years. As to the healthy mature trees, it is assumed that their places will be filled up from the lower classes within this period; hence there can be no question with regard to them. As to the inferior trees, less than four-fifths will come to maturity within the cycle of 28 years; given a mechanical rule that only trees of 6' girth are to be felled, then more than this proportion will not be removed in the felling cycle. To compensate for the earlier sequence of fellings, fully one-fifth of the inferior stock will be saved up for the second cycle. On the other hand, a felling cycle based on all trees, or on the inferior ones only, would result in loss.

As an illustration of the preceding remarks, the figures worked out during the present year by the writer for the Dudua plots of 1880, 1881 and 1894 may be quoted: —

	Class periods..... ...years.				
	V.	IV.	III.	II.	Total.
Healthy trees	30	27	25	28	110
All trees	42	28	26	39	135

7. A healthy sâl tree can more easily be recognized in the forest than defined on paper. Any trained forester with any experience at all of the species can point out healthy individuals.

Freedom from excrescences and epicormic branches, smoothness of the bark and the condition of the crown are sure signs of the state of vitality. The word "sound" has been avoided, as there are plenty of trees which appear vigorous and healthy from outside, but which are more or less unsound within. The forester selecting the trees in a plot must use his own judgment. Length and straightness of stem, again, need not be considered so much, although fairly tall trees without huge forks low down are to be preferred.

8. *Number of trees to be measured.*—So far it has been assumed that sâl is mature with a girth of 6′ at breast height. This has not yet been proved. In the better parts of Kheri there is every reason to believe that "physical" maturity is not reached under 7′; on the other hand, but to a much smaller extent in the "Timber" forests, there may be areas in which the tree is mature at 5′. Until "physical" maturity of the individual tree is known, "commercial" maturity of whole crops cannot be arrived at. So many undetermined factors enter into the question that, for the present, there is nothing for it but to continue the assumption as to 6′ girth. This being so a girth of 4′ 6″ to 6′ (class II) represents one stage short of maturity. As the rate of progress of the fellings depends on the rate of growth in this class, it follows that trees of class II are of more importance in a plot than others of smaller dimensions. Class III trees are not nearly so important, and as for class IV trees, they need hardly be troubled about at all in this connection.

Reference is invited to the figures given in paragraph 3. These show that the Kheri plots will not be nearly as useful for the next 30 years as they would have been (without increasing the number of trees measured), if only the classes had been arranged inversely to what they are. Too great stress cannot be laid on this matter. The practical requirements of the present generation are of more importance than those of the next. The Working Plans Officer now wants data for class II. Without such data he is no better off than his predecessors, who had virtually to assume a figure for the most important part of a working-plan, *viz.*, the felling cycle. The fewer the *assumptions* that have to be made the greater the outturn as a rule; for one is inclined to err on the safe side when making deductions from insufficient data. Given full information as to the rate of growth of the principal species, such caution becomes unnecessary. As the quality of the stock improves, so also will the importance of this question increase.

9. Before proceeding to indicate limits as to numbers in the different classes, the question may well be asked whether the existing girth-classes are not too large. They have a range of 18″. For sample plot purposes this is too wide. Moreover, there is no upper limit to class I. This should be remedied until the dimensions corresponding to maturity have been determined, especially as 6′ is probably under the mark. Although a range of 12″ would perhaps be small enough, to avoid disturbing the existing

nomenclature, the simplest plan appears to be to adopt a range of 9″ by dividing each class into two sub-classes *(a)* and *(b)*, thus:—

Class I	Sub-class	I *a* ...	6′ 9″	to 7′ 6″
	,,	I-*b* ...	6′ 0″	to 6′ 9″
Class II	,,	II-*a* ...	5′ 8″	to 6 0″
	,,	II-*b* ...	4′ 6″	to 5′ 3″
Class III	,,	III-*a* ...	3′ 9″	to 4′ 6″
	,,	III-*b* ...	3′ 0″	to 3′ 9″
Class IV	,,	IV-*a* ...	2′ 3″	to 3′ 0″
	,,	IV-*b* ...	1′ 6″	to 2′ 3″
Class V	,,	V-*a* ...	0′ 9″	to 1′ 6″
	,,	V-*b* ...	0′ 0″	to 0′ 9″

All trees over 6 feet in girth should not be clubbed together as in class I; those over 7′ 6″ shoud be treated separately. Recognition of so many sub-classes is certainly not an unnecessary refinement in the case of the better classes of sâl forest in Oudh. Besides, it only gives extra trouble at the time of starting plots, not subsequently. Adopting the above sub-classes, in a typical plot in a selection worked sâl forest, there should be the following numbers of sâl trees under measurement:—

Sub-class	I-*a*	5	10
,,	I-*b*	5	
,,	II-*a*	10	20
,,	II-*b*	10	
,,	III-*a*	12	24
,,	III-*b*	12	
,,	IV-*a*	12	24
,,	IV-*b*	12	
Class V		Special plots.	

10. A slight ambiguity in terms may be noticed. It is usual in working-plans to state "*the age of exploitability.*" This is generally taken as being the age corresponding to the lower limit of class I. In this sense the term is not synonymous with "*the average age of the trees exploited,*" which, under normal conditions, is equal to the age at the lower limit of class I + half the number of years in the felling cycle. Adopting the figures given in paragraph 6 and assuming that the sâl grows at the same rate in class I as in class II, the average size of the trees felled in Kheri, if the stock were normal, would be 6′ 9″, and the average age 124 years. Under conditions other than normal, of course, variations occur.

11. It will naturally be asked, how is it possible to find on one and the same area the above-mentioned numbers of suitable trees in the different classes, and no more? It may be impossible, but the answer to this objection is, that there is no necessity to limit all the classes to one and the same area. Herein lies a mistake made in the past. The number of trees in each class should not be subordinate to the area of the plots, but the reverse. To decide on the number of trees first, and then to mark off the requisite area, would be very little more trouble than to start with a basis of an area of two acres (in most cases) and to mark whatever trees happen to be in it.

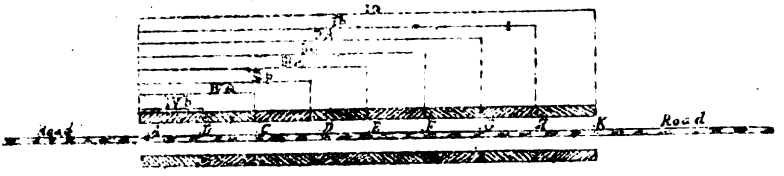
The numbers given in paragraph 9 represent a general case. Each type of forest, it is assumed, ought to have its own plot. If

the type contains few of class I, the numbers in that class may, of course, be reduced. In coppice with standard forests, such as those in Oudh, where it is assumed that class II represents maturity, class I of the standards may be left out of consideration altogether in the sample plots for the Standards, and the numbers in the lower classes may be correspondingly reduced. At the same time in both high forest and coppice forest, if the type has old trees but is deficient in middle-aged ones, the numbers in classes II and III should not be reduced. Let the area for these classes be correspondingly larger instead.

12. *Shape and size of the plots.*—The Kheri plots are 5 × 4 chains. This rectangular shape would be rather troublesome with compound plots having the different classes extending over different areas. In plains forests *linear* plots are preferable. They can easily be laid out and looked after. In most forests there are plenty of narrow roads (8′ to 15″ wide), which would serve as a basis. If not, a line could easily be laid out, either straight or curved, and marked off by a good-sized ditch.

(i) *A road as base*—

Starting from any convenient place A, select the trees for the plot between ½ ch. and 1 ch. of the edge of the road. Trees had better not be chosen within ½ ch. of the road, to guard against any possible effect on their growth of the opening along the road itself.



In the course of about 10 ch. (A—B, say,) the requisite number in sub-class IV-*b* will probably be found. From B onwards mark no more of sub-class IV-*b*. Some distance further on (A—C, say,) sufficient of sub-class IV-*a* will be found. From C onwards mark no more of this sub-class, and so on; in the course of about a mile all the required numbers will generally be obtainable.

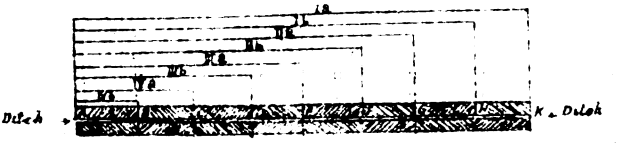
Thus the plot, when complete, will contain—

Selected trees of	sub-class	I-*a*	from	A to K.
,,	,,	,,	I-*b*	,,	A to H.
,,	,,	,,	II-*a*	,,	A to G.
,,	,,	,,	II-*b*	,,	A to F.
,,	,,	,,	III-*a*	,,	A to E.
,,	,,	,,	III-*b*	,,	A to D.
,,	,,	,,	IV-*a*	,,	A to C.
,,	,,	,,	IV-*b*	,,	A to B.

The erection of substantial posts at A, K, and at one or more of the intermediate places would make it easy to locate the plot at any time. If a broad clearing, such as a 50′ or 100′ line, is used as a base line, the inner limit within which trees are not to be selected should be increased in the same proportion of about 2 to 1, *e. g.*, with a 100′ line the distance should be not less than 3 chains.

(ii) *A special ditch as base*—

The general idea is the same as with a road. No space need be left in the middle. The trees can be selected anywhere within ½ chain of the ditch.



As already remarked, the base line may be either straight or curved, whichever is more convenient. In the hills a rectangular or, may be, an irregular form of plot will probably be found most convenient. The principle of compound areas remains the same, and plots can be laid out in a similar manner by merely increasing the breadth and diminishing the length.

13. *Special plots for class V.*—Outside influences exert such a powerful effect on the trees in a forest in early youth, that it is doubtful if any precise information can be obtained by the periodical measurement of a few single trees of class V.

To find out the average time required to produce trees up to 1′ 6″ in girth, attention should rather be devoted to the young crop as a whole. For this purpose special plots are required. Out of 2,000 or more seedlings to the acre, as a rule, less than one per cent. will ever come to maturity. The particular 20 individuals cannot, however, be singled out and watched. It is impossible to tell one from another. But, starting with an area containing, of class V, only seedlings a year or two old, it should be possible to find out how long one per cent. require to attain a girth of 18″. To be on the safe side, let the observation be made for 10 per cent.

A small area of known size (say, 1 or 2 sq. chains) can be marked off. A good method of distinguishing the individuals under observation does not readily suggest itself. Two ways occur to the writer—

(*a*) Uprooting of all seedlings between 3″ and 18″ in girth at the base, thus leaving an interval of 15″ between the seedlings to be studied and the smallest saplings in class IV.

(*b*) Attachment of small metal labels by wire to all, or a specified number, of the seedlings under 3″ in girth at the base.

Method (*a*) is simple, but it has the great objection of introducing a set of artificial conditions, so that it would be unsafe to depend solely on the data thus obtained. Method (*b*) is, therefore, to be preferred. Care must be taken to have *loose* wire loops, and to see that these are slackened every five years as required. The labels need not necessarily be numbered. The plot should be fenced to guard as much as possible against damage by animals.

By counting and measuring every five years, it should ultimately be possible to tell—

(i)	When	80	per cent.	of the	original	number	are 6″ in girth	
(ii)	,,	60	,,	,,	,,	,,	9″ ,,	At breast height.
(iii)	,,	40	,,	,,	,,	,,	12″ ,,	
(iv)	,,	20	,,	,,	,,	,,	15″ ,,	
(v)	,,	10	,,	,,	,,	,,	18″ ,,	

14. In coppice forests the same difficulty does not exist, except in the first few years of management. Where fellings have been started, the succession of coupes forms a series of young crops of known ages. The average girths of those percentages which will ultimately constitute the commercially mature crop can easily be ascertained.

The "Standards" can, of course, be treated in the manner already described.

15. *Selection of species to be measured.*—Although only the sâl has been referred to in particular in the foregoing notes, yet the latter are applicable, in a general sense, to any important species. Sâl is so much the most important tree in Oudh, both on account of its predominance in the forests and also because of the demand for its timber and fuel, that other species have been more or less left out in the cold. This should not be so. Even though, compared to that for sâl, the present demand for them may be small and the future prospects poor, still the determination of the rate of growth of some of the secondary species is of sufficient scientific interest to be worth the extra labour required for recording it.

The following species, other than sâl, might well be studied in Oudh :—

Asaina (*Terminalia tomentosa*).
Tikwi (*Adina cordfolia*).
Shisham (*Dalbergia Sisoo*).
Khair (*Acacia Catechu*).
Dhau (*Anogeissus latifolia*).

It is not suggested that separate plots for all these species should be established in all divisions, but that a general scheme for the whole circle would be worth drawing up. Neither would the numbers for sâl given in paragraph 9 be necessary. In many cases also sufficient Asaina and Tikwi might be found in the sâl

plots to obviate the need for separate plots. In this connection, however, care should be taken to choose only good and healthy trees of the secondary species in the sâl plots, and not to make-shift with any and every individual that happens to be handy.

PART II.

Up-keep and Measurement of Plots.

16. *General plan.*—The position of each selected tree should be recorded on a ground plan on a scale of 16″ to the mile, and the co-ordinates of each tree should be noted in the plot register. These co-ordinates will be two in number, *viz.*, the length of the offset on the base line, and the distance of the foot of the offset from the zero of the base line. An illustration of the usefulness of these records can easily be given. The old Dudua plots of 1880 and 1881 have not been attended to since 1892. A few months ago the writer examined the plots. Several numbers had disappeared, but the trees were identified from the map and register, which were prepared when the plots were first started. In the Bhira Sub-division there are similar old plots, but no further use can be made of them for want of such a map or register.

17. *Numbering of trees.*—Each species in a plot should have its own set of serial numbers. Opinions differ as to the best method of numbering the trees. Some officers prefer painting the figures on the bark. The writer prefers stamping the numbers on the tin plates, 4″ × 4″, and fixing these *loosely* to the trees with wire nails, 4″ long, driven in about 1½″. In most divisions sets of iron numbers are used for logs. If not, a set could be made for a few rupees. They give a very permanent impression. The numbers should not be painted on the tins, and the tins should not be *firmly* fixed by nails driven right in. The old Dudua plots may again be referred to. The numbers were painted on thick iron plates, about 3″ × 4″, *firmly* fixed by two nails each, one above and one below, the nails being driven in right up to the heads. In the course of the past 20 years the paint has been obliterated in several cases, and many of the plates have been forced off altgether. Where one nail held fast, the plate has been almost completely buried in the wood, more or less transversely, by the growth of a swelling all round it. Besides spoiling the timber, such obstructions no doubt interfere with the growth of the trees, and so make the latter useless for measurement. The tins should be attended to, and renewed as required, at each periodical measurement.

18. *Rings on the trees.*—The periodical measurements must be made at the same place on the stem. This is ensured by painting a white ring round each tree, and by always placing the tape on it with the upper edges of the two coincident. The paint should be of good quality. English paint is best; bazaar stuff should be

avoided. If good material is used, the rings will not require renewal for ten to fifteen years at least. Care should be taken to force the brush right into the cracks in the bark. The outer projecting parts are the first to flake off. The inner parts remain longer. Lastly, the ring should not be painted over any excrescence or irregularity on the stem. This is of great importance. So long as the rings are easily within reach, it does not matter at all at what exact height they are from the ground. Sir D. Brandis, as far back as 1880, laid special stress on this point (see Appendix A).

Attention is invited to the above details, because they have not always been observed in the past. Inferior paint has sometimes been used; and, owing to a too rigid adherence to the 4′ 6″ rule, rings do sometimes run over swellings, or where the stems have sloping surfaces on one side. Over five per cent. of the measurements in Kheri are of little value for these reasons.

19. *Month of Measurement*.—Reference to Appendix A will show that Sir D. Brandis advocated the measurement of the trees twice a year—in December and April, respectively. This seems too great a refinement. The bark flakes off irregularly, and is elastic, *i.e.*, the layers can be pressed inwards to some extent if the tape is held at all tightly. For these reasons the records of annual measurements show great variations; one year the figure may be the same or a trifle less than it was the year before, and the following year there may be a large increase. It is doubtful if any information as to the season of growth can be obtained from ordinary girth-measurements. The time of measurement may well be left to the discretion of the Divisional Officer, so long as the successive measurements of the same plot are made at the same time each year. The different plots should be measured at different times, the Divisional Officer can then generally arrange to attend to them himself.

20. The second year's measurements are of use as a check on clerical mistakes in the record of those taken in the first year, but beyond this, as already explained, annual measurements are of no particular value. Once in five to eight years is quite sufficient for the measurement of girth and crown. The intervals, however, should be regular as far as possible. This can easily be managed except, perhaps, for the first few years, even when several plots are started simultaneously. With five years' intervals, and 15 plots in a division, the measurements could be arranged somewhat as follows:—

Year..	*Plot*.
1st	.. 1 to 15, 1st measurement.
2nd	... 1 to 7, check measurement.
3rd	8 to 15 do.
4th	.. ..
5th	1 to 5, 2nd measurement (after an interval of 4 years from 1st measurement).
6th	6 to 10 do. do. (do. 5 do. do.).
7th	... 11 to 15 do. do. (do. 6 do. do.).
8th	... ...
9th	... ...
10th	... 1 to 5, 3rd measurement (after an interval of 5 years from 2nd measurement).
11th	... 6 to 10 do. do. (do. 5 do. do.).
12th	... 11 to 15 do. do. (do. 5 do. do.).
13th	... ...

If all plots are not started in the same year, the arrangement can be simpler, with regular intervals from the commencement. Whatever the plan may be, it should be drawn up and put on record.

21. *Crown measurements.*—The rate of growth in girth in the different classes can only be of use in gauging the productive capacities of different localities, when the trees under measurement grow under approximately similar conditions as to crown development in the plots under comparison. Recording the total sectional area per acre of all stems, good and bad, would be of little use, as the classes could not be separately dealt with in any useful manner; half-a-dozen poles of a foot each would count as equal to one tree of 6 feet, although the latter might cover as much ground as two dozen of the former. The best plan that suggests itself is to base the comparison on the sectional area of the crowns. The midday shadows can easily be measured. A step further would be to take the depth of the crowns into account; but this would be impracticable on a large scale.

The trees should be classified as follows:—

(i) Dominant (= D).

(ii) Dominated $\left(\frac{d}{1}, \frac{d}{2}, d\right)$.

$\frac{d}{1}$ = overtopped by a single tree on one side only.

$\frac{d}{2}$ = overtopped half-way round.

d = overtopped all round.

The crown measurements should be repeated, and the classification be revised as often as the girth-measurements are taken.

22. *Register of plots.*—Sample plot-registers are not often referred to, except on the rare occasions when a working-plan is in course of preparation. This may be partly due to trees of all sizes and species being mixed up together according as the serial numbers happen to run. The growth of trees in the same class cannot be compared at a glance. A better plan is to have separate pages for the different species and to arrange the trees according to size. This can be done, in the first instance, down to single inches, without much trouble. Decimals need not be considered in this arrangement. The trees can also be arranged in groups with a range of 9 inches, corresponding to the sub-classes already suggested. Between each group as many lines can be left blank as there are trees in the next smaller group. When any measurement subsequent to the first shows that a tree has passed into the next higher sub-class, from that time forward its measurements should be recorded in the latter. For example, suppose the measurements of a tree are—

1st	year	...	...	...	...	4′ 3″
6th	,,	...	...	...	...	4′ 7·5″
11th	,,	...	...	...	...	5′ 0″
16th	,,	...	...	...	...	5′ 4·5″

To treat such a tree in the register as being always in class III would not be correct. The exact year when it passed into class

II does not matter; but, for the first six years the tree should be treated as belonging to class III and afterwards as belonging to class II. Some of the trees in the old Dudua plot have passed through a whole class of 18 inches since 1880.

23. One little detail may be mentioned, only to be avoided, *viz.*, the survival, in some instances, of the "parts" of an inch. Decimals are much simpler.

24. Instead of having separate books for different ranges, all plots in a division should be recorded in one book; better still, one for a whole circle. When the initial measurements and plans are complete, they could be printed, with blank columns for later years, and bound up with the working-plan for the forest to which they refer. This would be well worth the little extra expense involved.

PART III.

SAMPLE PLOT RULES.

25. (A)—*Trees over* 18 *inches in girth in high Forest.*

Rules.	Selection and Preparation of Plots.	Paragraphs.
1.	A plot is to be chosen for each type of forest.	
2	The size of a plot is to depend on the number of trees to be measured; not the reverse. All girth-classes need not necessarily be spread over an equal area.	11.
3	Only selected trees are to be measured, vigorous and healthy ones being chosen. As a rule, the following kinds of trees are not to be selected :— (i) Isolated ones with large crowns. (ii) Short and crooked ones. (iii) Coppice shoots.	1 to 7.
4	Plots are required for each of the following species :— Sâl ... In all divisions. Asaina ... } ... ... Not required in all divisions; the Conservator to decide. Tikwi ... } Shisham ... } Khair ... } Dhau ... } The plots need not be in separate places, if suitable trees of more than one species are available in one place.	15.
5	The number of trees selected in each plot is not to be less than the following, without the special sanction of the Conservator :—	8 and 9.

Class.	Sub-Class.	Limits.	No. of Trees.	Remarks.
I ...	*a*	over 7′ 6″	2	Full numbers for the principal species; proportionately less for other species.
	b	6′ 9″ to 7′ 6″	5	
II ...	*a*	5′ 3″ ,, 6′ 0″	10	
	b	4′ 6″ ,, 5′ 3″	10	
III ...	*a*	3′ 9″ ,, 4′ 6″	12	
	b	3′ 0″ ,, 3′ 9″	12	
IV ...	*a*	2′ 3″ ,, 3′ 0″	12	
	b	1′ 5″ ,, 2′ 3″	12	

PART III.

SAMPLE PLOT RULES.

25 (A)—*Trees over* 18 *inches in girth in high Forest.*

Rules.	Selection and Preparation of Plots.	Paragraphs.
6 ...	The selected trees are to be personally inspected by the Divisional Officer before being accepted.	
7 ...	The linear form of plot is to be adopted, unless any other form is preferable in special cases, to be sanctioned by the Conservator.	12
8 ...	Narrow roads (15′ to 10′) as base lines are preferable to broad ones (15′ to 100′), as the trees can be selected nearer to them than with the latter.	12
9 ...	Base lines, other than roads, are to be ditched (2′ × 2′). In all cases the terminals are to be marked by good substantial posts, dressed and tarred.	12
10 ...	Plots, other than linear ones, are to be ditched all round.	
11 ...	With a road or fire-line as base line, the trees are not to be chosen within a distance equal to twice the width of the clearing, or more than ½ chain greater than this distance, measured from the edge of the road or line. With a special base line the trees are all to be chosen within ½ chain thereof.	12
12 ...	The position of each tree is to be recorded—	
	(i) on a map on a scale of not less than 16″ to the mile ;	16
	(ii) in a register.	
13 ...	The trees are to be serially numbered (each species in a separate series) with tins (4″ × 4″), loosely fixed by 4″ wire nails driven in about 1½″. The numbers are to be stamped (not painted) on the tins.	17
14 ...	When painting rings on the trees the following details are to be observed :—	18
	(*a*) The rings are to be at right angles to the axes of the trees.	
	(*b*) The rings are to be more or less at breast-height from the ground, but irregularities or excrescences must be scrupulously avoided.	
	(*c*) A good brand of zinc oxide is to be used, not cheap bazaar material.	
15 ...	The rings and tins are to be renewed as often as required. With good paint, once in 10 to 15 years will generally be enough for the former.	18

PART III.

SAMPLE PLOT RULES.

25 (A)—*Trees over* 18 *inches in girth in high Forest.*

Rules.	Selection and Preparation of Plots.	Paragraphs.
	Measurements.	
16 ...	Girths and crowns are to be measured in the 1st, 2nd, and every 5th year.	20
17 ...	So long as no change is subsequently made, the month of measurement is immaterial, the work being finished a clear month before the end of the working season.	19
18 ...	All girth-measurements are to be made with the upper edge of the tape touching the upper edges of the rings.	18
19 ...	The tension on the tape is to be only just sufficient to hold the latter in position.	
20 ...	All the measurements are to be taken by a gazetted officer (preferably by the Divisional Officer himself).	19
21 ...	The trees are to be classified as follows :—	
	(i) Dominant (= D in register).	
	(ii) Dominated ($\frac{d}{1}$, $\frac{d}{2}$, d in register).	
	$\frac{d}{1}$ = overtopped by a single tree on one side only.	21
	$\frac{d}{2}$ = overtopped half-way round.	
	d = overtopped all round.	
22 ...	The trees are to be arranged in the register according to girths, down to whole inches, 10 to 15 lines being left blank between consecutive sub-classes.	22
23 ...	When a periodical measurement shows that a tree has passed into the next sub-class, that measurement is to be recorded in two places in the register—	22
	(1) in its place in continuation of preceding figures;	
	(2) by transfer of the tree to the bottom of the next higher sub-class.	
24 ...	"Parts" of an inch are not to be used ; only decimals	22
25 ...	The register is to be kept in the following form :—	22

Species.	Serial No.	Position.		On.....th. of.....19 .				On.....th. of.....19 .				On.....th of.....19 .			
		Base.	Offset.	Classification.	Girth. ′ ″	Crown. sq. ft.	Remarks.	Classification.	Girth. ′ ″	Crown. sq. ft.	Remarks.	Classification.	Girth. ′ ″	Crown. sq. ft.	Remarks

Rules.	Selection and Preparation of Plots.	Paragraphs.
	B.—*Class V—plots.*	
26 ...	A known area (1 to 2 sq. ch.) is to be permanently demarcated by a ditch, if necessary ; the plot should be fenced.	13
27 ...	All, or a specified number of the seedlings under 3" in girth at the base are to be labelled with small metal plates loosely attached by wire. Coppice shoots are not to be labelled.	13
28 ...	The seedlings are to be counted and measured every five years until 10 per cent. have attained to a girth of 18" at breast-height.	13
	C.—*Coppice Forests.*	
29 ...	Enumeration surveys are to be made in a series of coupes of known age and averages to be taken from the best 75 per cent. of the crops.	14
30 ...	Standards are to be treated as in high forest ...	14
	(To be continued.)	

F. A. LEETE,
Deputy Conservator of Forests.

IV.—REVIEWS.

Forest Administration in the North-West Provinces and Oudh for 1899-1900.

The area of reserved forest in these provinces has undergone some alteration during the year; 21,097 acres of forest were added to the reserves of the Naini Tal, Kumaon and Ganges Divisions, and 8,976 acres to the Kheri and Gonda Divisions, whilst a reduction of 1,145 acres has taken place by the disforestation in the Bahraich Division of 1,134 acres, small areas being excluded in addition from the divisions of the School Circle.

There has also been some slight change in the area of the district protected forests in the Central Circle.

The following table gives details of the changes above referred to :—

Class of Forests.	Area at commencement of the year.		Added.	Excluded.	Area at close of the year.		Difference.	
	Acres.	Equivalent in square miles.	Acres.	Acres.	Acres.	Equivalent in square miles.	Increase, square miles.	Decrease, square miles.
Reserved Forests ...	...	4,005 *	...	...	...	4,049 *	44	...
Protected Forests ...	...	30	...	...	...	30	...	...
District Protected Forests ...		9,176	...	...	...	9,168	...	8
Unclassed Forests ...	...	43	...	...	...	43	...	...
Total ...	...	13,254	...	...	...	13,290	44	8

* Inclusive of 152 square miles of leased forests.

Settlement work has been proceeded with during the year, and it is satisfactory to note that the tracts taken up and settled, which include the Sarda islands in the Almora district, the Papidanda tract in Garhwal and the villages received from the Khairigarh estate, other than those made over for management to the Revenue Department, have been gazetted as reserves free of rights. The Forest Officer is so often handicapped in the management of his reserves by the ill-judged imposition of excessive rights on areas ill able to bear them, that it is quite refreshing to read of the contrary being the case. An investigation, practically completed during the year, has been carried out in connection with the policy laid down by the Government of India in 1894, to ascertain

whether the reasonable and unobjectionable requirements of the agricultural population in the neighbourhood of the forests were being fully provided for. The investigation showed that this was not always considered to be the case, and the grant of additional concessions and some alteration in the rules has been found necessary. Whilst of opinion that the grant of rights within a reserved forest is at all times dangerous, unless given only after the very fullest enquiry into both sides of the question, we are glad to note that the latter would appear to be the state of affairs in this instance. The powers of Conservators also have been enlarged, enabling them to use their own discretion in making free-grants to right-holders whose villages have suffered from fire or other calamities, without waiting for the usual red tape formalities.

Demarcation work has made progress during the year, and we note that the sum of Rs.10,113 has been spent on the work during the year. The sum, compared with the amount expended in other provinces, would appear to be large; but it must be remembered that these provinces, are in this respect far ahead of their less fortunate sisters. We are glad to note that excellent progress is apparently being made with working-plans for the forests of the provinces. The Tulsipur and Pilibhit working-plans were practically completed during the year, the working-plan for the Saharanpur Division was revised and a new plan for the trans-Sarda forests, Kheri, taken in hand. The working-plan for all the Government forests in Jaunsar was also nearly brought to completion during the year, whilst sanction was accorded to a revised working-plan for the leased *chir* forests. In all an excellent record.

The provisions of existing plans were carried out with some slight deviations, due in many instances to no purchasers coming forward to take the coupes.

It is worthy of note that the conversion into coppice-with-standards of the (in parts) extremely poor forest at the foot and lower slopes of the Siwaliks in the School Circle is having excellent results, though it has been found necessary to leave double the number of standards originally prescribed. The example might be followed with excellent results in other parts of India, where there is a demand for firewood.

The expenditure on roads and buildings shows an increased percentage on gross expenditure of 9·92 as compared with 8·11 of the previous year. The increase would appear to be under "New buildings," and is accounted for by the improvements made in the buildings used for the accommodation of the subordinate forest staff, a matter only too apt to be neglected to the detriment of the health and consequent efficiency of the men.

We notice that an important export road has been aligned to open the forests of the Kalaumi valley. As it is estimated that

its cost can be recouped within ten years of its formation, it seems a pity that money has not been at once made available to enable this road to be built. The thought suggests itself that the "ditching" boundary money might have been made available for a start.

The total number of cases taken into Court during the year was higher than it has been for several years; but although this was the case, it is sad to see that the proportion of convictions was less. To a certain extent this is attributed to the prosecution of fire cases having failed. The number of undetected fire cases also rose from 74 to 94, the increase being entirely in the Oudh Circle. It is a well-known fact that this class of offence, whilst terribly injurious to the forest, is the easiest to commit with a reasonable chance of evading detection. At the most there will probably only be the evidence of a fire patrol or guard, and a tyro at pleader's work can usually cause illiterate men of this class to contradict themselves in Court and thus render their evidence of no account. Were the Forest Officer empowered to hold in abeyance for a certain period any rights which a village might have in an adjacent forest should fire occur in that forest, the effect in the diminution of fires would, we believe, be startling. The truth is that the Courts are of very little use in fire cases, as in ninety-nine cases out of a hundred no offender can be found, or if found the evidence is not sufficiently strong to enable a prosecution to hold. If an effort is to be really made to stop fires, local Governments will have to help their officers by giving them fuller powers to deal with the matter themselves. In the Review of the Punjab Administration Report in the February Number of the *Indian Forester*, it was pointed out that most fires were due to incendiarism in order to get up new and stronger grass, whether for grazing, thatching, rope-making or other purposes. The stopping of this requires further powers than are at present granted to the Forest Officer. The success obtained in Bundelkhand this year is said by the local Government to be particularly satisfactory, as owing to the famine in Jhansi the forests were thrown open. This is exactly what occurred in the forests alluded to in the above quoted Review of the Punjab Report, and in that the immunity of the forest from fire was attributed to the absence of the incendiary. The rains failed, and there was therefore no incentive to burn the old grass when there was little hope of new coming up to take its place. It is simply a case of "a bird in the hand," &c.

The number of forest offences compounded rose from 445 to 483, but there was a decrease in the amount of compensation taken from persons. In this respect affairs would seem to be unsatisfactory in the Kumaon district forests, where the number of acquittals covered no less than one-third of the people prosecuted.

Grazing would seem to be on the increase, a fact entirely to be expected when it is remembered that additional concessions

have been made during the year to the agricultural population living adjacent to the forests. It is, therefore, not surprising to find that the fees received from cattle paying full rates fell from Rs.55,632 to Rs.51,716, whilst those for cattle paying privileged rates rose from Rs,25,161 to Rs.27,015. In addition there was a very large increase in the number of animals grazing free, the value of this grazing at full rates being put at Rs.45,392 as compared with Rs.33,679 in the previous year. The damage done to forests by grazing is a much vexed question, and many are the arguments that have been brought in support of the theory that it is not necessarily harmful to forests. It certainly is so to areas over which natural regeneration is required or in young coppice coupes, and when it is remembered that there are many areas which must of necessity be closed, either for such regeneration or for protective and climatic reasons in these provinces, the results of an increase in grazing rights would require careful watching.

Natural reproduction was, on the whole, good, especially in the case of sál, oak and Blue pine. The silver and spruce firs also produced fair crops. There was no general seeding, however, of the Deodar, though an abundant crop was expected during 1900. The bamboo seeded sporadically in all the submontane forests.

In connection with the "cutting back" in practice over felled coupes, the Conservator of the School Circle mentions that he introduced a very desirable modification in the system by commencing the work on the 1st April in the coupes already felled over that year instead of waiting until the next cold weather to do this work as prescribed by the working-plan. Considering that the size of the coupes is not large, that a year's growth is thus not wasted, one wonders why a year's wait, *i.e.*, the cutting back to be done the year after the coupe had been felled over, was ever prescribed.

Experiments were undertaken in the Ganges and Bundelkhand Divisions to ascertain whether the forests could supply grass fodder to the surrounding districts in time of drought at a price not too high to be prohibitive. In the Ganges Division the results were not satisfactory; but in Bundelkhand the supply appears to have met a distinct want. The manufacture of turpentine in the Central Circle has been put on a more satisfactory basis, a profit of Rs.4,000 having been made during the year, and it is reported that all the turpentine made is now sold without difficulty. In the School Circle the outlay exceeded the receipts, but a small profit is shown after deducting capital charges. An agreement has been made with the Raja of Tehri to tap the trees in the leased *chir* forests, and the actual profits would have been much greater but for the initial outlay on plant for the new leased forests.

In the Jaunsar Division the Salhra export works were in use throughout the year. The wet slide was nearly doubled in length, and it is calculated that the total saving effected by its use exceeded Rs.20,000. A good article on these export works appeared in the *Indian Forester* for July last (1900). The Conservator's report contains an interesting account of the floating operations on the Mautargadh, Dharagadh, Tons, and Jumna rivers. Over a million pieces of wood were brought down the Jumna and caught at the boom during the year, and the amount paid on account of boom and river dues exceeded Rs.12,000. The extension of railway communications to the forest north of Moradabad would greatly assist their exploitation. In the Oudh Circle the forests are within easy reach of the Bengal and North-Western Railway; but the inability of the Company to supply the necessary rolling-stock is reported to have caused considerable inconvenience in working the forests. Departmental working is not largely gone in for. The only part of the forests in which timber operations are now managed departmentally on a large scale is the Jaunsar Division of the School Circle. The fuel-supply of Naini Tal, Ranikhet, and Chaubattia is also arranged for departmentally, and in the Oudh Circle a large amount of timber or fuel was removed departmentally from the coppice fellings in Bahraich and Gorakhpur. But with these exceptions the greater quantity of the produce exported is shown as removed by purchasers.

The following figures compare the paying output of the forests with the amount or value of produce taken by free grantees or right-holders:—

	Removed by Government agency and purchasers.	*Removed by right-holders and free grantees.*
	C. ft.	C. ft.
Timber	3,591,791	806,883
	Rs.	Rs.
Fuel	1.50,165	58,191
Minor forest produce ...	2,72,775	87,615

There was a decrease in the timber and fuel taken by right-holders, and a considerable increase in the value of the minor produce so taken, owing partly to the reservation of additional areas subject to rights and concessions in the Central Circle, and partly to more accurate enumeration of cattle-grazing.

The financial results of the working of the forests during the year, though not so good as in the previous year, compare favourably with the average of the three preceding years. The gross receipts stand at much the same figure as before; but there has been a considerable increase in expenditure, and the surplus is less by some Rs.40,000. In the Central Circle the surplus has

increased, but in the other two circles there has been some falling off as shown in the following statement :—

Circle.	Receipts.			Expenditure.			Surplus.		
	Average of three Forest years, 1896-97 to 1898-99.	Forest year, 1898-99.	Forest year, 1899-1900.	Average of three Forest years, 1896-97 to 1898-99.	Forest year, 1898-99.	Forest year, 1899-1900.	Average of three Forest years, 1896-97 to 1898-99.	Forest year, 1898-99.	Forest year, 1899-1900.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Central ...	4,95,466	5,35,427	5,89,177	3,12,377	3,17,268	3,52,212	1,83,089	2,18,159	2,36,965
Oudh ...	4,86,143	5,03,185	4,62,861	2,68,712	2,70,431	2,75,572	2,17,431	2,32,754	1,87,289
School ...	4,96,228	5,62,108	5,41,272	3,39,735	3,66,504	3,58,239	1,56,493	1,95,604	1,83,033
Total ...	14,77,837	16,00,720	15,93,310	9,20,824	9,54,203	9,86,023	5,57,013	6,46,517	6,07,287

The decrease in the revenue of the Oudh Circle is chiefly responsible for this small surplus. A decrease of Rs.93,000 in Kheri Division was the cause. This decline was chiefly owing to the Railway Company's not being able to work up to its indents owing to differences with its contractors; and difficulties regarding the supply of railway wagons also adversely affected the demand from private individuals.

We may note, in conclusion, that the reports of the School and Oudh Conservators are commended for their conciseness, praise which is not given to the 36 pages covered by the Central Circle report.

The Local Government are to be congratulated on the year's good work done by the department, and on the possession of a forest administration of evidently high efficiency.

V.—SHIKAR AND TRAVEL.

Only a Cub.

That there was tigress in the jungles somewhere near my camp I knew, but she could not be persuaded to kill any of the baits that I had had tied up for her. Her tracks one morning showed that she had gone along a nullah not ten yards from one of the tied-up bullocks, but she had not touched it, and it seemed as if she fed on game only, as no damage to any of the cattle herds in the neighbourhood had been reported. I had quite given up all hope of getting a shot at her, and had, on my last day at the village of A., arranged for coolies to be collected to beat through a hill near my camp which was a sure find for lbear (if only they could be persuaded to break, which was not aways the case, as

there were so many caves in the hillside), when word was brought that a kill had taken place in a nullah between the bear's hill and my camp. On going to inspect the place where this had happened, I found that the carcase had only been dragged a short way from the nullah into the jungle along its banks, and but little of it had been eaten. The tracks showed that there was a cub with the tigress—a fact of which I before had not been aware, and the tracks further showed that after their meal the two animals had separated, the cub remaining in the jungle near by, while its mother had returned by the way she had come to the kill. For about two miles we followed her tracks which led us away from the nullah, and then they struck a small village path and we lost them. This was disappointing; but there was the chance that the tigress had gone round by some other way to join its cub, so I gave up all thought of having a bear beat, and instead made arrangements to beat along the foot of the hill on both sides of the nullah for the cub, and, if possible, for its mother too. The spot that I selected for my station was on the side of a small dried-up stream (a tributary in the rainy season of the nullah where the kill had taken place); all around me was grass jungle with scattered trees, and about 400 yards to my left was the bear's hill. Directly behind me, about 600 yards away, was another hill, for which it was anticipated the tigers would make on being disturbed. It was necessary in such a grass jungle to have a large number of stops, for although the grass was high and thick it was not matted, and a tiger could get through it easily anywhere, so I selected forty of the least stupid-looking from among the coolies assembled and placed twenty on each side of me, those on the left extending up to the foot of the hill. While laying the stops on the left my *shikari* came face to face with the tigress who was sleeping alone—the cub not being with her, at least my *shikari* did not see it—in a small depression at the foot of the hill. Fortunately, on being disturbed, she bounded off into the forest through which the beaters were to pass.

I had waited about two hours in my *machan* before I heard the welcome sound of the beaters advancing, and as I lifted up and cocked my rifle, I scared a covey of bush quail, that had allowed me to watch them feeding among the sâl leaves below me, and they scurried away across the dry stream and into the grass on my right. Ten minutes later I heard the sound of an animal coming towards me on my right; at first I thought it must be the tigress as it made so much noise among the dry leaves in the nullah, but it was only a four-horned antelope-buck that stood and looked at me and offered a most tempting shot at twenty yards which, of course, I did not take. Then after another wait of 10 or 15 minutes, the tiger-cub appeared. It came towards me across the bed of the nullah at a good rate, and I fired, when it was almost below me, between the shoulders, killing it at once.

All this time I was not aware that the tigress was in the beat, as my *shikari* did not tell me till afterwards that he had almost stumbled upon her as he was laying out the stops, and I was consequently very pleased to hear a low growl that could only come from her, soon after I had shot the cub. I heard her moving about the bed of the nullah, apparently coming and re-crossing it, and though I imagine she saw me, I never caught a glimpse of her, until the beaters were nearly up to her, and then she sprang across the nullah and through the grass to my left offering me two snap shots, both of which were unfortunately misses. They were both difficult shots; the first among the trees, and as there was a bend in the nullah when she crossed it, I could not get a clear view of her; and the second, in the long grass. The latter I ought to have made fairly sure of, but as I was on the point of firing I noticed that one of the stops, who was in a low tree to my left and rather below me, was almost in the line of fire, and I had to hold my fire until the tigress got well clear of this line. This delay put me off my shot, and, in all probability, accounted for my miss. After the beaters had come up, and I had searched carefully to see if either of my shots at the tigress had taken effect, I decided on another beat, through the low hill that I have already said was situated behind where I had been stationed. The tigress's track lay straight in this direction, and it appeared as if she must be lying up there; but the beat, which was a miserable, uncomfortable one, as a drizzling rain set in while the stops were being placed, proved blank, and we found that the tigress had made for this hill; but instead of ascending it, she had skirted along its foot and gone thence to some thick jungle and hills to the south-west. It was too late then to think of trying to hunt her up there, for I had 8 miles to go to my next camp and the sun was then very near the horizon, so I had to be contented with the cub I had bagged, and leave the mother for some future occasion.

AMTONG,
Raipur, C.P.

LONG TOM.

VI.—EXTRACTS, NOTES AND QUERIES.

A Visit to Dr. Schlich's Forests at Mirwart.

By Colonel F. BAILEY.

The following notes, made by me during a visit paid in the spring of 1898 to Dr. Schlich's estate of Mirwart, in the Belgian Ardennes, may, I hope, interest readers of the *Transactions*. Mirwart lies on the main line of railway running between Brussels and Metz. Much of this hilly region is still under forest, of which 2,844 acres belong to the estate. The woods, at an elevation ranging from 900 to 1,300 feet above sea-level, occupy a series of undulating hills with rounded tops, which are frequently extended

into plateaux. The rock is clay slate. The soil is for the most part a somewhat stiff loam, but clay is found in some places; the soil is shallow, rocky or stony on southern aspects, but elsewhere it is of good depth. The mean annual rainfall is from 35 to 40 inches.

The growing stock is constituted as follows:—Sixty acres of oak coppice, which is to undergo conversion into high forest; 100 acres of Scots pine, from fifteen to thirty years old; and the remainder, 2,684 acres, carrying crops of beech and oak, generally mixed with a small proportion of hornbeam, sycamore and Norway maple. About 2,000 acres of the last-named area have been under-planted with spruce, except in the most choice localities, where either acorns have been dibbled in or one-year old oak seedlings have been planted to the number of 8,000 to the acre.

Grand Campe.

A forest of beech, oak, and other hardwood trees of all ages, the remnant of a forest formerly worked on the "Selection" system. The stock had been very irregular; and though in a few places it was sufficient, the crop was for the most part far too thin, yielding an annual increment of perhaps not more than 15 to 20 cubic feet per acre, instead of 100 cubic feet, as it should have done. It was desired to remedy this state of things, and to obtain a full increment from the soil by under-planting with spruce, to be grown for pit-props. But notwithstanding the general deficiency in the stock, some thinning had to be done in places in order to permit the introduction of the spruce; and a secondary object of this treatment was to realise the value of the trees to be thus taken out.

The general rule followed in thinning was to remove all mature trees, with such as were diseased, injured, or misshapen, and would not improve sufficiently to warrant their being left standing throughout the rotation of the spruce, that is, for a period of forty years. In the denser parts, however, which occupied but a small proportion of the area, under-planting was not contemplated; and here fewer trees were taken out, the object being to leave the cover as complete as possible.

After this thinning, the greater part of the area carried a light crop of from 40 or 60 hardwoods to the acre; and these were carefully pruned to a height of about 16 feet from the ground, all branches under 3 inches in diameter being cut off close to the stem; the spruce were then introduced, 2-year—1-year plants being pitted at 4 feet 3 inch intervals (2,400 to the acre).

An area of 1,700 acres on the estate has now (in 1900) been treated on this principle. The oldest of these spruce plantations, 450 acres in extent, and planted during the season of 1893-94, has already attained a height of 12 feet, and, growing vigorously, presents a remarkably healthy appearance. After the lapse of forty years the spruce will be cut for pit-props, and the remaining

hardwood standards will be dealt with as may then appear expedient.

In order to carry out the fellings of spruce, the forest, which will bear an even-aged under-crop of that species, will be divided into four blocks; and, to avoid risk of damage by insects, through felling in successive years on adjacent compartments, the cuttings will be arranged as follows:—

First Year in Block A, | Third Year in Block C,
Second Year in Block B, | Fourth Year in Block D;

after which they will recommence in the Block A, so that there will be a clear interval of four years between two successive cuttings in any block.

Where the young spruce may be interfered with by coppice shoots already existing, or springing up as a result of the thinning, they will have to be protected by cutting back the coppice. In similar woods, where the soil was not considered good enough for spruce, the White (Weymouth) pine has been substituted for it.

Five-Hundred Acre Forest of Hardwoods.

Here, though the stock was deficient, and the annual increment much below what it should have been, the crop was far better than that found in Grand Campe, but the proportion of oak was too small. The treatment laid down was to pick out the thinner parts, where the scantiness of the crop was not due to poverty of soil, and to extend them by thinnings, made with a view to the planting of one-year old oak seedlings to the number of 8,000 to the acre, or about 2 feet 4 inches apart. It had originally been intended to introduce the oak by dibbling in acorns at intervals of 12 to 15 inches, but this intention had to be abandoned owing to the depredations committed by mice. After about ten years, when the young oaks have had time to establish themselves, the denser parts of the wood will be regenerated for beech; and the result will be a mixed forest of oak and beech, arranged in groups, the oak being at least ten years older than the beech.

At Mirwart it is not advisable to leave isolated beech standards, as they are liable to injury, inducing disease, occasioned by the direct impact of the sun's rays on their exposed stems, especially during severe frost. Beech standards also expand their crowns too widely, and grow into trees of small value.

Oak Coppice on a Southern Slope.

A worn-out coppice. The open space has been planted up with oak seedlings, which were destined to grow into standards, and to yield additional and vigorous stools for coppice. In places where the soil is very poor, Scots pine had been planted between the stools.

Ribelle Rose.

A very irregular beech-wood, consisting chiefly of poles with some trees of larger size, and a few oaks; also some naturally sown beech seedlings, in patches up to ten years old.

The treatment was to be as follows, *viz.*:—

(*a*) To widen openings over natural growth of beech, and thus permit its extension.

(*b*) Where the cover was light enough, and the natural growth of beech insufficient or absent, to under-plant with spruce.

(*c*) To plant larches here and there amongst the natural growth of beech, and amongst the young spruce in the more open parts.

(*d*) To defer for a time the regeneration of the denser parts of the crop.

The result of this treatment will be a mixed crop of beech and spruce, arranged in groups, with some larch scattered throughout them.

Fange d'Estang.

Swampy ground, with a thin young coppice of birch, oak and other species. The ground had been planted up with spruce at 3 feet 3 inch intervals; the plants were looking yellow, and many of them were making but little progress, especially in the wetter places. But on the little bank made by soil thrown out of the ditches, they were doing well. A good plan might have been to make small ditches and ridges at 8 or 10 feet apart, and to plant spruce on the ridges. The intervals between the lines thus formed might have been stocked with birch, which, however, grows spontaneously in places.

A little farther on we entered a thin forest of beech poles under-planted with spruce, a few oaks being seen in the thinner parts.

La Hure du Chapeau.

A forest situated on an open, sunny, southern slope, the soil being thin, dry and stony, with a covering of short grass and herbs from 6 to 12 inches high. The ground was to be sown with Scots pine, in accordance with an old local practice, as follows:—

The denser parts of the herbage to be burned off, and the seed to be sown broadcast without further preparation of the soil. Shallow trenches, from 3 to 4 inches deep, to be then dug with pick and shovel at 6½ feet intervals, the sods and soil being scattered between the trenches. This soil, together with that knocked out of the sods, falling through the herbage, was to afford a light covering to the seed.

The estimated cost of this method of sowing is 10*s.* for the seed and 32*s.* for the work, in all £2-2*s.* per acre.

Fosse Orban.

Here thinnings of undesirable trees had been made, and a light crop, consisting principally of oak, remained; this was to be

under-planted with spruce, the oaks being pruned up to a height of about 16 feet. The shade was for the most part too heavy for a crop of Scots pine, but this tree has since been sown on the more open and drier portions of the area.

Sapins de Biolin—30 *Acres.*

A crop of Scots pine, about twenty-four years old, raised by broadcast sowing.

The *first thinning* had been made at the age of nineteen years, when dead, injured, misshapen, and suppressed trees only were taken. It realised about 4*s.* an acre net. A *second thinning* had been made at the age of twenty-one years; it was similar in character, and realised about 16*s.* an acre net. A *third thinning* had been made (at the age of twenty-four years). It resembled the above, but a few additional stems were removed from patches which appeared too dense. It realised £2 an acre net. The crop remaining after the third thinning consisted of about eighteen hundred stems to the acre, or about half the number that had been previously cut out. The height of the dominant trees was 39 feet, their diameter being 5 inches at 4¼ feet above the ground. Dead branches had been knocked off up to a height of 8 feet. The ground was covered with moss, unmixed with grass, indicating that the cover was not too open. A *fourth thinning*, similar to the third, has since been made at the age of twenty-seven years, and has realised £4 an acre net. A *fifth thinning* will be made at the age of thirty years. It will be somewhat heavier than those preceding it, in order to allow the remaining trees to expand more rapidly in girth. It is expected to yield £8 an acre net. The crop on the ground after this thinning will be about six hundred trees to the acre.

If it be then decided to clean-fell for pit-wood at the age of forty years, and if it be evident that the desired diameter will be attained at that age, the crop may be left alone; but, if necessary, a *sixth thinning* will be made between the thirty-sixth and the thirty-eighth years, in order to promote the further development in diameter of the final crop. This crop, together with the produce of the sixth thinning, if made, is expected to realise from £55 to £65, or, say, £60 an acre net. After it has been removed, the ground will be re-*sown* with Scots pine.

The financial returns will probably work out somewhat as follows, *viz*:—

			£	*s.*	
First thinning at	19 years	...	0	4	*realised.*
Second ,,	21 ,,	...	0	16	,,
Third ,,	24 ,,	...	2	0	,,
Fourth ,,	27 ,,	...	4	0	,,
Fifth ,,	30 ,,	...	8	0	*expected.*
Final crop at	40 ,,	...	60	0	,,
	Total	...	75	0	an acre net.

This represents a net sale-price equivalent to £1-17*s.*-6*d.* per acre per annum.

The produce of the Mirwart woods is sold either by public auction, by private contract, or by tender, the last being the more usual practice. The crops are all sold standing, the purchaser felling and converting the trees and removing the timber. Scots pine poles, from twenty to thirty years old, sold as pit-wood, realise about 3½*d.* per (¼-girth) cubic foot net; at thirty-five to forty years old the net price rises from 4*d.* to 4½*d.*; at fifty years old to 5*d.*; and so on. Old Scots pine fetches a net price of 7*d.* or 8*d.*; beech realises from 7*d.* to 10.; oak, on an average, 1*s.* 3*d.* per (¼-girth) cubic foot net.

If at about the thirty-fifth year it should be decided to let the wood stand to produce timber of larger size, instead of cutting at the age of forty years for pit-wood, a thinning will then be made sufficient to permit the introduction of an under-crop of beech; and further thinnings will subsequently be made, from time to time, to enable the beech to develop. The produce of these thinnings will be sold as pit-wood, and the best of the Scots pine trees will be left as standards until they attain their most profitable dimensions. The final crop will, in the end, probably consist of pure beech.

Had the crop of Sapins de Biolin been composed of spruce instead of Scots pine, the rotation of forty years for pit-wood might have been adhered to; but the first thinning would probably not have been required until about the twenty-fifth year. Even at that age the number of dead, dying, and suppressed trees would probably have been small, and it might have been found necessary to remove a portion of the healthy stems in order to afford more growing space for those left upon the ground. Thinnings might have been necessary at short intervals between the twenty-fifth and the thirty-second years, after which a comparatively heavy thinning would have been made, in order to allow the stems of the final crop to put on girth. At the age of forty years the crop per acre might have been expected to consist of from 800 to 900 trees (as compared with 600 in the case of Scots pine), these trees being about 55 feet high and having a girth at breast-height of about 18 inches. The volume of such a crop would be about 30 per cent. higher than the crop of Scots pine, and the yield per acre per annum might approach 150 cubic feet. On the stock being removed, it would probably have been renewed by planting spruce at 4 feet intervals.

A Hill-Side,

from which a crop of Scots pine, consisting of 600 trees to the acre, and forty years old, had been cut for pit-wood in 1892. The ground had then been planted up with Scots pine, spruce, and White (Weymouth) pine. The treatment contemplated was to utilise all thinnings made up to the age of forty years as pit-wood. The greater part of the Scots pine would be taken out

during these thinnings, and the remainder of the crop, mostly spruce and White pine, would be allowed to grow on into high forest. At the end of the rotation, the area might be re-stocked with spruce by the method of natural regeneration.

Valuation Survey.

A matter well worth recording in connection with these forests is the manner in which Dr. Schlich made, a few years ago, a rapid valuation survey of them. He spent three days in passing through all the blocks which make up his total area of 2,844 acres. Once within the woods, he commenced by marking off upon the ground an area of one-tenth of an acre. On this small plot he estimated the value of every tree; he then walked on, at an even pace, for exactly ten minutes by the watch, when he halted, marked off a second area of one-tenth of an acre, and likewise estimated the value of every tree upon it. He proceeded in this manner throughout the whole of the three days; and adopting the measured plots as sample areas, he calculated from them the money value of the stock standing on the various blocks of the forest and on the whole property.

He has since been able to check the correctness of a portion of his work, and the following figures may be taken as fairly representing the degree of accuracy he attained. A block called Les Loches was estimated to carry stock worth £11,960. Having cut and sold timber from this block to the net value of £8,400, he carefully measured what was left, and found it worth £3,960. These two values added together amount to £12,360, only £400, or 3½ per cent., in excess of his valuation. On the whole, so far as he has data for forming an opinion, Dr. Schlich believes that his other estimates will turn out to be from 4 to 5 per cent. below the actual values, and will thus leave a suitable margin to meet unforeseen contingencies. Considering the very irregular nature of the crop, which changed in character every few yards, the results attained by his rapid survey are truly astonishing. They testify in a remarkable manner to his experience and skill in estimating.—*Transactions of the Royal Scottish Arboricultural Society.*

Imperial Forest School, Dehra Dun.

Prize Day.

On the 30th ultimo all Dehra assembled in the beautiful grounds of the Imperial Forest School, to speed the parting classes who have completed their course of 2¼ years' instruction. On these annual occasions society turns out in full force and in all the panoply of war to do honour to the school and its graduates. In return the school endeavours to put on as amiable a countenance, and to make the visit as pleasant as possible. On the lawn was pitched an arrangement of large tents open on the shady side and capable of holding two or three hundred persons. At 5 P.M. the proceedings began by the audience taking their seats, the Inspector-General of Forests, the Officers of the School, and the

more distinguished guests being placed on a daïs at the upper end. The Inspector-General, Mr. H. C. Hill, *I.F.S.*, having called on the Deputy Director to read the Report for the year, Mr. F. Gleadow, *I.F.S.*, rose and spoke as follows :—

"Mr. Inspector-General, Ladies and Gentlemen, and Students of the Imperial Forest School,—I regret to have to explain that the absence of Mr. Oliver, Director of the School, to-day, is due to illness. Although he is now recovering, his presence here has been absolutely prohibited. To-day is the great day of our year. From this date 41 of our senior students begin the real battle of life, and we hope they will find themselves well armed for the struggle by the learning and moral discipline which they have acquired here. Some 52 of the junior classes to-day become seniors. They assume the respect and the position due to the progress they have made. They also assume the responsibility of setting an example to those junior to them. Our numbers are increasing in a manner that may be convenient to Conservators with vacant appointments, but the increase is much less matter of congratulation for those who are responsible for the teaching, the touring arrangements, and the conduct of examinations. In fact, the limit of efficiency on existing lines has been reached. When classes are too large it results necessarily in one of two things: either a relaxation of the examination standard, or a large number of failures. The largest entry in any year up to date was 45. During the past year we admitted and taught about 55 junior students, including a few who left for various reasons. The entering classes to-morrow will number 51. At the last entrance examination we had no less than 90 competitors, exclusive of all the Government and University candidates.

"The changes in the staff have again been more frequent than is desirable. In July Mr. Gradon went on furlough, taking with him a large store of valuable knowledge and experience, and Mr. Caccia became senior instructor. His place was filled by Mr. Troup from Burma for three months, followed by Mr. McIntosh from Madras, who is still with us. I regret to say that we are now losing the services of Mr. Caccia, who is taking furlough from April 1st. The death of Mr. Gopal Singh has deprived the Forester classes of a good and painstaking mathematical instructor. The vacancy has been temporarily filled.

"The examination results have been fairly good. There is one student who has deserved and received honours, and there are only four who have failed. There were several students who came near to getting honours, but, on the other hand, there were more whose proximity to the caudal appendage was noticeable. The various subjects need not be discussed in detail now, but I should mention that the Prize Herbarium submitted by Mr. Seenayya attained an unusual degree of excellence, and his prize will, I hope, always be able to renew in him that keen inward satisfaction which is the reward of hard work crowned with success.

"In the matter of sports, &c., the school has done as well as usual. In A. R. Brown we have an athlete who can win a 100 yards' sprint or a 3-mile race. In Bakshish Singh we have a high jumper who has perhaps not been excelled by any previous native student. There is no lack of others. I regret to note that lawn-tennis has to some extent usurped the place of more manly games, but this is perhaps unavoidable considering the reduced number of European students.

"In Volunteering the school has done very well, considering the very small number we can now enlist. Trooper C. Alberts won the Viceroy's Medal for rapid firing between 200 and 400 yards. Corporal Powell's subsection, consisting of troopers C. Alberts, F. Dalton, and E. J. E. Basten, and himself, earned the distinction of being the best turned-out and smartest subsection in B. troop. In judging distances up to 2,000 yards Corporal Powell took second prize and Sergeant A. R. Brown third. Those students who do not belong to the Dehra Dun Mounted Rifles drill twice a week under two excellent instructors, who are very kindly lent us by the courtesy of the Officers Commanding the 2nd P. W. O. Gurkha Regiment. These instructors have taken a great deal of trouble, and the result has been evident in a satisfactory standard of efficiency. There have been, however, certain small breaches of our regulations as to uniform, and a certain amount of slovenliness in attire on the part of some of the senior class which have called for notice and will not be permitted in future.

"The general health of the school has been good. A new arrangement for water-supply on the premises has been carried out, and the only serious case was one of typhoid, in which the student had a very severe attack which necessitated his return to his home. It is unnecessary to mention here the prizes and medals earned, as they will be declared at the time of distribution. It has been in one or two cases difficult to select the best candidate, but I hope that the selection made will meet with general approbation. The awards include one silver and six bronze medals. No prize has been awarded for note-books on Forestry or Forest Engineering in the lower class.

"Our best thanks are due to those gentlemen who have given prizes, and also to our guests who have done us the honour of being present to-day. I am very sorry for those students who have failed, and in congratulating the successful ones I must warn them not to rest satisfied with their laurels, but to realise that they are only beginning a career in which they have yet to show whether they are worth their salt. They must not forget the old School, but ever remember it as having given them more than bread, namely, an object and interest in life. It only remains for me now to ask the Inspector-General of Forests to distribute the certificates, and to express a hope that these certificates may hold as good for the future as for the past."

The Inspector-General of Forests then rose and said :—

"Mr. DIRECTOR, LADIES AND GENTLEMEN,—You have heard the Director's Report, and so far as the passed students are concerned we may congratulate ourselves on having an honours man in Hudson, and on having but four failures. This result is a marked improvement on last year, when you may remember there were more numerous failures and the average standard was not so good. But we have our good years and our bad ones, and in 1899 the report was about on a par with that of this year. We have reason to hope that the better results will be maintained, and that years of numerous failures will, as time goes on, be rarer and rarer.

"When I stand up to make a speech in Dehra, I feel that I have been so intimately connected with the place for so many years, that I am like the prophet of old. I have no "honour" in Dehra, which is for all intents and purposes my own country. But by way of apology for presuming to make my voice heard I can claim to have the greatest interest in this unique technical school, both from its usefulness to the Forest Department and from the great influence that I sanguinely look for it to have on the true educational advancement of the country, and I can attest a feeling of deepest gratitude to you, ladies and gentlemen of Dehra, who so cordially aid and support by your presence to-day in keeping up a standard aiming at excellence.

"This year rivals in misfortune one you may remember some six or seven years ago, when an epidemic of influenza laid low the members of the Board of Control. To-day you will notice, and I am sure regret with me, the bareness of the 'rostrum.' Mr. Oliver, our worthy Director, is unable to attend. Mr. McKee and Mr. Duthie are and have been for days prostrated by illness, and the only member of the Board present is Mr. Manson. I particularly regret the poor show we make for this year. We have been specially fortunate in visitors, before whom we were anxious to appear at our very best. We have had the Principal of the Poona College of Science, Mr. Sprott, and also Major Alcock, the Superintendent of the Indian Museum, who have been most useful to us in giving us valuable advice and not less valuable criticism. We have been favoured with the senior Conservator of Bombay, Mr. Wroughton, as a member of the Board of Control, and it is the first time since the Board has been established that the Bombay Presidency has given us a member. I am sorry that he is not present to-day. He had to leave last night, and so cannot hear the thanks that I would give him and that he so well deserves for his indefatigable interest and work as an examiner and member of the Board and sharer with Mr. Manson. You will, I know, feel for Mr. McKee, who now has made the record by falling a victim to influenza on the only two occasions on which he has visited Dehra. Most of us become more and more enamoured of all the amenities of these parts each time we visit them, but he may be excused for hastening his departure and not giving us his blessing.

"The Director of Public Instruction, N.-W. P., Mr. Boutflower, has happily been able to be present and assist as a member of the Board with his mature experience, thereby filling at least one of the blanks at our sittings caused by influenza.

"PASSED STUDENTS,—You have been good enough to express to me your anxieties in terms which I think I may read:—

"'HONOURED SIR,—We, the unhealthy, poor exotic seedlings planted by your own hand in this school in April 1899, and watered and nurtured by your predecessor, Mr. Ribbonthrop, and yourself humbly beg to draw your attention to the following:—

"'1. We have been establishing for two years past in this school without being weeded away by the authorities with the firm belief that you will extend your mercey in giving all of us certificate.

"'2. The blood in our veins curdles when we think of the disastrous results of last year. And the melanchaly appearance which the prize distribution tent exhibted last year.

"'3. Owing to fear at the time when we were orally examined by the Board, many of us got confused and nervous, and were disabled from giving full answers to questions put to us.

"'4. We therefore request you who are Almighty God and everything for us, will kindly see before hastily publishing our *fate* all our marks, monthly as well as our finals, and also by giving grace marks to poor students make us all pass (as it was the case in some years back) and thereby give us and our generations the happyness of enjoying our future life with a poor pay of only Rs.30 (after this certificate) which is hardly sufficient to keep body and soul together in these famine days.

"'For which act of charity and kindness preying the Almighty for your long life and happyness we beg to remain, honoured sir,—Your Student's Class, 1899.'

"I can only tell you that all the nurturing of Mr. Ribbentrop, myself, and the whole school staff has not prevented that exacting body, the Board, from weeding out four of you. I regret the fact, but I am helpless to remedy the failure of these 'saplings' for such I may now, I presume, call them.

"My heartiest congratulations go to Hudson, who has gained his honours in such a way that no Board of Control could question them. It is possible that he may go on foreign service, when I trust the seed sown at Dehra Dun will bear the best of fruit and lead him on to a successful career. To those of you who have passed I wish every success, but I sound my usual note of warning. The certificate you are going away with is only a token that you are fit to pass on to further observation, study and careful work, by which you may become useful members of the service.

"STUDENTS OF THE FIRST YEAR,—Take care that you do not less well than those who precede you. That austere Board of Control will sit on you next year, and look to it that neither confusion nor nervousness, which, as far as my experience goes, are chiefly born of ignorance, overcome you.

"Ladies and Gentlemen, you have my sincere thanks for your supporting presence, and with your permission I will now ask Miss Oliver to present the certificates, medals and prizes, which even I will allow, have been well won."

The certificates were then distributed by Miss Oliver in order of merit, each recipient being greeted with hearty rounds of applause. The prizes-winners and medallists then took their turn, and were greeted still more warmly. The list is as follows :—

Mr. McKee's prize, for the best student in the Ranger class, R. D. Hudson; Mr. McKee's prize, for the best student in the Forest class, Puran Singh; the W. Prothero Thomas prize, for the best in practical forestry, K. G. Venkatarama Aiyar; Mr. Oliver's prize, for the best note-book in Forestry and Forest Engineering in the Ranger class, R. D. Hudson; Mr. Wroughton's prize, for the next best, E. H. Johnstone; Mr. Wroughton's Forest class, no award; Mr. Lace's prize, for the best in practical forestry, Forest class, Masharaf Ali; Mr. Gleadow's prize, for the best Herbarium, C. Seenayya; Mr. Hill's prize, for the best athlete, A. R. Brown; Mr. Stebbing's prize, for the best entomological collection, R. D. Hudson. The Brandis prize, for essays on subjects of practical forestry by former students, published in the *Indian Forester*, was awarded to three contributors, *viz.*, to Babu Birbal, now Curator of the School, to Mr. Ramchandra Krishna, E.-A. C., Forests, C. P., and to Mr. E. A. T. Radcliffe, Forest Officer, Kashmir.

The medals were awarded as follows :—

Ranger Class.—R. D. Hudson, a silver medal as the most distinguished student of the year, being first in forestry, in surveying, in forest engineering, in botany, in forest law and in forest zoology; Bakshish Singh, a bronze medal for forestry; A. R. Brown, surveying; F. T. Dalton, forest engineering; Uttam Chand, botany; C. Vasudeo Rao, physical science.

Forester Class.—Puran Singh, a bronze medal for forestry and general proficiency.

The remaining programme consisted merely of tea and coffee, strawberries and cream, cakes and sweets, pegs and smokes, and such like indulgences.—*Pioneer*.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

April 2nd 1901.

EAST INDIAN TEAK.—The deliveries during March have not been satisfactory, amounting only to 885 loads against 1,164 loads in March last year. The deliveries for the quarter, however, are still ahead of 1900, being 2,958 loads this year against 2,463

loads last year. Prices are inclined to be a little easier than of late, and the demand ahead is not very active.

ROSEWOOD—EAST INDIA.—Prices remain low, as the demand is dull and sales are only occasionally possible.

SATINWOOD—EAST INDIA.—Stocks are too heavy for the limited demand, prices are therefore weak and sales difficult.

EBONY—EAST INDIA—Is enquired for and would sell readily.

PRICE CURRENT.

	£	s.	d.		£	s.	d.
Indian Teak, per load ...	10	10	0	to	16	10	0
Rosewood, „ ton ...	5	0	0	„	9	0	0
Satinwood, „ square foot ...	0	0	5	„	0	0	12
Ebony, „ ton ...	9	0	0	„	13	0	0

Denny, Mott and Dickson, Limited.

WOOD MARKET REPORT,

London, 1st April 1901.

TEAK.—The landings in the London Docks during March consisted of 568 loads of logs, and 1,134 loads of planks and scantlings, or a total of 1,702 loads, as against 1,022 loads for the corresponding month of last year. The deliveries into consumption were 671 loads of logs and 440 loads of planks and scantlings, together 1,111 loads, as against 1,014 loads in March 1900.

The landed dock stocks on 31st March 1901 analyse as below:—

8,355	loads of logs,	as against	7,052	loads	at the same date	last year.
5,608	„ planks,	„	3,010	„	„	„
21	„ blocks,	„	7	„	„	„
Total ... 13,984	loads	„	10,069	loads	„	„

The first quarter of the year has shown a dull demand for teak, but the market has been very steady for logs, owing to shippers backing their resolute refusal to lower their *f. o. b.* prices, and consequently reducing the supply of floating cargoes to practically nil. Should this policy be pursued until the as yet very adequate landed supplies on this side are sufficiently diminished to require supplementing, shippers will necessarily command the position; and if they continue to adjust the supply to the demand, the holders of logs on this side will thoroughly appreciate such a sound attitude on the part of shippers. In respect to planks and scantlings, there has been a tendency to over-estimate the consumptive demand in Europe, which, although the appreciation of teak for purposes other than ship and rail-coach building continues to develop, is affected by the perceptible slackening in general trade and the consequent check to the demand for new constructive work.

Market Rates of Produce.

"TROPICAL AGRICULTURIST."

1st April 1901.

	£	s.	d.		£	s.	d.
Cardamoms, per cwt.	0	2	3	to	0	3	6
Croton seeds, ,, ...	1	5	0	,,	1	15	0
Cutch ,, ...	1	3	0	,,	1	13	0
Gum Arabic ,, ...	1	3	0	,,	1	15	0
,, Kino ,, ...	4	10	0	,,	5	0	0
India rubber, Assam, per lb. ...	0	2	6	,,	0	2	7½
,, ,, Burma, ,, ...	0	2	0	,,	0	3	0
Myrabolans, Madras, per cwt. ...	0	5	6	,,	0	6	0
,, Bombay, ,, ...	0	4	9	,,	0	9	6
,, Jubbulpore, ,, ...	0	4	3	,,	0	7	0
,, Bengal, ,, ...	0	4	6	,,	0	6	0
Nux Vomica, per cwt. ...	0	7	0	,,	0	10	0
Oil, Lemongrass, per lb. ...	0	0	4½	,,	0	0	0
Orchella wood, per cwt. ...	0	10	0	,,	0	12	6
Sandalwood logs, per ton ...	20	0	0	,,	50	0	0
,, chips ,, ...	4	0	0	,,	8	0	0
Sapanwood ,, ...	5	0	0	,,	5	10	0
Seedlac, per cwt. ...	2	11	6	,,	2	19	6
Tamarind, Calcutta, per cwt. ...	0	15	0	,,	0	16	0
,, Madras ,, ...	0	7	6	,,	0	11	0

THE

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Rotation and Possibility in Selection Forests.

By W. Schlich, C.I.E., Ph. D.*

In the March Number of 1901 you brought out an article by Mr. Gleadow on "Rotation and Possibility in Selection Forests." That article had been inspired by one of M. Broilliard's, headed "Une Catachrèse Forestière," published in the *Revue des Eaux et Forêts* of the 1st October, 1900. Allow me to invite your attention to the *Revue des Eaux et Forêts* of the 1st January, 1901, where you will find a short article by me on the same subject.

Mr. Gleadow seems to be affected by the term rotation (revolution) somewhat in the same way as the conventional Spanish bull by a piece of red cloth, and yet he uses that abused '*thing*' every day of his life, though he may not be conscious of it. Unfortunately, I am at this moment overburdened with work, or I should have gone fully into the details of the matter. May I ask you to publish the accompanying translation of my little article, and I promise you that I shall return to the subject as soon as I can find the necessary time.

In the meantime I beg to point out that Mr. Gleadow is wide of the mark when he says that Judeich, "the Great German Professor," is responsible for the French considering the selection method as a barbarous method; or, again, when he says:—"Judeich denies to selection the status of a method at all, since its possibility was incapable of being prescribed. But then he was thinking of nothing but *volume*." If this is what Mr. Gleadow has found in Judeich's writings, then he has, indeed, wasted his time.

As a matter of fact, Judeich regulates the yield, in the first place, by area, and as regards the selection method, he says on page 407 of the 5th edition of his *Forsteinrichtung* the following:—

"According to my view, in the case of the selection forest, the sylvicultural treatment and the considerations for a prospective

* See page 121 and 230 of this volume.

orderly grouping of the cuttings must decidedly take precedence of the cutting of a fixed yield; hence the latter can only serve as an entirely approximate estimate."—*Cooper's Hill, 24th March,* 1901.

Une Catachrèse Forestière.

Under this title M. Broilliard publishes an article in the October Number of the *Revue*. In this article, M. Broilliard recommends once more the determination of the yield by area in the case of selection forests, and he tries to demonstrate the uselessness, or even the mischief of using the term "rotation." As regards the first point, I am at one with M. Broilliard. My experience extending over more than forty years has proved to me that whenever the yield is determined by volume, one of the following two things occur:—

(1) Conscientious and prudent foresters always estimate the yield below the proper amount, from fear of estimating it too high.

(2) Foresters, with a more elastic conscience, generally estimate the yield too high.

In either case loss is the result. Hence the only means of assuring a proper management in the case of selection forests is to regulate the yield according to area.

As regards the second point, it seems to me that M. Broilliard goes too far. No doubt the several annual coupes differ more or less in material, but the object to be arrived at in each case should be to lead them over into a normal condition, so as to insure, as far as possible, an equal and sustained yield. Hence the cuttings in the understocked parts should be light, and heavy in the overstocked parts. But this is not all. Supposing we have to do with a forest in which each annual cutting area possesses a most regular crop, no doubt the question arises—"How much should be marked for cutting?" That quantity must, in the first instance, be decided by the approved rules of sylviculture. They tell the forester to cut—

(1) all mature trees which do no longer show signs of a sufficient increment;

(2) all sick or badly-shaped trees, if other circumstances permit their removal;

(3) such young trees which require removal from cultural considerations.

Then, it may happen that, following the above rules, cuttings would be so heavy that, on returning to the same cutting area after a number of years, there would be little or nothing to cut. M. Broilliard himself, in citing as an example the communal forest

of Pont-á-Mousson, has shown how little desirable this is. To avoid such inconveniences, the forester must construct for himself the law never to cut, at any one time, more than a certain proportion of the growing stock.

Let us take, for instance, a coppice with standards forest, and say, "Cut one out of every four standards at each going round." What does this mean? Assuming that the coppice is cut every thirty years, the four standards will be removed in $4 \times 30 = 120$ years, and four new standards take their place. Here you have a rotation of 120 years, or, if you add the age of the coppice, 150 years. *This is the calculation which passes through the brain of the forester, who marks the trees, whether he be conscious of it or not.* In marking one standard out of four, he determines the rotation under which the standards are treated, that is to say, the number of years during which the trees, growing at a certain moment, are replaced by a new crop. It is exactly the same thing in the case of a selection forest. On an average the growing stock is replaced by a new growing stock in the course of a certain number of years, which is the rotation; the length of it depends on the quantity which is cut on each return to the same area.

Why then this aversion to the term rotation? It seems to me such an innocent one.

In France, foresters have commenced war against the application of mathematics in the management of forests. After all what is the object of working-plans (*aménagement*) if it is not the proper and systematic application of sylviculture? A management which is not based on this fundamental principle, cannot be correct. At the same time the management cannot realise its object without the help of simple mathematical rules in every case when the object is to obtain a sustained and approximately equal yield. If foresters are afraid of the application of mathematics to the management, it is due to a faulty application, and not to an error of principle. Mathematics must be the servant, and not the mistress of sylviculture.

Proportionate Fellings in Selection Areas.

By O. C.

THERE is an ancient flavour about M. Broilliard's suggestion as transmitted by Mr. Gleadow to regulate selection fellings by a removal of a fixed proportion of the crop over the whole of the felling area. In the dim past, I seem to remember a prescription of 1 in 3 stems in "sál" forests; in the vivid present, I find it enforced in teak forests; in the hopeful future, I trust to see it placed in the list of obsolete makeshifts by means of which the Indian forester was at one time compelled to check the carelessness of ignorant subordinates, to control the revenue-hunting Divisional

Officer, and to prevent mechanically the too rapid uncovering of the soil in forests, where protection from fire was not assured. We are now in a position not to seek for information by laborious experiment, but to criticise the results of this method in Indian forests.

It is true that with us the term " age class " is a fiction; that in selection fellings trees are cut of all ages and even of all sizes; but the main crop still consists of stems which by attaining a certain girth-measurement have also, so far as our information has guided us, attained commercial maturity. It is this portion of the crop that we have for the last twenty-five years and more been accustomed to remove subject to the check of proportionate fellings, and it is understood that it is also this portion of the crop which is specially treated of in Mr. Gleadow's paper.

A forest must, however, be in a bad way when the forester is obliged to retain a large number of stems after the period of their most profitable utilisation has passed; especially in India, where trees of the lower girth classes should provide all the seed-bearers and all the canopy required. For such treatment must result not only in a present loss of interest, but also in retarding the birth of a new generation with the consequent drawbacks in the future.

Under this system the forester has indeed the power to fell individuals or groups of trees, provided the fixed proportion is not succeeded; but if his forest is in proper order he should in theory be able to remove each stem as it enters a prescribed girth-class in the certainty that reproduction of the species will at once take place in the blank created. It was this theory, though not set forth in these terms, which Captain Wood, Conservator of Forests, who commenced his forest service in the early sixties, endeavoured even up to his retirement to set before the department. But he failed to shake off the incubus of proportionate fellings, because of his failure to utilise the unsound mature stock. His method of extraction necessitated good quality in the yield of his forest, and had the restriction been removed, every sound tree would have been felled. With a change in the method of extraction, with the utilisation of unsound stems, proportionate fellings ceased, and in the crop of the future will happily be vindicated Captain Wood's assertion that we were utilising only one-third of our actual yield.

There are no long chairs in this circle, but from the limited comfort of a folding stool, I hazard the humble opinion that *in India* the system of proportionate fellings is a refuge for the destitute, a poor makeshift for the individual attention each stem should receive before its removal from selection areas. Further, that it involves a serious loss of revenue, and that it violates those natural laws by the observance of which alone we can induce the prompt natural regeneration of the most valuable species.

Checks with possibility by Area.

By A. G. Hobart-Hampden.

Mr. Gleadow's interesting résumé of M. Broilliard's article on "Rotation and Possibility in Selection Forests" draws attention to a most important point. Few will now stand up for Possibility by volume, but its alternative, Possibility by area, is inadmissible without something in the nature of a check to prevent excessive felling. For the regular forests of France, where the stock is complete throughout, M. Broilliard advocates a *proportionate* felling, that is, the felling of some proportion of the number of trees existing in the crop. But for our own irregular forests, which are in some places too thin, and in others perhaps too thick, it appears to me the form of check should be the other way round, that is, that a certain number of trees should be reserved per acre to serve as an irreducible minimum of safety. The usual Improvement Felling Working Plan merely provides that the felling shall be done on sylvicultural principles. The position has been taken up that the old ruined forests we have taken over are encumbered by a mass of very inferior material, which, when it suppresses better material, must be cleared away as rapidly as possible. Now if you can bring figures to prove that it is economically best to cut away at once all this superincumbent material, put the resulting large revenue into the Bank, and wait through a generation till the fine young crop which has thus been relieved is ready for the axe, then there is nothing to be said; the operation is sound. But if this cannot be shown, and a more or less sustained yield is insisted on, then I think that improvement fellings by area with no guarantee against excessive felling cannot safely be adopted. By "excessive felling" it will be seen that I only mean excessive financially, not sylviculturally.

The protection afforded to the damaged forests we took over was quickly followed by a grand crop of seedlings beneath the badly-grown upper stage, and in accordance with working-plan prescriptions, a very large proportion of this upper stage has been removed in the improvement fellings. Thus we now often find ourselves face to face with the question—"Where shall we get our revenue during the next rotation?" "From thinnings among clumps of poles and from such of the old upper stage as it was sylviculturally impossible to touch in the first felling" it will be answered, but there will certainly, in most plains sâl forests, be very little large material (that is, the material which brings in the bulk of the revenue) available, and it is at least very doubtful if the revenue of the next generation will come up to that of the past. However that may be, it is most necessary to avoid any such doubt in the future, and to provide some check on the possibility by area in the new working-plans made to replace the first improvement felling plans, now everywhere drawing to a close.

Our check may depend to some extent on the mode of treatment to be employed during the next rotation, but if we take a hypothetical case, which might well occur, and think out a form of check for that, it will be sufficient to indicate the kind of thing I mean.

Imagine, then, a sâl forest worked in the past under the usual system of improvement fellings, which is shortly to be brought under a system of selection, consisting in the removal of all stems over 6 feet girth with a felling rotation of thirty years. Past fellings may be supposed to have been heavy, and the result to have been such that to rely on the 6 feet (say, I. class) trees only for revenue, will mean a large drop in revenue. It is proposed therefore to continue to improve the crop of the other classes by subsidiary felling (*i.e.*, in fact improvement fellings). Now there will lie the risk. How are we to know that the subsidiary fellings will not remove so much II class material that at the end of the first felling rotation there will not be as many first class trees to fell in the second rotation as there were before? The only answer, it seems to me, is that we must *mark in reserve* a certain number of II class stems to take the place within thirty years of the first class stems removed in the first rotation, third class stems also to be marked to replace the II class that have grown up. The IV class may safely be disregarded as they will always be very numerous. Then, and *only* then, can the Officer who is to mark for the subsidiary fellings set to work. He would do so without any qualms as to excess felling, and be guided by sylvicultural principles pure and simple.

The above system would prevent a drop in revenue in the second felling rotation, but it has been suggested to me that we might improve on that, and mark in reserve the number of II and III class stems that ought in the future to stand on the area as I and II class trees, and this is no doubt better.

Whether or not there is adequate cause for this alarm, I cannot be sure; but I often pass through areas that improvement fellings have traversed and see standing in them very little but III, IV and V class trees, while of trees nearing maturity there is a painful lack. In any case I feel we ought to so arrange matters for the distant future that no doubt as to a sustained yield shall remain. Perhaps some Officer can suggest a better plan than marking in reserve.

Possibility by Area.

By G. A. F.

I AM glad to see Mr. Gleadow's notice of M. Broilliard's article on "Possibility and Rotation" in the March issue of the

Indian Forester. The article referred to by Mr. Gleadow is not by any means the first in which M. Broilliard advocates proportionate felling in preference to fixing the possibility by volume, though I am not sure how often he has referred to the subject, or whether any of his previous articles have been reproduced in the *Indian Forester*, as I have neither the back numbers of the *Indian Forester*, nor those of the *Revue des Eaux et Forêts* by me to refer to.

I wish Mr. Gleadow would enlighten us further as to how this fascinating method of proportionate felling is to be continued. In a previous article, I think in the *Revue des Eaux et Forêts* for 15th July, 1898, M. Broilliard explains how this method is to be applied to Oak in mixture with Beech, &c., to Spruce, and to Silver Fir forests, I think so far as concerns the "Coupes d' ensemencement" only, which I take it includes our preparatory and seed fellings. But how is the process to be continued? For spruce, for instance, he recommends the removal of one tree in 3 by groups, or say, 3 trees in 9. Two of these coupes would leave 4/9 of the original crop on the ground. Supposing two such coupes had in ten years resulted in a sufficiency of seedlings, how do we continue? Could we not apply some such simple prescription to all the regeneration fellings? I think we could. M. Broilliard shows that by taking two sets of coupes and making the first and third fellings in two coupes during the same year and similarly the second and fourth fellings in two other coupes the following year, and so on, the outturn can be very fairly equalised. What would appear to be required then is that the '*chiffre d'abatage*' should be fixed for our chief species. As M. Broilliard points out, however, his method has one serious drawback which may alone be sufficient to prevent its being generally accepted, and that is, that it is too simple. In India, however, the chimera of a sustained yield has not perhaps quite the same influence in it as on the Continent, so we may hope that even a simple method may have a chance of receiving consideration.

If Mr. Gleadow could be persuaded to give us his own idea on how one such simple method could be adapted to our wants in any given class of forest, I think there is no doubt some of us may be induced to rise from our long chairs to criticise or to approve. I quite agree with him as to the prescription of possibility by volume being unsuited to the selection method.

There can be no doubt that the simpler the method of prescribing the possibility the better, and the great merit of proportionate fellings in the regular method as M. Broilliard points out is, that it leaves the Officer entrusted with the marking free to devote his whole attention to the choosing of the best trees to mark, and relieves him of all anxiety about the volume, so that excellent results have everywhere been obtained by its adoption.

A Preliminary Note on Two New Destructive Bark-boring Beetles. *

By E. P. Stebbing, F.E.S.

Introductory Remarks.

In the month of August of last year (1900), Mr. Minniken, Deputy Conservator of Forests, in charge of the Bashahr Division of the Punjab Circle, discovered that his deodar (*Cedrus Deodara*) pole forests were being attacked by bark-boring larvæ. He reported the matter to Mr. Ribbentrop, at the time Inspector-General of Forests to the Government of India, and the latter went up and studied the attack on the spot. The notes which were the outcome of his observations on the deodar borer, and also on a kail (*Pinus excelsa*) borer, which he discovered doing severe damage to these trees, are embodied in this preliminary account of the life-histories of these two insects. It will be seen that there is yet much remaining to be observed.

Scolytus sp. (near to *Scolytus destructor*, Oliv.)

References.—This insect has been identified by Mr. C. O. Waterhouse of the British Museum as *Scolytus sp.* near to *Scolytus destructor*, Oliv.

Classification.—Order, *Coleoptera*. Family, *Scolytidæ*.

The beetles and larvæ bore galleries which are partly in the under surface of the bark and partly in the outermost layer of the wood. The insect has been reported as eating through the bark of deodar poles in the Bashahr forests and boring galleries in the wood below the bark. This fact is of interest, since I am not aware that the genus *Scolytus* has ever been previously reported in India as attacking Conifers. It does not do so in Europe, although it has been reported from America in this connection.

Life-history and description of insect.

Egg.—The exact period of egg-laying has not as yet been observed. Its European ally, *S. destructor* lays its eggs in June. The time at which our Indian species performs the same operation would appear to be somewhere about this month, since the larvæ were found by Mr. Minniken hard at work during August. It evidently varies with the elevation, since Mr. Ribbentrop observed that whereas at one elevation he noted larvæ already embedded in the larval galleries, higher up the females were swarming. Miss Ormerod † describes as follows the egg-laying stage of the European form :—

"The females may be seen early in June making their preparations for egg-laying by working their way along the bottom

* Reference has already been made to these insects in articles in the *Indian Forester* : in Vol. XXVI (1900), p. 560, under the title of "The Insect Plague in Deodar Pole Forests," and in Vol. XXVII, pp. 26, 132, and 231.

† "Manual of Injurious Insects and Methods of Prevention," by E. A Ormerod, p. 216.

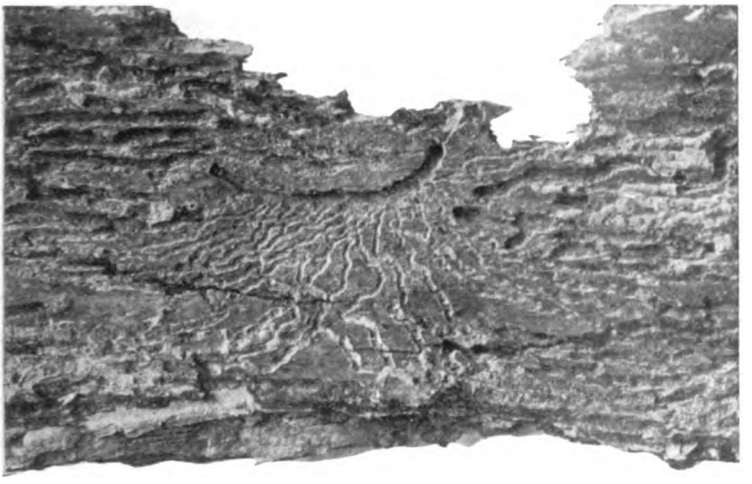

Fig. 1. Under surface of a piece of Deodar (*Cedrus Deodara*) bark showing galleries made by the beetle *Scolytus sp.*

Fig. 2. Under surface of a piece of Kail (*Pinus excelsa*) bark showing galleries made by the beetle *Tomicus sp.*

Life size from Photographs.

of cracks in the bark which they widen for some distance before beginning to burrow, so that the real opening of the galleries may be at some distance from the heap of rejected matter or little heap of wood-dust that marks the first point of entrance. The male is present for only a short time after the burrow is begun, before egg-laying commences. The burrow of the present beetle is usually about three to five inches long and takes about three weeks to form. The eggs are laid along each side of it, and are a hundred and upwards in number."

Larva.—The larvæ on hatching out start and bore at right angles to the parent gallery, their burrows which are regular gradually increase in size as the grub grows. From Mr. Ribbentrop's observations full-grown larvæ would appear to be present late in September and in October, when they form the little chamber or pupa-cradle noticed by him. In this they probably lie up as larvæ through the winter, changing to pupæ in the spring as is the case with their European confrère. This latter, however, has two broods in the year in Europe, although only one generally in England. When double-brooded, the larvæ of the first generation appear in July and spend about a month only or less in this stage, boring into the bark and outer wood. Beetles from these appear in August, and the larvæ from the eggs laid by these appear early in September and hibernate in their borings, pupating in the following spring.

Now we have seen that Mr. Minniken found larvæ at work in August, and Mr. Ribbentrop reports their presence late in September or into October. It follows that it is not at all improbable that our Indian species is also double-brooded, and this would account for the hiatus in the generations alluded to by Mr. Ribbentrop. The latter writes as follows:—

"The insect was first observed by Mr. Minniken in August last (1900), but is even now (1st October, 1900,) busy eating through the living bark of deodar poles, or engaged eating galleries below the bark. These galleries are regular. I have observed many old galleries, without a trace of the complete insect, with egg chambers at intervals . . . . . In many instances I found the white little larvæ curled up in the end of their galleries in the pupa-cradle, in others I found a hole whence the complete insect had evidently escaped. In no instance did I observe a complete pupa, though in two instances I found the larva enshrined in a web skin. Now it is quite evident that the egg chambers and larva galleries from the pupa-cradles of which the insect has found its way out, belong to a past generation, and possible that those in which the larvæ are still embedded are part of the present generation, which would indicate that the complete insect had been swarming for some time before it was observed. I am confirmed in this opinion by the fact that when I observed the larvæ already embedded, this happened at a somewhat lower elevation, whereas at a higher elevation the perfect insect was

more active. The question whether the former generation belongs to a previous year, or whether more than one generation appears in the same year, must remain for future observation. I have not sufficient material to solve the question. That, however, there has been a hiatus between the two generations is evident by not finding a single complete pupa. I am inclined to believe that the larvæ winter in the pupal chambers. This should be ascertained later on."

Now it must be remembered that this insect is living at a considerable altitude, and taking into account the life-history of its European ally, I am inclined to think that the two sets of larval galleries observed by Mr. Ribbentrop, *i.e.*, those containing larvæ and those in which the pupal chamber contained a hole through which the beetle had escaped belong to two different generations of the same year. Mr. Ribbentrop's attention was only drawn to the devastation in August, and he made his observations, I believe, in the latter part of September. By that time the larvæ from the galleries with a hole at these extremities would have already changed to the perfect beetle and left the tree boring their way out at the hole in question. The larvæ found in a web skin were probably already hibernating for the winter.

The larva is whitish, fleshy, wrinkled and curved; it tapers bluntly and is legless.

Pupa.—The pupal stage has not yet been observed. It will not improbably be a short one.

Imago.—The beetle is about an eighth of an inch in length and is black in colour, antennæ and legs being fulvous brown; small and cylindrical in shape; head projecting with a short broad rostrum; under-surface of abdomen is flexed upwards.

We have already seen that beetles are to be found early in October, and that they lay eggs producing the larvæ which probably hibernate as such during the winter. It has now to be ascertained whether these winter larvæ produce beetles which would appear about June. This will enable us to settle the point, a very important one, as to whether the insect is double-brooded or otherwise.

Locality from where reported.

The larvæ of this insect were discovered, as already mentioned, by Mr. Minniken, Deputy Conservator of Forests, attacking the deodar pole forests of the Bashahr Division in August, 1900. He reported the matter to the Inspector-General of Forests, and the latter went up and made a study of the attack on the spot. Mr. Ribbentrop wrote, "As regards the deodar, the attack is by no means serious, but it is evidently due to the large number of suppressed, and consequently seedy, trees in the young pole forests, and this would seem to furnish another reason for the early thinning of deodar thickets and poles." I have no doubt myself that Mr. Ribbentrop

has here hit the right nail on the head. The large number of sickly and dead trees remaining unbarked in the pole forests provided an immense supply of food for bark-boring beetles, and the usual result followed; they multiplied rapidly, and then attacked the surrounding living poles, and through sheer force of numbers were able to overcome and break down the resistance they met with. It will be remembered that when a green tree is attacked by bark beetles, *i.e.*, when the green bark is pierced through, it answers with a flow of sap. This would drown the burrowing beetles, but others fill their places and carry on the attack, and the answering flow of sap gradually becomes weaker and weaker, and finally ceases and the tree dies.

Specimens of this beetle with its larva were sent to me by both Messrs. Ribbentrop and Minniken; the former's diagnosis of the beetle as a *Scolytus* proved to be the correct one, and this would appear to be the first report of this genus attacking conifers in India. In Europe, as I have already mentioned, it confines its depredations to broad-leaved trees. I sent the beetle home to the British Museum authorities, and Mr. C. O. Waterhouse, who has very kindly examined it, informed me that it was very close to *Scolytus destructor*, the well-known Elm tree bark-borer.

It has yet to be decided whether the borer will prove a species new to science.

Note.—Accompanying the Scolytus beetles sent to me were some long reddish pink larvæ, evidently not the larvæ of *Scolytus*, which are small white curved legless grubs. Writing with reference to this larva, Mr. Ribbentrop stated :—"The matter (*i.e.*, the identification of the deodar-boring pest) has been somewhat complicated by the finding of a red larva in the galleries. This has been sent to Mr. Stebbing and others as belonging to the insect, which I identify as a *Scolytus sp.* It has, in my opinion, nothing to do with it, if not as an enemy. To begin with, it is about five to six times the size of the complete insect : has three pairs of complete legs ; has strong flat mandibles and two hooks to its other end, twelve distinct rings. Its colour is fleshy-pink." This pink larva belongs to the order *Coleoptera*, ann family *Cleridæ*, and is, as Mr. Ribbentrop correctly surmises, an enemy. The *Cleridæ* are cannibals, and these pink larvæ prey upon the *Scolytus* grubs, thereby no doubt exercising a certain amount of check on their too rapid multiplication.

Tomicus sp. (near to *Tomicus typographus*, Lin.)

Reference.—This insect has been identified by Mr. C. O. Waterhouse of the British Museum as *Tomicus sp.* near to the European form *Tomicus typographus*, Lin.

Classification.—Order, *Coleoptera*. Family, *Scolytidæ*.

The beetles and larvæ bore galleries in the bark and outer wood of the kail (*Pinus excelsa*) tree. They have been reported by Mr. Ribbentrop as doing serious damage in kail pole forests. The insect was at first thought to be identical with that attacking the deodar (*i.e.*, the *Scolytus sp.*), but on examination Mr. Ribbentrop found the pest to be a *Tomicus*.

Egg.—The date of egg-laying of this beetle has not yet been observed. In order to assist further researches into its life-history, I will give here a few notes on that of its European

confrère, *T. typographus*. This latter lives on the Spruce in Europe, and our Indian form is likely to resemble it in habits.

Life-history and description of insect.

T. typographus appears in the perfect state at the end of April or in May, at higher altitudes in June, and under favourable circumstances a *second brood* may appear in July and August.

This latter is of importance. The beetles are to be found in pairs boring into the trunks of large spruce trees under the crown, especially on the sunny side; when they reach the bast, they prepare a breeding chamber; after pairing the female excavates one or more galleries running in the long axis of the trunk which, besides the original bore-hole, may contain 2—5 air holes. On the right and left of the mother gallery, she bites out little recesses of the size of a poppyseed and lays in each an egg, generally to the number of 30 to 50, but sometimes as many as 120, which she covers with fine wood-dust.

These egg-receptacles may be seen in Fig. 2 of the accompanying plate.

Larva.—The larva was found at work in the kail trees in September, and it is probable that this would be the larva of the second brood. This latter supposition requires, however, careful observation and corroboration.

The Plate, Fig. 2, shows that our Indian *Tomicus* makes much the same sort of gallery in the kail bark.

The larvæ of the first brood of the European *T. typographus* appear 14 days after egg-laying in May and June, before the whole of the egg-laying is quite completed, and eat out slightly winding galleries in the bast, somewhat at right angles to the direction of the mother gallery. Our Indian species acts in much the same way, the winding galleries may be seen in the Plate, Fig. 2. The length of time the larva spends feeding is not yet known.

Pupa.—The larvæ pupate in a chamber at the end of the winding galleries which they bore in the bast.

Imago.—The beetle is about a quarter of an inch in length, dark-brown or yellowish in colour, shiny, hairy beneath, with scattered hair on the dorsal surface; head hidden beneath thorax and scarcely visible from above; thorax slightly longer than broad; its dorsal surface with rather fine sparse punctuation over the posterior half; tarsal joints simple; elytra have impressed striae, the intervals being punctured; elytra slope down at apex, the sloping portion excavate or impressed. Under-surface of abdomen flat.

Locality from where reported.

This insect was reported by Mr. Minniken in August, 1900, as attacking and killing kail poles in the Bashahr Division, Punjab. The attack was studied by Mr. Ribbentrop. He noticed that whilst the *Scolytus* attacking the deodar (already

mentioned) only appeared to attack that tree in clumps here and there, the *Tomicus* attacked the kail *en masse*. In a note on the subject he wrote :—

"The insect found in and destroying large numbers of *Pinus excelsa* poles is different" (*i.e.*, from that on the deodar poles), "though it was first considered to be identical. It is a *Tomicus*, of this, I have no doubt . . . . . The same insect is sometimes dark-brown, sometimes yellow as is the case in Germany. The larva-galleries and pupa-cradles are more irregular than with the deodar insect. Its attack, when it has taken place, is much more serious. I have not found the *scolytus* above described in *Pinus excelsa*, nor the *Tomicus* in deodar."

Specimens of this beetle were sent to me for identification. The insect, as Mr. Ribbentrop had recorded, proved to be a *Tomicus*, and Mr. C. O. Waterhouse, of the British Museum, kindly identified it for me as *Tomicus sp.* near to *T. typographus*, Lin. He wrote that the insect was new to the British Museum Collection.

Much remains to be done with reference to obtaining full information as to its life-history. The first and most important step is to find out how many generations it passes through during the year. The winter is probably spent hibernating as the perfect insect, under bark or in cracks of bark or stumps, and in spring the beetle bores through the bark and commences to lay her eggs. Search must be made for grubs in the spring. If such are found, the resulting beetles should be watched for and the month they appear noted. If it be in the summer months they will probably lay eggs which will hatch out at once, and we shall get the larvæ of the second generation during the rains. In Europe the entire development of a generation is passed through in ten weeks. It is evident from this that in the warmer climate of the lower Himalayas, at least two generations may be expected as the annual cycle of this pest.

NOTE.—*Hypohlæus flavipennis.*

Specimens of this beetle were forwarded to me, together with the *Tomicus sp.* Mr. Ribbentrop stated that they were found in the *Tomicus* galleries. He imagines, and correctly so, that these beetles are probably cannibals.

This beetle is a small heteromerus one and is carnivorous The beetles are simply present in the burrows to prey upon the *Tomicus* larvæ.

Attacks of Hyblæa puera on Teak Trees.

BY R. S. HOLE, F.C.H.

MR. STEBBING in his letter, printed on pp. 72 to 74 of the *Forester* for 1901, refers to a note by Mr. L. S. Osmaston, which appeared in the October Number of the *Forester* for 1900, on the subject of the present article, and says that as the larvæ noticed

by Mr. Osmaston pupated in the rolled-up end or edge of the teak leaves, they could not have changed into the moths which have been identified as *Hyblæa puera*, for the reason that the larva of *Hyblæa* always pupates on the ground and never does so in the rolled-up edges of the teak leaves. It has, however, occurred to me that Mr. Osmaston may perhaps be right after all, and my reasons are as follows:—

In the first place, Mr. Osmaston merely says that pupation takes place in the rolled-up end or edge of a teak leaf. It is not clear from this whether pupation occurred on the leaves on the plants, or on the leaves on the ground which had fallen from the seedlings. Presumably, however, the former is intended, and Mr. Stebbing appears to adopt this view. From observations hitherto recorded, it appears that the pupæ of *Hyblæa* are usually found on the dead leaves on the ground; but, as far as I am aware, it has never been definitely proved that the larva does not, at all events occasionally, pupate on the leaves while the latter are still on the tree, the pupa then falling to the ground with the leaf to which it is attached. In the case of *Paliga damastesalis* I have found pupæ on the leaves on the teak trees, and have also found both, larvæ about to pupate and pupæ, on the dead leaves on the ground. I have also found that *Paliga*, in that part of the Central Provinces at all events of which I have had experience, hibernates in the larval stage, and that, when about to hibernate, the larvæ descend from the trees, on which they have been feeding, and usually, if not always, hibernate in the ground in cocoons made of silk and bits of earth. These cocoons are frequently found in clusters under stones and large boulders, but they are often seen at a depth of several inches in the soil. This hibernation appears to commence towards the end of October and pupation takes place in the ground in the hot weather of the following year. After the hibernating stage then at all events the pupation of *Paliga* frequently, if note always, takes place in the ground. The mere fact, therefore, of pupæ being found on the leaves is not, I think, sufficient to enable us to definitely assert either that the insect is not *Hyblæa* or that it is *Paliga*.

Mr. Stebbing also lays stress on the fact that the *Paliga* larva pupates within the *rolled-up* leaf or edge of a leaf. This rolling-up of the leaf, however, appears to be by no means so general or characteristic a feature of this insect's attack as it is generally believed to be. I have frequently found that the larvæ when about to pupate take up their position in any small depression or hollow in the leaf which may prove convenient, and proceed to construct their cocoon there, swinging their heads quickly from right to left and from left to right, as they attach the thread to each side of the leaf and draw it across to the other. In such cases there is no rolling of the leaf, and there is obviously very little difference between the procedure here followed by the larva of *Paliga* and that adopted by the larva of *Hyblæa*, which Colonel Bingham tells us occasionally

forms its cocoon "along the mid-rib of a leaf dragging the sides of the leaf slightly together with the web." On the other hand, again, *Hyblœa* appears sometimes to *fold* the leaf in a manner closely resembling that which is usually followed by *Paliga*. On page 127 of the *Forester* for 1898 we have the following description of an insect subsequently identified as *Hyblœa puera*: "When the caterpillar begins to pupate it suspends itself by threads at either end to a leaf, not necessarily a dead leaf, spins a cocoon round itself and folds the leaf over so that it is quite snug."

Mr. Stebbing thinks that the larva described by Mr. Osmaston "will not improbably prove to be *Paliga damastesalis*." From Mr. Osmaston's description, however, I think it might equally well be *Hyblœa puera*. As far as our present knowledge goes, it appears that the larva of *Hyblœa* may at all events occasionally pupate in the rolled-up end or edge of a teak leaf. The pupal stage of *Hyblœa* is said to last from eight to eleven days. The length of the larva of *Hyblœa* is said to range from ¼ inch (after the first change of skin) to 1¼ inch (when fully developed), *vide* the account on page 128 of the *Forester* for 1898. All this tallies with Mr. Osmaston. It is noticeable also that the colour of the larva according to Mr. Osmaston is *dark-brown* or *black*, and this is certainly far more like *Hyblœa* than *Paliga*. In the account on page 128 of the *Forester* for 1898, the larva of *Hyblœa* is said to be pale-grey when young and dark-grey when full grown. Colonel Bingham describes the larva as "whitish yellow beneath, dusky greenish above." The larva of *Paliga*, on the contrary, is a light yellow-green when young, becoming pale sap-green when mature. Also, when about to pupate, this larva becomes a light primrose-yellow colour and the curious dark purple spots on the back then become very conspicuous and could scarcely fail to have been noticed by Mr. Osmaston.

Mr. Osmaston's pupa also is described as "one-half to two-thirds of an inch long." I am not aware of there being any recorded measurements of the pupæ of *Hyblœa*, but numerous measurements made by me of the pupæ of *Paliga* have shown that the pupa of this insect never exceeds one-half an inch in length and is usually only about three-eighths of an inch long.

Mr. Stebbing rightly remarks that *Hyblœa* is almost invariably accompanied by *Paliga*, and I have no doubt that, if Mr. Osmaston makes a careful search in his nursery, he will find *Paliga* more or less well represented, but I do not think there is sufficient evidence to show that the description of the larva and pupa given by Mr. Osmaston on page 516 of the *Forester* for 1900, is absolutely inapplicable to *Hyblœa puera*.

From the fact that these two insects, *Paliga* and *Hyblœa*, are so frequently found together, it is obvious that very careful observations, extending over several years, must be made before we can hope to draw up an accurate life-history of one or both of these pests. It is also obvious that, in the case of insects like these which have such a wide distribution throughout India and

Burma, it is necessary to collect information from all localities where they are known to occur, seeing that their life-history may vary somewhat in different localities.* Unfortunately, Divisional Officers, as a rule, have very little opportunity or leisure for making scientific observations, and it will obviously help us considerably in collecting reliable information regarding these insects if we can discover some means of readily distinguishing between the attacks of these two pests.

In a note printed on page 325 of the *Forester* for 1897, Mr P. C. Thompson reported the attacks of a defoliating caterpillar in the teak forest of Damoh, and drew attention to the peculiar fact that these larvæ only destroyed the parenchyma of the teak leaves, leaving the veins and vascular tissue intact. At the time, Mr. Thompson was unable to identify the insect, but in the following year 1898, when I took charge of the Damoh Division, I noticed another attack of defoliating caterpillars which seemed in all respects identical with that noticed the previous year. As noticed on pp. 428-429 of the *Forester* for 1898, specimens of the larvæ, pupæ and imagoes were obtained by me and forwarded to the Indian Museum for identification, and were there pronounced to be *Paliga damastesalis*. The teak leaves attached are usually most beautifully skeletonised and, occasionally, only the upper layers of the parenchyma are destroyed, the leaf tissue not being pierced. I have bred several larvæ of this insect, and have watched them feeding on teak leaves in all stages of their development, but I have never found them destroy the veins or nerves of the leaf It is to this fact that the forests which have been badly attacked by *Paliga* owe their characteristic sombre-brown colour noticed by Mr. Thompson, and which is very striking during the monsoon months, when the rest of the country side is green. The larvæ of *Hyblœa*, on the contrary, devour the whole tissue of the teak leaf, leaving only the middle and main nerves. I have invariably found this to be a most constant characteristic in the Central Provinces, and if it holds good elsewhere, the fact will, I am sure, render it easy to distinguish the attack of *Paliga* from those of *Hyblœa*, at all events in the case of teak.

It has been frequently noticed in the mixed forests of the Central Provinces that, simultaneously with the attacks of *Paliga* on teak, *Anogeissus latifolia*, *Stephegyne parvifolia*, *Adina cordifolia*, *Terminalia tomentosa*, other trees are also defoliated by a caterpillar. In the case of such trees also, the whole of the leaf tissue is destroyed, leaving only the mid-rib and main veins. At first sight one would be inclined to attribute this to *Hyblœa*. I have, however, noticed that when the teak have been absolutely

* Mr. E. P. Stebbing, Forest Entomologist, Imperial Forest School, Dehra Dun, will be glad to receive information and specimens from all parts of India during the different months in which the insect appears—Hon. Ed.

defoliated by *Paliga*, and when I have not been able to find a single specimen of *Hyblœa*, I have still found the foliage of *Anogeissus latifolia*, and of other trees destroyed as noticed above. I am consequently inclined to think that *Paliga* will attack trees other than teak, and that when this is the case it is apparently impossible to readily distinguish between the mode of attack of the two insects.

I have made careful notes regarding the habits and life-history of *Paliga* in the Damoh and Jubbulpore Divisions of the Central Provinces during the years 1898 to 1901, and I hope to ultimately give the results to the *Forester*, when I have been able to draw up a complete life-history of the insect for these provinces. As far as my observations go, however, they point to the following conclusions which I venture to enumerate with the hope that they may be useful for comparison with observations recorded in other localities, and may help us to draw up a complete account of the insect for inclusion in Mr. Stebbing's "Injurious Insects" :—

(*a*) As already mentioned above, *Paliga damastesalis* hibernates in the larval stage and hibernation commences from the end of October to the beginning of November, when the larvæ leave the trees and construct cocoons for themselves in the ground. Hibernation appears to last about 22 weeks, after which pupation takes place in the ground, and the moths emerge about April.

(*b*) The pupal stage usually lasts about eight days and the larval stage three weeks. The exact time for a complete generation I have not been able to accurately determine, but it seems to be about six weeks, and as many as five broods usually appear to be developed during the year. It also appears probable that the larvæ of one or more of these broods may live chiefly on some tree or trees other than teak.

(*c*) After hibernation some insects appear to pupate considerably earlier than others of those kept by me; the first insects which pupated did so just three (?) before the last. The early larvæ of the first brood would therefore emerge three weeks before the later larvæ of the same brood, and taking the time for a complete generation as six weeks and the length of the larval stage three weeks, there would appear to be a continuous chain of larvæ from the date of emergence of the earliest larvæ of the first brood to the date on which the latest larvæ of the last brood begin to hibernate. It should, therefore, be possible to find larvæ at any time during this period. From July to October I have invariably found larvæ present, and I think that if a careful

search is made they will also be found earlier in the year. All stages of the growth and development of the insect may frequently be found at the same time and on the same leaf. I have often seen larvæ of all sizes from one-twelfth of an inch to one inch in length together with pupæ.

(*d*) Pupation generally takes place on the leaves which have been attacked by the larvæ, except after the hibernating stage, when it takes place in the ground.

Regarding *Hyblæa*, unfortunately my notes are still very incomplete. It is, I think, generally believed that this insect has at least two broods in the year. In July, 1900, teak, *Millingtonia hortensis* and several other trees in Jubbulpore were defoliated by this insect, and during that year there appeared to be only one brood here of which any considerable number of larvæ developed. The trees which were then attacked in July, put out a second flush of leaves in the following September, and these remained practically untouched, except in the case of teak, which tree was as usual attacked by the larvæ of *Paliga* in September and October. The south-west monsoon in 1900 was unusually late and did not arrive in Jubbulpore until July. During this month also there was a good deal of sunshine, alternating with short showers, and the fact that heavy rain was not continuous appears to have favoured the development of *Hyblæa*. After July rain was more or less heavy and continuous, and this may have accounted for the failure of the insect to attack again in September-October. A reference to the account, printed on pp. 126—129 of the *Forester* for 1898, of the insect subsequently identified as *Hyblæa*, shows that very dry and very wet weather has seemed to be detrimental to the spread of the insect in Southern India. From this account also it appears that the principal larval attacks have been noticed in April-May and again in September-October. No attack in July appears to have been recorded, but it seems probable that there are at least three broods of the insect in the year. When more accurate observations have been made regarding the period required for each stage of the insect's metamorphosis, we shall find, I think, that there may be more than three broods in the year, one or more of them being frequently prevented from developing by some unfavourable circumstances. *Hyblæa* certainly appears to be far more susceptible to injurious climatic influences than does *Paliga*.

In conclusion, I will note a few facts which appear to indicate that there is likely to be more similarity between the life-histories of *Hyblæa* and *Paliga* than appears to be generally thought.

(*a*) *Paliga's* habit of letting itself down from the trees to pupate in the ground, as noted in para. 2 above, is clearly very like that of a large number of noctuid larvæ to which family *Hyblæa* belongs.

(*b*) The pupal stages of both insects appear to last the same time, usually eight days.

(*c*) From the account published on p. 128 of the *Forester* for 1898, it appears that the larval stage of *Hyblœa* lasts 19 days. From observations made by me last year it appears that the larvæ stage of *Paliga* takes the same time, *i.e.*, about three weeks.

JUBBULPORE:
The 20th November, 1901.

A Note on the Self-sowing of the Kusli Grass (Heteropogon contortus) seed.

BY L. K. MARTEN, *Berar Forest Service*

NATURE'S methods for the distribution and self-sowing of plant seed are numerous, but that of the seed of the "Kusli" grass has struck me as being most ingenious.

There are few who have had occasion to wade through open grass-lands early in November, clad in other than "Khaki" or some stout non-fluffy cotton fabric, who are not only too well acquainted with the "Kusli" or spear grass.

According to native classification, there are in Berar three kinds of "Kusli" grass:—

I.—The *Tâm*, a tall grass, generally found growing in damp rich soils and attaining a height of 6 feet; it produces an ear with only two or three large "kusals," a very formidable looking spear, but comparatively harmless.

II.—The "*Kusli*" *proper*, a grass found growing over large areas of more or less open forest land and on a variety of soils, seldom growing above 2 feet in height.

III.—The *lesser Kusli* or "*Bhurani*," a short grass found growing on dry slopes where lime predominates, seldom grows above one foot in height.

The seeds of all three begin to ripen towards the end of October or beginning of November; that of the *Tâm* soon falls to the ground and is lost sight of. In the "Kusli" and "Bhurani" the seeds, which are numerous, are borne in an ear, and each is a regular quiver full of small arrows; on ripening, these small spear-like seeds, with their hair-like appendages, burst away from the sheath and collect into small matted masses, which in the case of the Kusli are long or irregular in shape, and in the Bhurani each cluster forms itself into a perfect ball.

On examining these matted masses of seed, it will invariably be found that the little spears are all pointing outwards, and as they thus hang amongst the grass are on the *qui vive* for the

unlucky passer-by (man or beast) in whose coat they may find a billet, and thus get carried free to pastures new.

The less fortunate spears hang on a little longer, then give up hope of obtaining free transport, disentangle themselves and slide down to the soil.

On touching the soil the small spears start working their way into it, assisted by a peculiarly powerful screw-like action set up amongst the hairy appendages, caused by contraction and expansion of their fibres, due to the drying of the nightly dews by the sun's rays.

This may be seen at any time by removing the grass from a small patch where Kusli abounds, when the whole of the soil below will be found covered thick with a coat of what has the appearance of brown hair or bristles; in fact the ground looks like a coarse brown bear's skin.

Pull some of these bristles up and you will find at the end of each a Kusal seed which has been deeply imbedded in the soil, that they have worked their way under and between the crevices of large boulders for a considerable distance, and have thus sown themselves.

Now drop a few drops of water on these bristles and they will immediately start curling and twisting round as if alive; this peculiarity was apparently long ago spotted by the wily Indian juggler, for they will often produce a small packet of these Kusli bristles, and, after repeating various weird formulæ, proceed to moisten them and bring them as it were to life.

During the late severe drought experienced in Berar, great scarcity of fodder prevailed; every blade of grass that could be found in the reserves was cut and removed, and ultimately even the old unburnt refuse, the accumulation of years in fire-protected forests, was swept up and used for fodder.

In the past monsoon the rainfall was generally abundant, and a luxuriant crop of grass came up; but a most noticeable feature in the new crop is the great diminution, in fact in some localities complete disappearance, of the better qualities of fodder grasses and the marked predominance of Kusli.

As none of the grasses had a chance of seeding the previous year and removal was wholesale, irrespective of kind or quality, the abnormal increase in Kusli is remarkable and difficult to account for.

It is quite possible that the inferior qualities of grass are deeper rooted and escaped being scraped up for fodder, or that they are better able to withstand protracted droughts; but personally it has struck me that this deep self-sowing, with possibly the power of lying quiescent in the soil for a considerable time, accounts for the marked increase in "Kusli" grasses.

The matter may perhaps be of some interest in connection with fodder reserves.

Insufficiency of the World's Timber Supply. *

(*Continued from p.* 288.)

2.—Belgium.

Like England, Belgium is a great industrial country, and for that reason a heavy consumer. Hence, although the Government displays toward sylviculture a solicitude that is entirely absent in England, the production of its 506,000 hectares of forest (17·2 per cent. of the country, 8 *ares* per head) is quite insufficient. Reference to Table IV will show that the imports of timber for building and for mines, exclusive of cabinet woods, &c., amounted in 1898 to 1,492,141 cub. met., worth 104,255,611 francs. The exports were only 28,333 m.c. worth 2,143,483 francs. Hence a difference of 1,463,808 m.c. worth 102,112,128 francs. Allowing for necessary waste in squaring and sawing, the forest volume of this difference will amount to 1,850,000 m.c., whereas the timber production of the Belgian forests is but 850,000. m.c.† Forty years ago Belgium was not self-supporting, but the deficit was nothing like it is now. Going back to 1860 and comparing the imports and exports of building timber only, neglecting the less important kinds, it is seen that the excess of imports over exports rose from 157,432 m.c. in 1860 to 1,030,873 m.c. in 1898. In thirty-eight years an increase as 6½ is to 1 (see Table V). There is no reason to suppose that the Belgians are likely to reduce their consumption, and as the national resources can only increase at a very slow rate, it must be accepted as a fact that for many years to come Belgium will have to pay the foreigner for some 2 *millions of cubic metres annually* of timber in the rough, *say*, 70,000,000 *cubic feet.*

3.—Netherlands.

The Netherlands, consisting principally of fertile alluvial plains deposited by the Rhine, the Meuse, and the Scheldt, has been for centuries a country of few woods. The wooded area is but 7·5 per cent. or less than 5 *ares* per head, making a total of 248,000 hectares. Formerly, the Netherlands drew its supply from the basins of the Meuse, the Moselle and the Rhine. The expression "Bois de Hollande" occurs frequently in ancient documents having reference to the forests of Lorraine. At present the supply comes mostly from the north, by sea. Holland is essentially a commercial nation. The total of its external trade is almost the same as that of France, though the population is seven or eight times smaller. It is a sort of international depôt where the different peoples of Europe come to exchange their products for foreign ones. On the other hand, manufactures are less developed than in Belgium, and mining is of small importance. Thus the consumption of wood is smaller.

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* Translation by F. Gleadow, I.F.S. of "L'insuffisance de la production des bois d'œuvre dans le monde," par A. Melard, Inspecteur des Eaux et Forêts.

† Bulletin de la Société Centrale Forestière de Belgique, 1899, p. 313,

The imports in this case also exceed the exports. The values for 1898 (see Table VI) were :—

	francs.
Imports	104,121 912
Exports	85,976,696
Excess Imports ...	18,145,216

The available Dutch statistics do not always give figures of volume, so that it is impossible to complete the comparison.

4.—Switzerland.

Owing to the ruggedness of the country and the want of means of communication, the industries of Switzerland were for a long period of merely local importance. The produce of the forests was then greater than the demand, and there was no care for the needs of the future. As in all mountainous regions, the forests that were best liked were those that offered the greatest amount of grazing, *i.e.*, precisely those which were in process of destruction, possessing the least density and the greatest number of open glades.

When roads and railways enabled the Swiss to send their produce abroad, the result was a rapid growth of industries. Exports became a great object, and the forests, which were formerly fully ample (842,000 hectares, or a fifth of the whole country), soon became insufficient. At present, under the fear of the terrible consequences that are to be expected if the ruin of the forests goes far enough to endanger the stability of the mountains and the safety of the valleys, steps are being taken to limit the exploitation and to increase the imports from less wise nations.

At present the volume of the timber imported is five times that exported, and there is reason to expect that the disproportion will become greater. Switzerland is rich in waterfalls, the power of which is now being made available for factories run by electricity. In spite of the absence of coal, Switzerland is being transformed into a vastly industrial country like England and Belgium. "The glaciers are white coal," according to a current saying. The future of the Swiss external timber trade may be forecasted from the progress of the last few years. (See Tables VII and VIII.) In 1888 the figures were :—

	quintals*	francs.
Imports	738,509	5,032,373
Exports	778,763	3,859,706

At that time Switzerland was about self-supporting. Her exports, though greater in weight, were less in value. In 1898 the situation was different.

	quintals.*	francs.
Imports	1,757,082	16,541,409
Exports	332,541	1,786,482
Excess Imports ...	1,424,541	14,754,927

* See table of equivalents.

Thus in ten years the imports have more than doubled, while the exports have dwindled by half.

The excess imports for 1898, therefore, represent about 240,000 m.c. net, or *in the Forest* 300,000 *m.c.*

5.—GERMANY.

Considering that in a total area of 54 million hectares Germany possesses nearly 14 million hectares of forest, and considering that these forests are mostly situated in the plains or on mountains of moderate height, and are further to a great extent peopled with dense and productive coniferous crops, it is natural to expect that Germany has plenty of timber for herself and a share for her neighbours. But for thirty years past the commerce and industry of Germany have been progressing by leaps and bounds. The population of Germany is increasing by about 500,000 annually, and is already over 55 millions. It will be 60 millions in 1910. German external commerce, imports and exports combined, but exclusive of the precious metals, was 7 milliards 442 millions in 1875, and in 1898 it had risen to 10 milliards 910 millions. The mercantile tonnage rose from 1,085,000 tons to 1,555,000 tons in the same period. The outturn of coal mines, &c., was 56 million tons in 1883, and 131 million tons in 1898. The production of cast-iron was 2,914,000 tons in 1881 and 6,889,000 tons in 1897.

It has been remarked in the cases of England, of Belgium and of Switzerland, that the expansion of industry and commerce involves a similar increase in the demand for timber. The rule is again proved by Germany. Comparing the external trade in common timbers (see Tables IX and X) for 1888 and 1898, the following are the figures:—

		quintals.	francs.
1888	Imports	32,404,363	172,17[illegible],000
	Exports	8,762,439	78,273,000
	Excess Imports ...	23,641,924	9[illegible],903,00
1898	Imports	47,349,948	370,612,000
	Exports	3,341,748	27,08[illegible],000
	Excess Imports ...	44,088,200	343,531,000

In weight the excess has nearly doubled, in value it has more than tripled, in ten years.

Adopting 6 quintals as the average weight of the cubic metre, the excess of imports for 1898 works out to about 7,300,000 m.c. including boards and staves, and representing *at the least* 9 *millions of cubic metres.*

When it is seen that a country possessing 14 million hectares of its own under forest cries aloud for 9 millions m.c. from

abroad, it becomes possible to understand how a country, like England, with practically no forest, requires 15 millions of cubic metres.

6.—Denmark.

Denmark is certainly a country where the value of forests is best appreciated. Those which exist are treated most carefully, and the area is being increased as far as possible by planting up the waste lands. Unfortunately the area is small, 241,430 hectares, or only 6·3 per cent. of the entire country. The production is far too little for a population of 2,300,000 inhabitants. In 1898, Denmark imported 31,085,318 francs worth of common timbers, and only exported a trifle of 57,947 francs worth. The excess imported (or national deficit) was thus 31,027,371 francs (see Table XI).

The volume imported was about 650,000 m. c. representing *at least* 800,000 *m.c. in the forest.* The situation is becoming graver every year. From 1891 to 1895 the mean excess of imported timber was only about 19,500,000 francs.

7.—France.

The 9,500,000 hectares of forests (17·7 per cent. of the country) by no means suffice to provide France with the needful timber. From 1894 to 1898, the value of imported and exported timbers (see Tables XII, XIII, XIV) amounted to:—

	Imports.		Exports.	
1894 ...	141,909,363	francs.	45,204 012	francs.
1895 ...	124,957,884	,,	41,547,028	,,
1896 ...	144,550,610	,,	44,343,517	,,
1897 ...	148,539,484	,,	46,497,593	,,
1898 ...	142,443,353	,,	31 518,931	,,
Total ...	702,400 694	,,	209,111 081	,,
Average ...	140,480,140	,,	Mean 41,822,216	,,
Mean excess, Imports ...			98,657,924	

With such a demand, the question at once arises why it is so difficult to make forests pay in France? The reply is simple. For ages one-half or two-thirds of the forests have been managed with a view to the supply of wood for fuel and for charcoal making. Of late years these outlets have been stopped or greatly diminished. Working-plans and forest crops cannot be altered and changed daily. To increase the age of a coppice, to wait while small timber becomes large, to convert a poor firewood forest into a firwood, and so forth, requires considerable time, and may involve the making of heavy sacrifices for a long term of years. Communes and landowners are only just beginning to see the necessity. Consequently the old firewood production still goes on, though it is no longer desired, and other timber is badly wanted. The whole of the French forests yield no more than 6 million m.c. of timber as compared with 20 millions m.c. of fuel.

This will be made clearer by a short analysis of the external commerce. During the five years referred to, the trade in wood fuel and charcoal was as follows:—

	Wood fuel.	*Charcoal.*
	francs.	francs.
Imports	592,401	538,033
Exports	815,657	677,492
Excess Exports ...	223,256	144,459

These figures show the trifling nature of the foreign market for charcoal and wood fuel. The imports are too small to have any effect on home markets, and are less than the exports. The latter in no way diminish the surplus of fuel in France. There is plenty of wood fuel for export, but no buyers. Fifty years ago it was a very different story. For the ten years from 1847 to 1856, the normal forest production was augmented by an unfortunate amount of disforestment, no less than 133,000 hectares having been destroyed with the sanction of the State. Nevertheless, the market was not sated, wood and charcoal sold at good prices, the supply was in fact insufficient; for the imports were worth 3,648,000 fr., while the exports only reached 142,000 fr. Such times cannot be expected to return. Charcoal, already abandoned by the metal trade, is being daily displaced for domestic purposes by petroleum, gas, and electricity. Wood will indeed remain the best and most luxurious class of fuel, but its use in this capacity is strictly limited. It is thus emphatically necessary for communes and landowners to follow at once the good example set by the State, to make no deferring and delaying, but immediately to set about so revising the treatment of their forests that the future produce may be as far as possible timber and not fuel. When the production of fuel is unavoidable, it should be large fuel, there is no room for small stuff. Wherever possible, timber should be aimed at, for the quantity and the quality of the present supply correspond neither to actual needs nor to the productive power of the forests.

It has been already stated that the average value of the timber imports for the late five years was 140,480,140 fr. for an average weight of 1,561,536 tons (see Table XIV). The average value of the imported ton was thus 89 fr. 96 cent. During the same period the value of the timber exports was 41,822,216 fr. for 858,530 tons. The value of the exported ton was thus only 48 fr. 71 centimes. The conclusion is, that the timber imported was of a quality very superior to that of the exports. What is most required in France is thus seen to be timber of the very highest class, rather than small timber of which there is plenty.

This statement is confirmed by a detailed examination of the imports and exports, but a difficulty arises from the fact that the figures as given in the Customs returns are not always comparable. Logs, mine-props, wood for pulp, &c., are entered in the rough; while others, such as sleepers, scantlings, staves for casks, &c., are

entered net, that is to say, after the waste portion has all been removed. The whole must therefore be reduced to one unit, the cubic metre in the rough, and this can be done with sufficient approximation by aid of the mean density of the different kinds of wood and by using the fraction representing the known proportion of waste in converting timber for a given purpose (see Table XIV).

After making the calculations, it appears that for the period 1894—98, the annual imports amounted to 3,828,840 m c. in the rough, and the exports to 1,492,170 m.c. in the rough. A deficit of 2,336,670 m.c. This deficit includes only what the Customs call "common timber," and is less than the real deficit, for during the same period 122,000 metric tons of wood pulp came into France, and this represents not less than 700 000 m.c. of wood.

The real deficit of France is thus 3,036,670 m.c. or *in round figures* 3 *millions of m.c.*, or 106 *millions cubic feet. annually.*

The timber deficit of France is thus equal to about half the total production of the country, which does not exceed about 6 million m.c. The necessity of increasing the timber yield is therefore obvious, but what is the best way to set about it? What are the classes of produce most desired by the consumer? (See Table XIV). The largest deficiency is in squared and sawn timbers of various species, being largely coniferous woods from Russia, Sweden, Norway, and North America, derived from trees 100, 150 and even 200 years old. For these, the excess imports (or national timber deficit) correspond to 2,800,000 m. c. in the rough. Comparing this with the yield of all the State-managed forests in France (1,000,000 to 1,100,000 m.c. of coniferous wood from 3 million hectares), the importance of the fact becomes clear. There is also imported some 227,000 m.c. of coniferous wood fit for wood pulp. In the matter of oak beams, scantling and cooperage, the excess imports are 428,000 m.c. As this class of goods is only obtained profitably from oaks of large size, it must be concluded that French oak forests are not grown large enough. On the other hand, the classes that can be procured from small or moderate-sized trees (sleepers, &c.), show an excess export of 70,000 m.c. There is also an excess export amounting to 1,040,000 m.c. of rough logs, poles and mine-props of various species, mostly absorbed by the British and Belgian collieries. These are in great part either coppice standards or young conifers grown in the Landes and Dunes along the coast. This class of produce is far preferable to fuel or charcoal, but is vastly inferior in quality and value to the sawyer's timber of oak, silver fir and spruce, and the oak cooper's wood that is desired.

France has thus an excess of fuel and small timber, but a notable deficiency of conifers and large oaks.

8.—Spain and Portugal.

Geographers point out the African character of Iberian physiography, the Spanish peninsula being a plateau bordered by high

mountain terraces and divided into compartments by internal chains.

The rivers are precarious, having neither glaciers nor great lakes at their sources, and the rains are very unequally spread over the different seasons. A general drought is often followed by severe floods. Spain and Portugal *ought* therefore to possess great masses of forest composed of shady species, and able to act the part of a regulator to the rivers. There is nothing of the sort. Spain is indeed credited with 6,500,000 hectares of forest, 13 per cent. of the whole country, 37 *ares* per head of population, but these forests must be uncommonly poor if the Customs statistics mean anything. It must not be assumed that the Spanish forests are valueless. They satisfy a great deal of the local demand, and they furnish to the foreigner a much appreciated supply of cork, which, for 1898, was valued at 31,800,000 fr. The natural timber deficit of Spain for 1888 to 1898 (see Tables XV and XVI) is as follows :—

		francs.
1888	Imports	29,020,700
	Exports	1,534,423
	Excess Imports ...	27,486,277
1898	Imports	30,330,590
	Exports	810,544
	Excess Imports ...	29,520,046

The increase is but small for ten years, and is to be accounted for by the misfortunes endured by Spain in 1898. Now that the country has before it a hope of prolonged peace, it will be able to devote its energy to the active exploitation of its mineral wealth and to push on its industries, so that in a very few years a notable increase in its timber consumption is likely to become apparent. * In 1898 the volume was the following :—

	m. c.
Imports (13,140,000 donelles)	50,000
Various timbers	282,000
Total Imports	332,000
Exports (20,263,596 kilog)	32,000
Excess Imports ...	300,000

In the forest the requisite volume *cannot be placed lower than* 400,000 *m.c.*

* The provisional figures for 1899 showed an increase of 20 millions in 1898 including the increase (if any) in fuel and charcoal.

The Portuguese statistics do not agree among themselves, but the forest area seems to be about 450,000 to 500,000 hectares. In any case its timber production is very inadequate.

The figures for 1898 being not yet received, those for 1897 show :—

	francs.
Imports	5 705,874
Exports	705,265
Excess Imports ...	5,000,609

The volume was :—

	m. c.
Cask staves (3,448,0 0 pieces)	13,400
Beams and planks	52,268
Total ...	65,663

or the equivalent of 100,000 m.c. in the forest.

The exports cannot be stated as they are expressed in "pieces," "metres run," and what not. The most profitable export of Portugal appears to be cork, which in 1897 was valued at 20,750,000 fr.

9.—Italy.

Bounded on the north by the Alps and traversed from end to end by the Appennines, Italy is a country of mountains and hills, with only one great plain, that of Lombardy. The Alps are easily eroded by rains, while the Appennines, which are the most recently evolved water-parting in Europe, are no less so. As a consequence the Italian rivers are perpetually washing down the soil of their upper courses and depositing it as silt at their mouths, with the formation of sandbanks and deltas of a marshy and malarious kind. These conditions have been aggravated by the general disforestment of Italy, which began in the earliest times and has continued through succeeding ages, till at present Italy with its 28,664,800 hectares has no more than 4,093,000 hectares of forest, or 14 per cent.

Speaking generally, the Italian forests are poor in timber. According to a valuation made in 1886, the annual supply was only 1,374,000 m.c. The greater part of the produce was fuel and especially charcoal, the demand for which has greatly decreased. In 1879, the Italian Customs valued it at 80 fr. a tonne, but in 1898 it was taken as 60 fr. when imported and 48 fr. when exported. Italy thus produces less timber than she consumes, though her national deficit is considerably less than those of England, Germany, France, and Belgium. This is explained by the general absence of minerals, mines, and great industries.

The timber exports and imports in 1888 and 1898 (see tables XVIII and XIX) were—

		m tons.	*francs.*
1888	Imports	473,683	31,646,810
	Exports	62,805	3,778,875
	Excess Imports ...	410,878	27,867,935
1898	Imports	487,960	35,262,298
	Exports	67,762	4,130,762
	Excess Imports ...	420,198	31,131,536

The excess imports for 1898 correspond to 700,000 c. m. partly converted, *and to* 900,000 *c. m. in the rough.*

10.—Greece.

Nine-tenths of Greece is mountain. The river beds have a rapid fall, and the rivers themselves have less the character of rivers than of torrents; a mere thread in summer, a raging flood whenever it rains in the autumn or winter. In ancient times the numerous cities that were thickly scattered along the indented coasts of Greece and the Archipelago had two kinds of navies. The mercantile marine consisted of very short, almost round, tubby sailing ships. The warships were long and narrow, propelled by oars. Every port had its docks supplied with wood from the neighbouring mountains. Thanks to its forests, Greece was enabled to found colonies and extend its commerce throughout the Mediterranean. Thanks to the forest, Themistocles was able to marshal at Salamis 378 three-deckers, belonging to 18 different cities, besides many smaller craft, and thereby to save the liberty of his country and the independence of the Western World.

To-day the forests are extinct or rapidly becoming so. Reckless fellings, fires and grazing will very soon make an end of them, unless immediate steps are taken for their preservation and improvement. They are supposed to cover 830,000 hect. or 13 per cent. of the whole country. This would be quite inadequate even if the forests were good ones. The latest discoverable records, those for 1897 (see tables XX and XXI) show that the imports of timber amounted to 42,279 m. c. and 5,749,809 kilog, representing a total of 51,862 m. c. worth 3,272,432 fr. The exports were only 38,310 kilog, or 64 m. c. worth 3,910 fr. The excess imports thus amounted to 51,798 m.c. worth 3,268,522 fr. This corresponds to an *annual deficit for Greece of* 65,000 *m. c. in the forest.*

11.—Turkey.

The situation of Turkey is no better than that of Greece. The ravages of man and beast are equally severe, and though there are still remote corners of forest fit for the speculator, the country as a whole is very poor. In the absence of any official statistics

it is impossible to give figures, but there is no doubt that Turkey too must be included among the nations that are destroying a good deal more than they produce.

(*To be continued.*)

II.—CORRESPONDENCE.

Abbreviations in Forest Technology.

Being engaged lately in writing descriptions of forests, I have found the use of abbreviations saves a great deal of time. As it may be useful to other officers, who may not have thought of it themselves, I give below the method I adopted. The following headings were written down in my note-book:—

Configuration and Soil.—

G (gradient)	S (soil)	C (cover of the soil)
G_1 = slopes precipitous	S_1 = good	C_1 = much humus.
G_2 = „ steep	S_2 = average	C_2 = a little.
G_3 = „ moderate	S_3 = poor	C_3 = nil.
G_4 = „ gentle	S_a = deep	C_a = much grazed.
G_5 = „ ground level	S_b = average	C_b = moderately.
A = aspect	S_c = shallow	C_c = excessive.

Growing stock.

T (type of forest)	G (growth.)
T_1 = trees of all ages	G_1 = very good.
T_2 = mature high forest	G_2 = good.
T_3 = pole forest and scattered trees of upper classes	G_3 = average.
T_4 = pole forest	G_4 = stunted.
T_5 = scattered trees	G_a = trees straight.
T_6 = scrub jungle	G_b = malformed.
T_7 = do. containing bamboos	G_c = „ with twisted fibre
	Gd = lopped

D (density)	R (reproduction)	U (undergrowth.)
D_1 = crop dense requiring thinning	R_1 = good.	U_1 = dense.
D_2 = canopy complete	R_2 = fair.	U_2 = moderate.
D_3 = „ open.	R_3 = scanty.	U_3 = scanty.
D_4 = „ very open	R_4 = nil.	U_4 = nil.

The above can, of course, be modified to any extent found necessary. The forests being examined were chil forests and scrub jungles. Having then completed the inspection of a compartment, it did not take a minute to write down its description, *e. g.*—

Configuration, &c.—G_3 A,N.E. S. sandy $_{2a}C_{2b}$. In S.W. C_c.

Stock.—T_1 D $_{s2}$ G_{1d} R_4 U_3. In S. W, T_6 D_4.

Remarks.—Thinnings required, S. W. part might be closed, &c.

Also having all the items written down no important point was omitted. Translated into English, the above would read as follows :—

Configuration.—Gradients moderate ; aspect N.E ; soil, sandy, average, deep ; humus a little ; grazing moderate, but in S. W. portion excessive.

Stock.—Chil forest containing trees of all ages. Canopy complete and in places requires thinning. Growth very good, but some trees are lopped. Reproduction nil; undergrowth scanty. S. W. portion contains very open scrub jungle.

Remarks.—Thinnings required, &c., &c.

These abbreviations are rather difficult to read until translated, otherwise it would save a great deal of space if descriptions of forests were printed in this form ; or the descriptions might be done away with altogether and the above symbols entered on a map, if one on a sufficiently large scale were available, *e.g.*, 2″ to the mile. The letters might be omitted and the description could be entered in the following form :—

$$\frac{3,\ \text{N. E.},\ 2a,\ 2b.}{1,\ 1\ \&\ 2,\ 1d,\ 4,\ 3.}$$

It would of course be necessary always to write the various items in the same order. Two maps would then be necessary (1) the ordinary map showing contours and physical features, and (2) the stock map which would give only the boundaries of the compartments and the above symbols. Two of the items could be indicated by colours, *viz.*, the type of forest and perhaps the density. The remarks regarding treatment would be wanting, but whatever was necessary would be prescribed in the body of the report.

KALESAR : *14th April* 1901. } E. M. C.

III.—OFFICIAL PAPERS AND INTELLIGENCE.

Sample Plots.

(*Continued from p.* 314.)

PART IV.

CLASS PROPORTIONS IN SELECTION WORKED FORESTS.

26. IN forests worked under any form of selection system for the production of large timber, attention must be paid to the proportions between the girth-classes as well as to the total stock

per acre, in order to make sure of obtaining the maximum or "normal" yield. A forest, fully stocked as to density, but deficient in the older classes, cannot furnish the normal outturn for some years to come. On the other hand, a fully stocked forest with the older classes in excess can for the time being yield more than the normal. The natural sub-division of a forest into "units" in which the "quality of the locality" is constant is permanent. The artificial sub-division into coupes must also be permanent. The simplest case is for the unit and coupe to coincide; but as this would often entail the formation of an inconveniently large number of working-circles, in practice more than one unit may be found in a coupe. To avoid unnecessary complication of the argument, however, it is assumed that the terms "unit" and "coupe" are synonymous. The coupes being permanent, each of them must contribute its maximum yield, and so attention may be confined to the determination of the normal conditions in a single coupe.

27. Consideration of the normal or maximum yield would have little but theoretical interest now, if none of the forests in India were in a sufficiently favourable condition to furnish the normal yield in the near future. Without making any generalizations for India, as a whole, the writer can point to one forest in which the matter is even now of pressing importance. In the hope that the solution of the problem in Kheri, as herein suggested, may be of general interest, the following notes are put together. The argument may be inconclusive or altogether wrong; if so, the writer would be grateful to any one taking the trouble to point this out.

28. In the *Indian Forester* an article recently appeared* by Mr. Gleadow on "the future treatment of sâl forests." Without entering into a criticism of the article, it may be remarked that the system which Mr. Gleadow defines as "Storeyed Forest" is but a slight development of that proposed under the name of "Selection" for Kheri. Whilst the main fellings are to be of mature trees, full attention will be given in the subsidiary operations to the girdling of inferior trees of the lower classes, the retention of which is not required on sylvicultural grounds. Thus superfluous trees in all classes will go where they are of inferior quality. Want of a knowledge of the right class-proportions for the production of the maximum number of trees of class I, precludes the possibility of proceeding much further for the present. Mr. Gleadow suggests the regulation of classes on the basis of cover. This is open to argument. He points out that, by the allotment of equal areas to the different classes, the maximum yield cannot be obtained in a selection-worked forest; and then he gives certain figures as an illustration of the desired

* *Indian Forester*, February 1900, p. 39.

proportions. But these figures are exactly what it is all-important to know. If they can be determined, a very practical application indeed can be made to the working of Sâl forests. If they cannot be determined, the discussion is of no practical value.

29. The Kheri forests fall into two main groups:—

(i) Forests in which Sâl reproduction is coming on, but which are still so poorly stocked with all classes but the lowest, that they will be nothing like normal for the next two felling cycles at least.

(ii) Forest already so well stocked as to be in a position to give something approaching to their normal yield at once.

Group (i) consists principally of localities where old trees are to be found standing in heavy grass, through which advance growth is now forcing its way, owing chiefly to fire-protection. Poles are generally deficient in numbers. The old stock is mostly of poor quality. As it is believed that this is chiefly due to injuries by fire or otherwise in the past, and not to inherent unsuitability of the localities, it would be very unsafe to base any calculations on the rate of growth of these inferior individuals.

Group (ii) stands in marked contrast to the above. Fully 30 per cent. of the Kheri forests is included in this group. Why one locality has a good crop and another only a poor one need not be discussed here. Both natural causes, such as soil and spring level, and artificial ones, such as protection from fires and cattle, have been at work. The stock in group (ii) consists of a splendid growth of all ages. Some parts have only recently been felled over: other parts have only recently been brought under fire-protection; so that differences do exist in the present appearance of the component parts, but it may be confidently asserted that every tree of class I may be removed within the next felling cycle by a proper sequence of coupes. Lastly, when it is remarked that the grass-growth is everywhere moderate or scanty owing to the density of the tree-crop, it will be admitted that the time has already come for seriously considering the question of potential outturn.

Two ways of arriving at the best class-proportions suggest themselves:—

(*a*) By study of control forms for a number of cycles.

(*b*) By study of growth-percentages.

30. *Control forms.*—By definition the normal yield is constant. A fluctuating outturn must therefore be less than normal. Herein lies the value of control forms. If kept up long enough, they will give details of the actual outturn per coupe in a series of felling cycles, from which a close approximation to the normal outturn can be made in the future. The main fact to be borne in mind, at present, is that fluctuations in a coupe in successive felling cycles have to be avoided. This method has the great drawback of being exceedingly slow.

31. *Growth percentages.*—The data obtainable from the sample plots already described, will be sufficient to determine the rate of growth in the different classes. Another important detail to be taken into account is the percentage of each class which passes into the next higher one, within the average time, thus determined. These growth-percentages vary. It remains to be seen whether the limits of variations for the important species are so wide that the percentages themselves are practically indeterminate.

In Mr. Hearle's working-plan for the Naini Tal forests a comparison is made between the results of two enumeration surveys in the same blocks. Ten years or more elapsed between the surveys and no fellings took place in the interval. From the figures thus obtained the growth-percentages are estimated. It is proposed to develop this idea in Kheri. The felling cycle will be 30 years more or less. For the next 15 years at least—possibly for longer—the whole or part of the coupes will be in the better stocked localities already described as group (ii). In each coupe the year *after* the fellings are completed an enumeration of the three upper girth-classes (the sub-classes being kept separate) is proposed, over a known area of, say, 200 acres. The limits of these plots will be carefully recorded. Supposing this is done, and also that, towards the end of the cycle, the same plots are again enumerated, with a knowledge of any odd trees that may have been taken out in the interval, details will then be at hand showing the changes that have taken place in the course of 25, 24, 23 . . . . . years, respectively, in areas with similar characters as to soil and spring level. Knowing the average rates of growth in the different classes, it will then be possible to work out the growth percentages as follows:—

Number of trees passed into any class = Number of trees passed out of the class.
+ Number of trees in the class at 2nd survey
− Number of trees in the class at 1st survey

Percentage passing into any class = Number of trees passed into the class.
÷ Number of trees in next lower class at 1st survey.

Using the following symbols :—

Class.	Enumeration.		Interval *between* surveys.	Class *age* periods.
	1st.	2nd.	years.	years.
Above I	a	A		...
I	a_1	A_1		t_1
II	a_2	A_2	n	t_2
III	a_3	A_3		t_3

Number of trees passing out of class I in n years = $A - a$.

Percentage ——— t_1 ——— = $\frac{100\,t_1}{(a_1 \times n)}(A - a)$.

Number of trees passing from class II to class I in n years = $(A - a) \times (A_1 - a_1)$.

Percentage ——— t_2 ——— = $\frac{100\,t_2}{a_2 \times n}(A + A_1 - a + a_1)$

Number of trees passing from class III to class II in n years = $\overline{A - a} + \overline{A_1 - a_1} + \overline{A_2 - a}$

Percentage ——— t_3 ——— = $\frac{100\,t_3}{a_3 \times n}(A + A_1 + A_2 - a + a_1 + a_2)$.

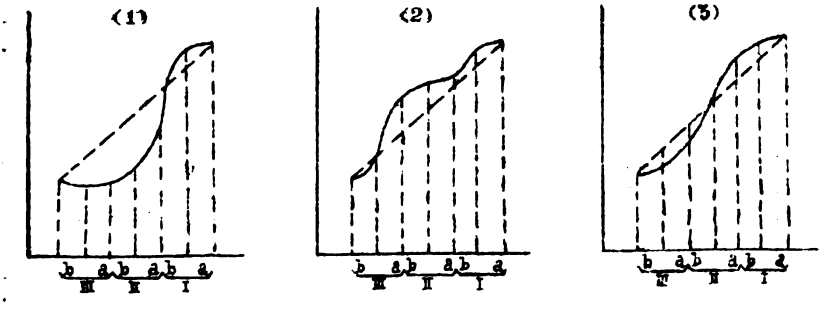
The number of trees passing into any class between two enumerations is thus seen to be equal to the difference between the sums of that class and all higher classes at the two surveys. This makes the calculations very simple.

At the 1st survey dead trees and windfalls may be left out altogether. Any trees dying or blown down later on should be included in the 2nd survey (*i.e.*, in A, A_1, A_2, etc).

32. It may be asked what use these figures will be when obtained? In reply to this the writer hazards the opinion that—

> In a fully stocked forest the nearest approximation to the normal class-proportions is that which shows the most continuous increase in girth-percentages beginning with the smallest class.

If all trees of class III and upwards are measured in 9" sub-classes, six percentages will be obtained for each coupe plot. By plotting these to scale as ordinates, the progress of the coupes can be studied graphically. From the time the trees have reached physical maturity the rate of increase of the percentages will probably be found to diminish, *i.e.*, the curve at this period will probably be convex on the upper side. Before this period the curve will probably be concave in the upper side. As remarked in paragraph 8, physical maturity will probably be found to correspond to a girth of more than 6.



What the exact form of the normal curve will turn out to be it is impossible to say at present. Of the three examples sketched

above, No. (3), it is supposed, lies nearer to the normal than either of the other two.

The statement at the beginning of this paragraph requires proof, it is true; but, in the meantime, it is better than nothing to go upon as a working basis.

PART V.

33. In conclusion it may be remarked that the fact that from 20 to 30 years will be required for the collection of the foregoing data by sample and coupe plots, makes it all the more one's obvious duty to see that adequate arrangements are made as soon as possible. In too many existing working-plans although the want of sufficient data is admitted, yet instructions as to collection of more information are limited to a few general remarks at the end of the book. The subject ought, on the other hand, to be treated in as minute detail as the fellings themselves, and be as carefully controlled. These remarks hold good equally well for a wide range of subjects in the field of forest management.

The Working-plans Officer should start as many as possible of the plots and observations himself and lay stress on the early commencement of any others that may be desirable, otherwise valuable time may be lost. Reference to paragraph 3 of these notes shows that it took six years to start the sample plots suggested in the Kheri working-plan of 1892. There were doubtless reasons for this, but the delay is to be regretted, as the stock of available data is now so little better than when the plan was drawn up. The matter was worth the deputation of a special officer for a few months.

In the prescribed form of working-plan report given in Article 87 of the Forest Department Code, no specific reference is made to the collection of data. Read in connection with the general nature of the remarks on the Forest Journal given in Article 89, this seems to be a great pity. The writer ventures to suggest the modification of these articles in the manner above indicated.

34. The subject hardly falls into either of the existing control forms (2 and 3). The writer would suggest a special form headed "Record of collection of data as to the growth and utilization of trees and crops," to be submitted annually until all prescribed observations have been started, and thereafter once every five years, with an additional report at each transfer of Divisional Officers. It may be urged that the Forest Journal already fulfils this function. Let it be said rather that it ought to do so, but only too often does not. Casual jotting down of notes at any time often results in nothing being done at all. The writer, as a Divisional Officer, pleads guilty as much as anyone. So few men take much interest in the Journal. On the other hand, it would be very different if every Divisional Officer knew that he would be expected to submit a report at least once in five years, and moreover, knew that in every division of which he might hold

charge, he would have the *opportunity* of publicly showing his worth as a scientific observer.

The result would be better still if the reports were officially published from time to time in the *Indian Forester*, and were subsequently collected into one book, every five years, for the whole of India. The compilation of these books could be entrusted to selected officers, one or two for each subject, *e.g.*, one for Sal, one for Teak, etc., etc. Such volumes would be of great value by gathering together in a handy form all available information up to date. Time and labour are often spent in working out what has already been elucidated, because the information does not travel beyond the limits of a division or circle. More than one man probably would bestir himself to avoid having it recorded in print that he saw nothing. The want of knowledge is not so much deplored as the lack of any inducement to the Forest Officer in general to make it known.

F. A. LEETE,

Offg. Deputy Conservator of Forests.

APPENDIX A.

Extract from "Suggestions regarding the working of the Trans-Sarda Forests, Kheri District." By Sir D. Brandis, Inspector-General of Forests,—dated Simla, the 20th August 1880.

Paragraph 33.—It will now be well to submit a few remarks regarding the measures that should be taken to collect data for determining the rate of growth of Sâl in the Oudh forests. The best plan will be, in those divisions of the Oudh Forests where satisfactory arrangements can be made, to select a sample plot of, say, two-fifths of an acre, or larger if it can be done. On this plot all trees should be cut down, except those which are above 18 inches in girth and are straight, sound and vigorous, whether Sâl or other kinds. Among the trees and poles left standing, the best should be selected for measurement, and these should, as much as possible, be of different sizes. Some should stand isolated and others close together. All trees selected should be marked between 3 and 6 feet from the ground, at a point, where the shape of the stem is round and regular. Within these limits there is no object in marking and measuring the trees at the same height from the ground The point is to measure the stem where it is regular. The best mark is a line of oil paint, which must be renewed annually. If this should not remain visible after the monsoon, a small wooden nail (heart-wood of Khair or Sandan) should be driven into the bark. All trees selected for measurement should be numbered and registered, and the girth should be measured at three places, *viz.*, at the mark, six inches above and six inches below the mark, each measurement being separately recorded in the register.

Simultaneously with the girth it will be well if accurate diameter gauges are available, to measure two diameters at right angles to each other, the diameter gauge being always applied at the same point of the circumference. All these measurements should be recorded separately. I do not propose a large number of plots. On the contrary, I advocate a limited number, for it is essential that the measurements should be made by responsible officers and with great care.

Paragraph 34.—In this manner within a few years reliable results regarding the annual increment of trees of different sizes will be obtained, and these measurements should not be limited to Sâl, but should extend to trees of other kinds, such as may be available in the plots. It should be remembered that the annual increment measured in this manner consists of the increment of the wood plus or minus the result of the changes which take place in the bark by the additional layers of the fibre and by throwing off of the outer layers. If r is the radius of wood only, the radius of the entire stem (R) obtained from these measurements will be $-R + (r + b)$, b being the thickness of the bark, which is an increasing amount during the earlier ages of the tree, but which remains more or less stationary or varies in an irregular manner after the tree has attained a certain size. The thickness of the bark in trees of different sizes b, b^1, b^2 must be determined by observation. The mean width of the annual rings of the wood only (w) will then be

$$W = \frac{r^1 - r}{n} = \frac{(R_1 - b_1)}{n} \frac{(R-b)}{},$$

n being the number of years intervening between two measurements and R^1 and R the mean radius of the stem deduced from two measurements at the same point in different years.

Paragraph 35.—These measurements should always be taken in one and the same month, and an important question is, which month should be selected for these measurements? In paragraph 17 of the interesting report, which is appended to the present paper, Captain Wood gives an account of the appearance of the Sâl tree in the Oudh Forests at different seasons. He considers that during January the tree is pretty nearly at rest, though it has all its leaves on, and that this is the month for felling, as the bark comes off easily. In Europe spring is the season when the bark of oaks and other deciduous trees comes off easily, and this is caused by the soft condition of the cambium layer, which separates the bark from the wood. The cambium layer is nothing else but the slimy mass of the bark fibre, wood cells and vessels in their youngest state, before they have hardened into wood and bark. And this state of things, when the bark separates readily from the wood, is generally believed to indicate the commencement of the annual growth of wood and bark, which continues during part of the summer season. As regards Sâl, we have no information whatsoever respecting the season when the formation

of wood commences. Obviously the best time for the annual measurements would be the season when the tree is at rest, and its diameter or girth undergoes no change. Until we have acquired more knowledge on this subject, the best plan will probably be to measure the tree twice in the year—once in the cold season, say, towards the end of December, and once in the hot season, say, early in April.

VI.—EXTRACTS, NOTES AND QUERIES.

The International Congress of Sylviculture.

By J. S. Gamble, C.I.E., M.A., F.R.S.

This Congress was one of the first of the long series of International Congresses which took place at the Great Exhibition, and it is, it is hoped, to be the first of a long series of important Forest Congresses to be held at short intervals in the future. It opened on the 4th June, in the Congress Palace, close to the Alma Bridge. There were delegates present representing most of the countries of the world, but, naturally, the great majority of those who followed the discussions were French, mostly gentlemen connected with the Forest Service. So far as is known, England was represented only by Mr. Stafford-Howard, Commissioner of Woods and Forests, and India by Dr. Schlich and Messrs Fisher and Gamble, all old Indian forest officers. Messrs. Cadell, Moir, Hearle and Carr were also present to represent the Indian Forest Service unofficially.

The proceedings of the Congress opened with an introductory speech by M. Jean Dupuy, the Minister of Agriculture. He began with a welcome to the foreign members, and then proceeded to discuss the position of the Exhibition as "not only a marvellous spectacle offered to the world, but also presenting, for all civilised people, a powerful interest as being the résumé, the synthesis, the relief map, so to speak, of human progress." He then proceeded to show how Sylviculture, so important in the economy of nations, could not fail to take a place, a great and honourable place, in the Exhibition. The Minister was followed by the Director-General of Forests, who, after thanking him for presiding and opening the Congress, pointed out the importance of an international understanding on the subject, so as to take stock of the forest resources of the world, in view of the probable wood famine which, before long, may be expected to be a serious difficulty.

These preliminaries were followed by what was the most important paper read before the Congress, that by M. Mélard, Inspector of Forests, on the insufficiency of the supply of building timber in the world. In an able discourse, he pointed out that the supply of such timber was already diminishing, that most countries actually at the present day were importing more timber than they

exported, and that in those few countries where the exports still exceeded the imports, there were serious signs of the supply falling short before long. Taking the nations in order, he discussed the question as regarded each of them; and gave statistics, both of the quantity of material imported and exported, and of the value of the excess of one or the other. The following average figures of the values will be found interesting. They are in millions of francs.

	Excess of Imports.	Excess of Exports.
Great Britain	471	...
France	99	...
Germany	344	...
Belgium	102	...
Holland	18	...
Denmark	31	...
Spain	30	...
Portugal	5	...
Italy	31	...
Switzerland	15	...
Greece	3	...
Bulgaria and Servia	3	...
Austria-Hungary	...	199
Norway	...	47
Sweden	...	198
Finland	...	89
Russia, ...	...	134
Roumania	...	5
United States	...	101
Canada	...	127
British India	...	14
China and Japan	4	...
South Africa	9	...
Mexico	2	...
Argentina	26	...
	1,193	913

He went on to point out how the excess in Austria-Hungary, Russia and the United States was much threatened, partly by increase of population and partly by industrial development; and how the excess in Norway was menaced by the deterioration of the forests; so that there only remained three countries where the forest resources were capable of helping in the future, *viz.*, Sweden, Finland and Canada, but that what they could produce was quite insufficient, in presence of the increase in population and the development of industrial work, not only in Europe and America, but in China, Australia, South America and South Africa, so that it was clear that we were on our way to a timber famine. He gave us fifty years only before such a catastrophe should take place. His recommendations were—(1) that the destruction of forests should be stopped, partly by strict legislative measures on the part of Governments, partly by making private forest owners understand that their interests lie in taking care of the capital stock, and only exploiting so much as may be calculated to be the interest on it; (2) that forest property should be helped by not being too heavily taxed; (3) that measures should be at once

taken to utilize all available waste lands by replanting and restoration. The paper was listened to with very great interest, and the thanks of the Congress unanimously voted to M. Melard.

On the 5th June, the first work done was to subdivide the Congress into three sections, *viz.*, (1) Forest Economy; (2) Influence of Forests from the point of view of the maintenance of the soil. the water supply, and of meteorological phenomena; and (3) Application of Natural Sciences to Sylviculture; and this having been done, the sections separated to carry on their deliberations, which continued on the 5th, 6th, and 7th.

In the First Section, the *first* subject was the question of the treatment of silver fir forests, and the advisability of converting into forests of silver fir all coppice lands of poor growth in mountain regions. The chief speakers were MM. Runacher, Huffel, and Mer. No very definite conclusion was arrived at, it being agreed that the best method of treatment for silver fir forests was still in doubt. Then came the important question of thinnings, discussed, after the reading of an able paper by M. Broillard, by M. Boppe and M. Mer especially. It was generally agreed that the principle to be followed in thinnings was that of working by careful regard to canopy, that the canopy should be lightly opened but not interrupted, and that the undergrowth should be carefully respected. The *third* question was that of the utility of cultivating the soil in regeneration fellings, and it was generally agreed that such cultivation, accompanied by artificial seed sowing, was most useful. The *fourth* question, the treatment of coppice under standards, so as to increase the production of timber material, gave rise to considerable discussion, and it was agreed that in those cases where good oak saplings were not to be found in sufficient number to give a good series of reserves, groups of coniferous trees might be planted, under which afterwards the oak might reappear, the conifers serving to give a considerable amount of useful produce. The *fifth* subject was the address by M. Mélard, to which reference has already been made; and the *sixth* was a paper by M. Guyot on the subject of international legislation for mountain forest lands. The *seventh* subject was that of the use of exotic, acclimatized, or naturalized species of trees in forest growth. The cultivation of exotic trees at Vaux (Loir et Cher) was described by M. Cannon, and an important paper was read by M. de Vilmorin on the exotic forest trees found in France; while M. Pardé, whose experience of the cultivation of exotic trees was drawn from those of the Domaine des Barres, in the Loiret, originally planted by the De Vilmorin family, and now the property of and worked by the State, described the chief exotic forest trees from the forest point of view. It was agreed that more experiments were required, and that the results of such experiments should be carefully watched, recorded, and made public. The *eighth* subject was that of experimental stations, and here also it was agreed that more such stations were wanted in France, and that they should be

better connected with each other, the results of their researches being regularly published.

In the Second Section, the first subject discussed was forest meteorology, and the influence of forests on the subterranean waters in the plains regions; the result of the discussion being that it was agreed that more accurate study of the action of forests on springs and on hailstorms required to be undertaken at all experimental stations, and that orographic maps ought to be prepared, showing the density of forest growth in different regions, so that the question might be more fully discussed at the next Congress. The rest of the subjects chiefly regarded the great works undertaken in France for the restoration of denuded mountain slopes; the works necessary for the protection of mountain forests from avalanches; the regulation of hill pasture; the reclothing of dunes on the sea-coast; and the protection of forests from fire. The latter subject gave rise to a long discussion, in which many foreign foresters took part, the general gist of which was to show the great importance which the subject possesses for all those forest lands where fire is possible and the means of prevention inadequate.

The Third Section was chiefly occupied in discussing the need for experiments on forest soils, the necessity of having good botanical forest maps, and the improvement of systems of forest transport.

The final sitting of the Congress was a general one, and was very largely attended, for there were many French and other foresters interested in the important question of the permanency of the Forest Congresses, and whether such Congresses should be held as a separate institution, or whether they should he held at the same time as, and as a section of, the Congresses of Agriculture. After a long discussion, it was finally agreed that there were many advantages to be obtained from the Forest Congress being made a branch of that of Agriculture. The President, then, M. Daubrée, closed the sittings by thanking the members for their presence, and for the valuable assistance they had afforded to the important discussions.

The visit of the members of the Congress to the forest exhibits of the different countries at the Exhibition, was made on the afternoon of the 8th. The members met in front of the splendid Forest Palace, and began their sightseeing with the magnificent pieces of timber lying outside, which were explained and discussed by MM. Rudolph and Bouvet. These pieces consisted of huge logs of oak and silver fir. Then we visited, led by M. Thil, the French forest exhibit, with its splendid collections, its beautiful photographs and water-colour pictures of mountain restoration works, and its well-arranged collection of hunting trophies. In turn we then explored, in each case under the guidance of the officers in charge, the great collections exhibited by Russia, Austria, Hungary, Roumania, Canada, the United States, Japan

and Sweden. From the Forest Palace we passed to the Trocadéro, visited the Algerian section, the exhibits of the Imperial Russian Apanages in the Siberian Court, and the collections of British India and West Australia.

The most important of the collections exhibited were, after the French Government one, those of Russia, Austria and Hungary, between which there was little difference to be noted in respect to excellence. The exhibits of Roumania, Canada, Sweden, Japan and the United States of America were also of importance; while of those which were housed apart from the Forest Palace. the most noticeable, undoubtedly, were those of British India, West Australia, Algeria, Russian Siberia and the French Indies.

In the French Section, the chief interest lay in the "*reboisement*" works, the Forest administration being clearly especially proud, as well it might be, of the work they have done in stopping the damage done to the cultivated lands in the valleys of the Alps and Pyrenees by the constantly increasing devastation of landslips. These works have now gone on for about forty years, with the most satisfactory results. The Government has spent about 2½ million pounds sterling, and have reclothed more than 600 square miles of country, stopping landslips, rendering torrents inoffensive, and safeguarding from damage very large areas of valuable land which had previously been threatened. The works undertaken were illustrated in the Exhibition by a beautiful series of water-colour drawings and large photographs, and by a diorama in two scenes, one showing the same locality as the other, but at the end of ten years after the commencement of work. "*Reboisement*" work is naturally carried out in different ways, according to the different characters of the localities, but, speaking generally, the first thing is to regularize the beds of the torrents by means of barriers, which usually consist of fascine-work at the top of the ravines where there is not much water, and heavy masonry walls below, where the current is strong and many boulders are brought down. Trees and cuttings are planted near the streams, and the seeds of grasses and herbs and bushes are sown in order to create a vegetation; tree-planting being usually only carried out afterwards, when that vegetation is assured.

In the French Section also, the fixing of sand-dunes, the methods of stopping avalanches, road-making and house-building, were all well illustrated, and there was a large collection of the woods and products of the French forests, and of the many valuable publications which have been prepared by members of the forest staff. And here it is right to mention the great liberality with which the French Government presented free to the members of the Congress copies of the valuable papers written specially for the Exhibition. The most noticeable of these papers was that of M. Mélard on the probable early wood famine, to which allusion has already been made. "*Reboisement*" works

are dealt with in a long series of a dozen or more interesting papers. M. de Gorsse discusses the treatment of the torrents of the Pyrenees; M. Champsaur, those of the classic grounds in the Lower Alps; M. Bernard, those of the Upper Savoy mountains, especially the valley of Chamouni; and the landslips in that same valley, and especially that which overwhelmed the baths of St. Gervais in the night of 11th July 1892, are described in a long and admirably illustrated paper by M. Kuss. The torrent of Rieulet, in the Pyrenees, is fully described by M. Dellon; and the methods of settlement employed at Pellafol, in the Isère, by M. Bernard. The best kinds of herbs and trees to use in the works are fully treated in an interesting paper by M. Bauby. Messrs. Campardon and Buisson discuss the systems of improved pasturage; M. Campagne the works necessary to protect forest and uncultivated lands against avalanches; and M. Calas the recommendation of the extension of the use of Salzmann's variety of the *Pinus Laricio*, which has been found valuable in "*reboisement*" plantations. The same author has a monograph of the processional caterpillar of the moth *Cnethocampa pityocampa*, with suggestions for the best system of counteracting its ravages.

Among other subjects on which important papers were printed and distributed, may be especially noted M. Lafond's work on the sand-dune plantations on the coast of the Bay of Biscay; M. Delassasseigne's very interesting paper on fire-protection; and M. Arnould's work on international measures necessary for the protection of useful birds.

In the Russian Section, the most noticeable exhibit was the fine series of sections of trees. As is well known, the forest flora of Northern Russia is a very poor one, the chief forest trees being the spruce and Scots pine; but in Siberia and the Caucasus there are many other species, and the value of their timber is well illustrated by the sections. Canada and Roumania have also fine series of wood sections, whose preparation must have been a difficult work. The Austrian and Hungarian sections have no very special exhibits, but they have represented almost every branch of forestry, and more especially those branches which belong to forestry in its scientific side; working-plans, experimental stations, researches on rate of growth, "*reboisement*" works, planting and sowing are fully shown, as fully as are the methods of extraction of timber, and the utilization of forest products in general. Both of these countries presented to the Congress for free distribution, copies of valuable papers on forestry. The most important of those presented by Austria is the official guide to the forests, published by the Ministry of Agriculture at Vienna, and official papers on forest police and forest '*reboisement*' are also of great interest. The question of beech in the Austrian forest is the subject of a paper by Herr Hufnagl; and a full, well-illustrated account of the small forest

wood-industries of Austria is contributed by Professor Lauboeck. The '*reboisement*' works in the Karst region, that curious denuded tract of mountain slopes on the Illyrian coast, are fully described in a paper by Herr Pucich. The treatment of spruce forest, and the best systems of preventing the barking of the trees by large game, or the death and damage of forest growth by bad procedure are discussed by Herr Hermann Reuss.

The Hungarian contributions to the literature of the Congress are too many to be all mentioned here, but it is right to call attention to Herr Vadas's history of the Forest School of Selmeczbanya, and the same author's very interesting paper on the cultivation of willows as a protection against inundation. The Government publications refer (1) to the forest law of 1879; (2) to the preparation of working-plans; (3) to the organization of the forest staff; (4) to forest experiments and experimental stations; (5) to the organization of special schools for forest guards; and (6) to the history of the National Forest Society. And here it is also right to mention a very interesting account of the development of sylviculture in the Austrian territories of Bosnia and Herzegovina, by Herr Petraschek, who was himself present at the Congress to represent these provinces.

The forest exhibits of the United States were chiefly intended to illustrate forest utilization; the most noticeable features of their section were the beautiful transparencies in the windows illustrating the giant trees of the Western States, and the panels and sections of fine-grained woods in the American châlet.

In the Japanese Court, richly marked bamboo culms formed a remarkable exhibit, as did the huge planks of *Cryptomeria* and other woods.

In the Swedish Section the Congress admired a diorama picture of a pine forest, with a lake and mountains beyond, lit up by the glowing colours of a northern sunset; the large model of a saw-mill and timber export yard in the Gulf of Bothnia; and a pyramid of wood paving blocks marked with the brands of the various firms dealing in that important and increasing article of trade.

In the British Indian Section, the inspection by the Congress was hampered by the great crush of other sight-seers, still, though the crush was detrimental to a full appreciation of Mr. Ribbentrop's beautiful trophy and the carved showcases of the Schools of Art of Madras and Lahore, the Congress was able to see fairly well the forest show in the galleries, and admire the maps and plans, the fine photographs, and the Dehra Dun collection of products destined to be preserved for the future at Kew.

In the West Australian Court everybody was interested in the huge sections of "Karri" and "Jarrah" which stood sentinel before the doors, and in the excellent way in which the exhibition of these woods had been taken advantage of to serve two purposes, the embellishment of the Court and the display of the capabilities

of the woods. They had been employed in the paving of the Court to show their use as paving blocks, in the paving of the stairs in small cubes to show their use for inside floorings, in the balustrades and railings to show their capabilities for furniture and interior decoration, and in railway waggons to show their use for carriage-building. The whole display was most creditable, and was greatly admired by those members of the Congress who stayed on to the end. We had a long afternoon, and most members were very tired when their labours were over. It is scarcely too much to say that had the Forest Palace and its exhibits, increased by the inclusion in it of the collections of those countries who, perhaps mistakenly, preferred to be represented in their own special buildings (no mention has here been made of the forest exhibits, many of great importance, shown by Italy, Finland, Servia, Mexico, and other countries in their own exhibitions in the national palaces, as they were not visited by the Congress), been a separate Exhibition apart from the other portions of the great world's show, and displayed, like the Edinburgh Exhibition of 1884, as a separate thing, they would have formed a collection which alone would have attracted crowds and been a wonderful success.

The last day of the Congress, June 9th, was devoted to an excursion to the Forest of Fontainebleau, one of the largest of the Government forests of France, containing 17,000 hectares. It was a whole day's excursion, and was a very enjoyable one, both from the forest point of view and from that of the scenery, and the members received the greatest help and courtesy from the Inspector in charge, M. Reuss. The party was headed by M. Daubrée, Director-General, and there were representatives of almost all the nations of Europe.

The party left the Lyons terminus early, and arrived at Fontainebleau at 10-30 A.M., where carriages were in waiting, and a start was at once made, in rather hot weather, for a drive round the most interesting parts of the forest. At midday the restaurant at Franchard was reached, and the party were saluted with the strains of the well-known, '*cor-de-chasse*' welcoming them to the déjeuner. After the meal, speeches were made by members of most of the nationalities represented, and the excursion was then continued to other interesting parts of the forest, ending up at the railway station, where the train was taken at a little before 6 P.M. The forest of Fontainebleau is chiefly on sandy soil, with here and there small outcrops of the chalk, and the chief and most important tree is the oak, of the variety *sessiliflora*. Oak constitutes about 50 per cent. of the individual trees of any size in the forest, and its growth is excellent, Fontainebleau being one of its best localities in France. Some trees still exist known to be over five hundred years old, and to have more than 6 feet in diameter. The few oaks of the variety *pedunculata* found here and there are probably the result of sowings of acorns collected

elsewhere. Next in importance among indigenous trees is the beech, which is found to the extent of about 15 per cent.; but the trees are not very good, and they are more valuable for the help which they give sylviculturally to the good growth of the oak than for their industrial importance. Among other broad-leaved trees common in the forest, the hornbeam and birch are most noticeable. A considerable area is covered with Scots pine, which is, however, not indigenous, having been introduced so recently as 1786 in the first plantations made at that time by Dr. Lemonnier, the first physician to King Louis XVI. The seeds were brought from Riga, in Russia, and this circumstance was taken advantage of by M. Kern, the Director-General of the Imperial Forest School at St. Petersburg, at the déjeuner, to emphasize the close relations between Russian and French forest officers. The greater part of the pine forests were, however, planted in 1830—1848, and the tree is now completely naturalized. Unfortunately, of late years, the extension of touring, especially by cyclists and auto-car drivers, has had the serious result of causing extensive fires, usually lit by the careless use of wax matches and vesuvians, so that not only is it necessary for the staff to be constantly on the alert in dry weather, but endeavours have had to be made to replace the pine by less inflammable species.

The first Working Plan of the forest was made in 1861, and under it 13,724 hectares were devoted to high forest, 1,618 hectares to coppice, and 1,631 hectares to special working. This plan was kept in force and worked till 1880, when, owing to much damage done by frost and snow, many of its provisions had to be suspended and the dead wood cleared out. A new Plan was then found necessary, and this was made and brought into force in 1892. This new Plan divided the forest into five sections, which it will be interesting to enumerate.

	Hectares.
Section 1.—*High Forest of Broad-leaved Trees.*	
9 working circles, treated, on a rotation of 120 years (4 periods of 30 years), by the method of successive regeneration fellings (shelter-wood compartment method)	7,239
Section 2.—*High Forest of Conifers.*	
3 working circles, treated, on a rotation of 72 years (8 periods of 9 years), by the same method	3,292
Section 3.—*High Forest in Selection.*	
5 working circles, with a rotation of 7 years for the selection fellings,	2,975
Section 4.—*Coppice with Standards.*	
3 working circles, with a rotation of 30 years for the coppice ...	1,758
Section 5.—*Artistic Parts.*	
1 working circle, without fixed system, maintained to preserve ancient trees and picturesque localities	1,616
	16,880

And this is the Plan which is now in force, and which is giving such excellent results.

In a Congress at which so many foresters from all parts were assembled, there were naturally several interesting meetings of a more convivial character. On the 6th a déjeuner was given at

the Restaurant de la Belle Meunière, close to the Jéna Bridge, by the French members of the Congress to their foreign guests. There were many speeches, and the excellent fare and the cordial reception were greatly appreciated. On the 7th, again, the foreign members were invited to the dinner given by the Mutual Aid Society of Forest Officers in the splendid Salle Hoche, where the hospitality of the French hosts was again unbounded, and the evening was spent in the harmony which usually characterizes such forest réunions.

There can be no doubt that the Forest Congress of 1900 was a great success, and it may be hoped that future ones will be equally so, and that the cordial and excellent understanding which animates Forest Officers of all countries, whose subject has no relation to the difficulties of current politics, will tend to improve the mutual relations of these countries amongst themselves, and make for that permanent peace which all those who desire the welfare of the human race must ardently wish for. For the first of the series of great Forest Congresses, no better hosts could be found than the French ; for hardly anywhere, after all, is hospitality and good-fellowship so thoroughly understood as in France, especially when the whole of the meeting is animated by the same *esprit-de-corps*, the same intense interest in all that appertains to the management of forests and the extension over the world of the benefits of forest conservancy.—*Transactions of the Royal Scottish Arboricultural Society.*

The Harmfulness of Bush Fires in the West Indies.

By Dr. H. A. Alford Nicholls, C.M.G., M.D., F.L.S.

I have been asked to read a paper at this Conference on Bush fires and their harmfulness to the soil and to vegetation in those islands in which they are not controlled by legislative enactment.

The subject is one which has engaged attention for some years past, and I have spoken and written a good deal about these fires and their harmful effects in those West Indian Colonies in which they are allowed to rage without interference. It follows, therefore, that most of what I have to say to you has been made public by me elsewhere in some form or other.

Now-a-days, however, it too often happens that useful legislation is delayed until its necessity is brought home to the Government and people by frequent discussions, by the reiteration of arguments, and by the constant statement of facts bearing on the subject. This, I hope, will be the last effort that will have to be made to bring about the much needed legislation to control bush fires, for I trust that the discussion which will follow the reading of my paper will crystallize the facts into such a concrete form as to allow the question to be dealt with satisfactorily by the various

Governments concerned—the Imperial Department of Agriculture of course assisting by its advice and, if necessary, its initiative.

It may be well, perhaps, for me in the first instance to state briefly what steps have already been taken to bring the question before the public. In July, 1899, after a certain amount of discussion and correspondence, I raised a debate in the Legislative Council of Dominica on the destruction caused by bush fires in the island, by moving the following resolution :—

Whereas it is the custom during the dry season for peasants and others to clear lands by setting fire to dry grass and brush thereon ;

Whereas in many instances such bush fires having escaped control have run on to cultivated and forest lands, causing considerable destruction and entailing great loss to planters, as well as interfering with the progress of the Presidency towards prosperity ;

And whereas, such fires, by destroying seedling indigenous trees, prevent the reafforestation of the waste lands on the leeward side of the island, thereby causing these lands to remain barren ;

Be it resolved—That in the opinion of this Council it is desirable to empower the Governor by Legislative enactment to issue his proclamation in times of drought forbidding for certain periods, under severe penalties, the setting of fire on any lands whatever, unless in special instances permission in writing be given by an authorized official.

This motion gave rise to an interesting and instructive debate, during which the harmfulness of bush fires was borne testimony to by the Councillors, some of whom detailed the destruction worked by fire on their own properties. The resolution, I am glad to say, was passed unanimously by the Legislative Council, but the Government has not yet introduced a draft Ordinance to deal with the question. Afterwards the West India Committee communicated with me on the subject, informing me that they had requested their correspondents in Antigua and St. Kitts to do what they could to get a similar resolution passed in the Legislature of those islands. Later on, the Governor of the Leeward Islands, in an address to the Antigua Council, pointed out the necessity of counteracting the evils caused by bush fires in the country districts ; and there has been, I understand, some official correspondence on the subject with the Secretary of State for the Colonies. It had been decided that I should bring the matter before you at the last Conference, but I was unable to attend the meeting, and, as no definite action was taken by the local Government, I read a paper on the subject at a meeting of the Dominica Agricultural Society on May 30th, last year, not only in order to keep the matter before the public mind but also to prepare the people for the promised legislation. This meeting was presided over by Mr. Bell, the Administrator of Dominica, who during the discussion admitted that I had "made out a good case for legislation." A similar resolution to that passed by the Legislature was then adopted by

the Agricultural Society, and a copy of it was subsequently forwarded to the Government. Such, then, is a brief account of what has been done in the Colony of the Leeward Islands towards the solution of the question, and I now bring the matter before this Conference. I understand, however, that there are Representatives here from Colonies in which legislation to control the mischievous effects of bush fires has been in force for years, and I hope that these gentlemen will bring forward facts to show the usefulness of such legal restraint.

In the West Indies and elsewhere in the tropics, under the generic term of Bush fires are included all those conflagrations, both great and small, whether caused purposely or accidentally, that destroy the vegetable products of the soil. They may be divided into five classes, as follows:—

1. The fires deliberately set to burn down plants growing on limited areas with the object of destroying blights that are troublesome or are likely to become epidemic.
2. The fires sometimes made to the windward of cultivated lands affected by insect blights, so that the dense smoke may kill or drive away the pest.
3. The "burns," when high forest is cut down, the trees lopped, and fire is used to destroy the immense encumbering mass of wood so as to render the ground sufficiently clear for cultivation.
4. The "grass fires" that are set in dry seasons to destroy dry rank grass in order to induce a new and tender undergrowth for the grazing of cattle or for the grass-cutter's knife.
5. The ordinary "bush fires" of Dominica and other mountainous countries, by means of which the soil is cheaply and expeditiously cleared of brush and weeds, cut down or hoed up, on lands intended to be put into cultivation.

The first class of fires is simply a method adopted in the treatment of diseased plants, and is one of the heroic remedies of the plant physician when he endeavours to stamp out a dangerous epidemic. Such a remedy, however, is never used without careful precautions being taken to prevent unnecessary damage.

The second class of fires differ from the first in that the cultivated plants are not destroyed. The plan is frequently employed in some countries to rid plants of insect pests, which are readily killed by the acrid smoke of burning green wood, bush and leaves.

The third class of fires are seen only in forest clearings where they are made use of to remove the massive tangle of fallen trees that encumber the ground. In the early years of settlement in the West Indies, when the islands were covered with primeval forests, these "burns" as they used to be and still are called, were part of the systematic work of all planters. Laborie, in his

well-known work entitled *The Coffee Planter of Saint Domingo*, published in 1797, gives particular directions as to the proper way in which the forest trees should be felled, and the branches lopped and strewn, so as to get what he describes as a "good burn" that will clear the land sufficiently for commencing cultivation. It is worthy of remark, however, that even this far-seeing writer, who penned his words over a century ago, deplored the destruction of certain constituents of the soil by these fires, and said "it is to be wished that burning could be dispensed with." Forest burns are now to be seen only in Dominica, St. Lucia, Trinidad, Jamaica and other islands in which there are still tracts of virgin forest; and, as such fires are essential and not fraught with dangerous consequences if due care be taken to prevent the conflagrations spreading, it is unnecessary further to consider them than to point out that legislation should not prohibit them, but should impose an obligation on the planter to prevent destruction of standing forest around the clearings.

The fourth class or grass fires, are frequently seen in all the islands, more especially in dry districts. As I shall later on have occasion to show, these fires—which often take place every dry season on the same ground—are disastrous in their ultimate effects, and the crop of fresh grass that springs up after them does not compensate for the evil worked.

The fifth class comprises the ordinary and well-known bush fires of the tropics. They are especially common in Dominica, and, in the dry season, they may be observed in that island in all directions. Indeed, not only the peasants but also many proprietors of large estates invariably employ this wasteful method of clearing land for cultivation. The advocates of the system say that the fire gets rid of the brush and weeds expeditiously and cheaply, and some say that it also does lasting good by destroying the harmful insects on the soil. It may be conceded at once that vegetable matter is removed most easily by fire, and if the removal of this matter were the only consideration no voice could be raised against bush fires. But a serious question has to be answered in the first instance, namely, is this vegetable matter in the form of leaves and brush of so little use to the land and the planter that its destruction is desirable? And, following on this question is the equally important one, does the planter gain or lose by converting all this organic material into inorganic matter in the form of ashes? Both these questions I hope to answer in such a way as to show that the clearing of land by fire is the worst and most wasteful system that the planter could adopt. I would pause here, however, to say a few words about the erroneous idea that, in consequence of fire having been passed over the land, there is likely to be a long immunity from the depredations of insects, for the reason that all of them have been destroyed in the burnt area. Now, most insects, like the higher animals in a state of nature, wander about in search of food. They are kept in check by natural laws, the chief of which

is the struggle for existence. And it is futile to expect that a circumscribed area can be kept free from insects by passing fire over it, for, as soon as fresh vegetation springs up on the burnt land, the insects will find it out and come in from all sides, so that in a short time the insect population of the patch will be as numerous as it was before the fire was set.

The harmful effects of these bush fires on the soil may be thus tabulated :--

1. They destroy nitrogenous matters that would have gone to enrich the soil by the natural decay of the brush and leaves.
2. They destroy a certain proportion of the nitrogenous matters already in the upper layers of the soil.
3. They destroy the nitrifying microbes in the upper layers of the soil.
4. They sterilise the upper layers of the soil, and thus for a time prevent the fixation of nitrogen for the use of vegetation.

It may be roundly asserted that in all cultivated soils in the West Indies there is a deficiency of nitrogenous constituents, which deficiency is usually attempted to be made up by the application of manures or by the digging in of plants, more especially those of the pea family grown on the land for the purpose. It is therefore most essential that the planter should do everything possible to add to his soil all the vegetable matter he can get hold of, so that by its decay it may increase the deficient nitrogenous constituents. And yet it is the custom in Dominica and elsewhere to destroy these most valuable organic materials by fire, instead of turning them into the land to repay the expense and labour of so doing over and over again by the resulting increased crops and finer produce. Indeed, as I have said elsewhere, "To prevent the peasant from destroying what is necessary for the fruitfulness of his land, is to do him good by ensuring larger crops from his holding. Thus it is advantageous to the country generally that this wasteful destruction by fire of important constituents of the soil should be put an end to." Agricultural chemists tell us that every pound of nitrogen in the soil has a definite value which may be expressed in figures. Were it possible to calculate the annual loss to planters on the basis of the money value of the nitrogen robbed from the soil annually by the bush fires, the total amount would be astounding.

But these bush fires not only destroy the vegetable matters intended by nature to enrich the soil, but they burn or bake the upper layers of the land, and this means that not only does the heat of the fire volatilize the nitrogenous matters already prepared in the soil for the assimilation of plants, but that it also destroys the nitrifying microbes that are constantly at work to produce the rich organic material for further plant food. Thus it seems that fires on lands, especially in these countries, are utterly disastrous

in many ways, that they cause a diminution of the quantity of the produce got from the soil, and therefore deleteriously affect the fortunes of the planters and consequently the prosperity of the country.

To prohibit these fires entirely would be to prevent peasants and others from destroying what is necessary for the fruitfulness of the land, and so it would be sound political economy. But political economy and "the liberty of the subject" are sometimes contradictory terms, as in this instance, in which a man is held to have as much right to destroy the fruitfulness of a certain portion of the land as he has to pull down his house. But he must confine the destruction to his own property and not injure his neighbour's. Were these bush fires always limited to the circumscribed areas being cleared for cultivation, there would be less to be said against them, and it is questionable whether in the present state of public opinion repressive legislation could be suggested with any chance of its adoption. But by carelessness, by ignorance and sometimes with malicious intent, the conflagrations spread over and ravage large tracts of land, thereby destroying much valuable property.

The devastation caused by bush fires in Dominica alone is enormous, and it is undoubtedly a serious drag on the prosperity of the island. During the dry seasons the fires may be seen in all directions along the coasts, in the valleys and on the hills. The absence of all control has rendered the people quite reckless in regard to them. If a peasant has to clear a few square yards of land to plant some "ground provisions," he will set fire to the dry brush in the afternoon and then gaily go home without troubling as to where the fire may run to. A fire set in this way in Dominica not very long ago near to the sea, spread to neighbouring lands and produced a conflagration that raged for days, running up a wide valley, destroying everything in its path and then reaching and seriously damaging cane and lime plantations on the hills. Dominica planters will tell the tale of how their cacao and other plantations have been greatly injured and the crops ruined by fires carelessly set in contiguous peasants' holdings; and they will tell also how their woodlands have been destroyed by similar fires. Indeed the losses due to these constantly recurring fires have become so great that legislation is urgently needed. If the matter were carefully inquired into, it would be found that, year by year, an increasing extent of land is being rendered barren by bush fires. As an illustration of the correctness of this statement I may bring forward the following facts concerning certain districts along the leeward coast of Dominica. Many years ago there were thriving coffee plantation on these lands, but now they are barren wastes of rocks covered in places with a thin skin of soil. During the wet season rank grass and weeds spring up from seeds dropped by birds or blown by the wind. Were the land left to itself, by the operation of natural laws soil would accumulate and seedling trees would grow and incease in number and variety, and, in a

comparatively short time in our West Indian climate, a "secondary forest" would result, and then, by the judicious felling of a portion of the wood, the land could be gradually brought back to cultivation. But what really happens is that most of these waste lands are subjected to the ravages of bush fires every year; the seedling trees are killed out and the soil is left burnt and bare, with no live roots ramifying in all directions to hold its particles together, so that, when heavy rains come, the loosened surface soil is washed to the valley or sea, and nothing but a rocky barren waste remains. This disastrous destruction of a cultivable soil has been going on for years and years in many islands in the West Indies, and it has resulted in the conversion of former fertile districts into barren wastes in Dominica, Montserrat, Antigua and all the islands to the north. It has not only made deserts where there should be gardens, but it has actually in places produced a disastrous effect on the climate. Mr. Watts can tell you of the evil effects of bush fires at the northern end of Montserrat and throughout Antigua. And I doubt not that many here can bear testimony to the fact that I have not over-estimated the urgency of the question.

In Dominica there is a dry barren district known as the Grand Savannah, and years ago the late Dr. Imray endeavoured to reclaim a portion of it by planting young Ceara rubber trees on it in all directions. The plants grew well and there was every hope that this barren waste would have been brought into remunerative cultivation and that a new industry would have been established in the country; but, unfortunately, the bush fires set by the peasants in the dry season swept over the plantation and killed out the rubber trees planted with so much care and expense. A similar attempt made later on to plant up portions of the Grand Savannah met with the same disappointing result, and it is clear that nothing can be done in Dominica to reclaim such barren lands until, by legislative enactments, the people are prevented from causing these extensive and disastrous conflagrations.

Legislation is also undoubtedly greatly needed in many of the other islands to abate the evils caused by these bush fires. It would not be advisable now to prohibit all fires on lands, but, without delay, an end should be put to the system whereby every person can at any time with impunity set fire to dry grass and brush and so produce a conflagration that may and often does cause great injury and loss to his neighbour's property, and that certainly retards the prosperity of the country. Although bush fires need not altogether be prohibited, they should not be allowed to be set in very dry seasons, as they are then exceedingly dangerous; and, at other times, they should be so regulated that the evils I have brought to your notice may be mitigated if not entirely abolished.—*Paper read before the West Indian Agricultural Conference.*

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

May 2nd, 1901.

EAST INDIAN TEAK.—There is no change to report in prices in this market, but the consumption has again taken a favourable turn. The deliveries in April amount to 1,850 loads as compared with 1,012 loads in April last year, and for the first third of 1901 to 4,890 loads against 3,475 loads for that period of 1900. The demand for floating cargoes for arrival has slackened considerably for the moment, and lower rates than those recently current would now have to be submitted to, to effect sales.

ROSEWOOD—EAST INDIA—No sales have been made, and the stock is more than sufficient to meet the limited current demand.

SATINWOOD—EAST INDIA—Some fair sales have been made at satisfactory prices, but the stock on hand is in excess of the requirements of the market.

EBONY—EAST INDIA—Is in good demand.

PRICE CURRENT.

Indian Teak.	per load	... ...	£27 10*s*. to	£32 10*s*
Rosewood	„ ton	... ...	£5	„ £9.
Satinwood	„ square foot	... ...	5*d*.	„ 12*d*.
Ebony	„ ton	... ...	£9	„ £13.

Denny, Mott and Dickson's Wood Market Report.

London, 1st May, 1901.

TEAK.—The landings in the London Docks during April consisted of 2,007 loads of logs and 51 loads of planks and scantlings, or a total of 2,058 loads, as against 2,165 loads for the corresponding period of last year. The deliveries into consumption were 1,409 loads of logs and 319 loads of planks and scantlings, together 1,728 loads, as against 1,027 loads in April, 1900.

The Dock stocks at date analyse as follows:—

	8,962	loads of	logs	as against	7,738	loads at the same date last year.	
	5,340	„	planks	„	3,462	„	„ „
	21	„	blocks	„	7	„	„ „
Total	14,323	loads.			11,207	loads	„ „ „

The above figures show a marked improvement in the demand during April for logs, but the moderate enquiry for planks and scantlings serves to give point to our recent warning against the tendency to over-estimate the outlet for such conversions, which is causing an undue production of this class of material; and

shippers would be wise to adjust their shipments more nearly to the European demand, as they have so successfully done for some time past in respect to teak logs.

During April there has been an appreciably better tone in the timber trade, owing to shippers, merchants, and dealers increasingly recognising that the consumptive demand, though not lacking sound backbone, has lost the elasticity of recent years. Supplies and prices are therefore being more readily adjusted to the present conditions of trade, which, if no longer booming, is sufficiently good to ensure a reasonably remunerative handling of well selected and soundly-priced stocks.

Market Rates for Products.

Tropical Agriculturist, May 1*st*, 1901.

Cardamoms	...	... per lb.	2*s* 3*d* to 3*s*. 6*d*.
Croton seeds	...	... ,, cwt.	23*s*. to 35*s*.
Cutch	...	... ,, ,,	23*s*. to 35*s*.
Gum Arabic	...	... ,, ,,	23*s*. to 35*s*.
Do. Kino	...	... ,, ,,	90*s*. to 107*s*. 6*d*.
India-rubber,	Assam	... ,, lb.	2*s*. 2*d*. to 2*s*. 6*d*.
Do.	Burma	... ,, ,,	2*s*. to 3*s*.
Myrabolans,	Madras	... ,, cwt.	6*s*. to 7*s*.
Do.	Bombay	... ,, ,,	4*s*. 3*d*. to 9*s*. 6*d*.
Do.	Jubbulpore	... ,, ,,	4*s*. 3*d*. to 7*s*.
Do.	Bengal	... ,, ,,	4*s*. 6*d*. to 6*s*.
Nux Vomica	...	... ,, ,,	7*s*. to 10*s*.
Oil. Lemon-grass	...	... ,, lb.	4½*d*.
Sandalwood Logs	...	... ,, ton	£20 to £50.
Do. Chips	...	... ,, ,,	£4 to £8.
Sapanwood	...	... ,, ,,	£5 to £5 10*s*.
Seedlac	...	... ,, cwt.	50*s*. to 57*s*.
Tamarinds,	Calcutta	... ,, ,,	15*s*. to 16*s*.
Do.	Madras ...	... ,, ,,	7*s*. 6*d*. to 11*s*.

THE

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Irregularity in the Growth of Teak.

By R. S. Hole, *F.C.H.*

In a letter published in the August Number of the *Indian Forester* for 1897, "S. C." drew attention to the extraordinary irregularity in the growth of teak as exhibited by the rings counted on a large number of teak stumps. In the words of the author of that letter the peculiarity is that "the growth of the whole tree consisted of alternate cycles of normal and abnormally slow growth, each cycle (both of normal and abnormal growth) extending over a varying but generally considerable number of years." "S. C." goes on to enumerate the possible causes of this irregular growth, and says, "No. (1) (*i.e.*, damage by insects) may be left out of consideration altogether, the length of time over which the damage extends rendering it absolutely impossible that insects should be the cause . . . and it seems to me that in the majority of cases fire is the cause of most of it. My reasons for coming to this conclusion are as follows:—

(*a*) The suddenness with which the change from normal to very slow growth takes place.

(*b*) The very large proportion of trees exhibiting this appearance.

(*c*) The occurrence of 2, 3 or even 4 cycles of slow growth during the life of the tree."

The few observations which I have been able to make during the last three years regarding the life-history of the two defoliating insects, *Paliga damastesalis* and *Hyblæa puera*, both notorious teak pests, have convinced me that the peculiarity drawn attention to in the letter above referred to is, in many cases at all events, caused by these insects. The press of official work in unusually busy years of famine and working-plans preparation, with two transfers to boot, have prevented me from obtaining incontestable proof of this; but I think I have sufficient data to warrant my above assertion; sufficient, at all events, to show

that insect damage is at least as probable a solution of the problem as fire, and to make it desirable that more attention should be paid to the damage done by these insects in this connection.

The first point I wish to draw attention to is the very wide distribution of the insects mentioned. The first detailed account of them appeared to have been given by Lieutenant-Colonel Bingham in 1892, which is published in "Indian Museum Notes," Vol. III, No. 2, page 93. It is there stated that the plague of caterpillars which defoliates the teak occurs annually in some portion or other of the Rangoon Division of Burma, the destructive larvæ belonging to two species, *Paliga damastesalis* and *Hyblæa puera*, the former occurring in far the greater numbers. A reference to Mr. Stebbing's "Injurious Insects of Indian Forests," pp. 116 to 117, and again pp. 120 to 121 will show that *Hyblæa puera* has been reported in 1892 from the teak forests of the Hyderabad Assigned Districts; in 1893 again from Berar, from Dehra Dun, from the Kulsi plantation in Assam, and from the Pegu Circle of Burma, and that *Paliga damastesalis* has also been reported from Burma and Berar. In addition to this I would draw attention to an account published on pp. 126 to 129 of the *Forester* for April 1898, describing the attacks "of one or more species of caterpillars" in the teak plantations of Southern India at Nelambur, in Cochin and in Travancore. One of these was subsequently identified as *Hyblæa puera*, and it seems more than probable that it was accompanied by *Paliga damastesalis*. In an editorial note printed on page 517 of the *Forester* for 1900, *Hyblæa puera* is noted as attacking the forests of the Damoh Division, C.P., and in the same year I found the same insect attacking the forests in the adjoining Division of Jubbulpore. *Paliga damastesalis* is common in the Bombay Presidency, and I recently received a letter from the Divisional Officer, W. D., Kanara, in which he remarks that "the moth (*Paliga damastesalis*) is common here in Kanara always, especially when the teak is in leaf; sometimes so common as to injure every teak tree in Kanara, and I well remember one year when every teak tree from Kanara to the north of Thana district was badly attacked." In a letter published on page 325 of the *Forester* for 1897, Mr. R. C. Thompson reports that the teak forests in the Chanda Division, C.P., were defoliated by a small caterpillar in 1892, and that the same caterpillar defoliated the teak in the Damoh Division, C. P., in 1897. This insect has since been identified as *Paliga damastesalis*. I have found the same insect in the Damoh forests in 1898 and 1899, and in the Jubbulpore Division in 1899 and 1900. After reading some notes furnished by me in November 1898, regarding the life-history of *Paliga damastesalis*, Mr. Fernandez wrote: "I have no doubt now that the insect noticed by me in 1875 is one and the same as the *Paliga*," and on page 428 of the *Forester* for November 1898, Mr. Fernandez remarks, in connection with the same insect, that "the pest is spread all over the Central Provinces wherever you find

teak, and it certainly is more general than it was when I was here some years ago." It is therefore clear that both these insects have a very wide distribution, and that in all probability they occur wherever the teak grows throughout India and Burma. Hence it is quite possible that teak may be attacked by them in various localities over enormous tracts of country.

It also appears that one, if not both of these insects, has been known to attack teak in India for the last quarter of a century. From the notes collected by me also, it would seem that *Paliga damastesalis* (which, as a rule, appears to be far more numerous than *Hyblæa puera* in Burma, and which, of late years at all events, has been far more numerous than *Hyblæa puera* in the Central Provinces) is nearly always present on the teak trees, but that its attacks only do serious damage when the conditions are peculiarly favourable for its development, or when it is aided by *Hyblæa puera*. There is therefore obviously nothing extraordinary in a teak tree being attacked by these insects two, three or even four times during its life.

The next point is, that the period of slow growth appears, from the rings on the teak stumps, to last for a considerable number of years, *i.e.*, for some ten to forty years. It is, however, obvious that these 10 to 40 rings may by no means represent the growth of 10 to 40 years, and the possibility of more than one ring being formed in a year does not appear to have been considered. It is, I think, generally believed that the defoliation of a tree, followed by the output of another flush of leaves, results in the formation of an extra ring of growth. Now the number of times a tree is defoliated in the year obviously depends on (*a*) the number of generations the attacking insect has during the year, and whether the conditions of the environment are generally favourable to its development or not; (*b*) the period during which the tree attacked usually remains in leaf, which in turn depends on the species of tree, the climate generally, and the character of the season in particular; and on (*c*) the vitality of the tree attacked and its ability to replace the leaves which are destroyed with fresh flushes of new foliage. As far as my observations in the Central Provinces go, they have shown that (1) the first attack of *Paliga* on teak in the year usually takes place in June-July, *i.e.*, when the first flush of leaves has fully developed, the majority of the trees being practically leafless in April-May; (2) *Paliga* hibernates in the larval stage, and hibernation commences from the middle to the end of October; (3) during this period from June to October, *Paliga* has three generations, each lasting about six weeks; (4) a teak tree which has been completely defoliated takes at least one month to renew its leaves, and that in consequence the same tree is not defoliated more than twice in the season, although the insect has three broods; (5) after the last attack, a weakly flush of small leaves is put out. In the Central Provinces, therefore, we may usually expect from two to three narrow rings to be formed during one year in the

wood of a tree which has been badly attacked by *Paliga* instead of one ring of normal growth. In the damp regions of Burma and Bombay, however, the teak obviously remains in leaf for a longer period than it does in the dry and severe climate of the Central Provinces. We should therefore naturally expect that the teak would be attacked earlier in the year in Burma than they are in the Central Provinces. From the account given by Lieutenant-Colonel Bingham, already referred to above, and which is printed in "Indian Museum Notes," Vol. III, No. 2, p. 93, it appears that this is the case, the teak trees being attacked in the Rangoon Division in April 1892. Supposing that the time necessary for the insect to pass through one complete generation and that the period of its hibernation is the same as it is in the Central Provinces, there would nearly be five generations of the insect in one year in Burma, and supposing that the trees attacked take at least one month to renew their foliage, as many as four narrow rings could be formed in the period. It must, however, be considered that in a moist, mild climate (*a*) the hibernation of the insect may commence later and last for a shorter period, and (*b*) the teak trees attacked might have sufficient vitality to renew their leaves in less than a month. It is therefore not impossible for five or even six narrow rings to be formed in one year. We have, therefore, only to suppose that such attacks last for five years in succession, and we shall have accounted for 30 small rings on the teak stumps of "S. C."

My observations have shown that *Paliga* often has certainly three and very probably four generations in one year in the Central Provinces, and I believe that in more favourable localities it may have as many as five or six; and this insect is almost always present on teak in more or less considerable numbers. *Hyblœa* is known to frequently work in combination with *Paliga*, and it is believed to have at least two broods in the year. It is therefore clearly not difficult to imagine conditions being sufficiently favourable for the development of these insects to enable them singly or in combination to attack teak severely for four or five years in succession. It is also obvious that such favourable periods may be separated from each other by less favourable periods of varying duration. To show that severe attacks may be made for several years in succession, I will, however, remark that in 1897 *Paliga d.* was recorded as defoliating teak in the Damoh Division, C.P., three times during the year. In 1898 the same thing happened, and I was told by the inhabitants of the district that the same thing had happened for several years past. In 1899 I was unfortunately transferred from Damoh, but I believe that the teak were again attacked more or less severely. In 1900 the Damoh forests were severely attacked in July; this time principally by *Hyblœa*, and, from what happened in the adjoining Division of Jubbulpore, I believe that the second flush of leaves put out by the injured

teak was more or less severely attacked by *Paliga* in September-October of that year. It is therefore, I think, quite possible that teak may be defoliated several times in the year for several years in succession, and that from 10 to 40 small rings may be formed in the wood in consequence.

Finally, it is obvious that (*a*) the suddenness with which the change from normal to very slow growth takes place, and (*b*) the very large proportion of trees exhibiting this irregular growth would be fully accounted for by supposing the peculiarity in question to have been caused by insect attacks.

CAMP JUBBULPORE,
14th April 1901.

Insufficiency of the World's Timber Supply.*

(*Continued from p.* 366.)

12.—BULGARIA.

Bulgaria sits astride the Balkans, and might therefore be expected to possess vast forests: so she did for ages. But the last century or two have wrought such havoc that her supply no longer suffices for her needs. The excess of imports (see Table XXII) was as follows for 1898:—

	Kilogr.	*Francs.*
Imports	58,133,502	3,094 830
Exports	13,838,345	8,45,337
Excess Imports... ...	44,295,157	2.249,493

This excess import corresponds to a volume of 73,000 m.c. net, or 90,000 *m.c. in the forest.* It is a large amount for a population of small density and agricultural habits.

13.—SERVIA.

Servia is credited with 2,090,000 hectares of forest, or 42 per cent. of the total area of the country, which is 4,855,500 hectares. Either these forests are not yet opened up, or they are already ruined by abuse, for the official statistics show that the timber imports are in excess. See Table XXIII.

	C. metres.	*Francs.*
Imports	28,965	756,561
Exports	8,003	394 :35
Excess imports ...	20,962	362,326

The excess imports are about equal to 35,000 cubic metres in the rough.

This is the last of the European timber-importing countries. They include the southern, western, and part of the central States. Their total area is 267 million hectares, and their population of 215 millions represents 57 per cent. of the total continental and island peoples. They comprise all the nations

* Translation by F. Gleadow, I.F.S., of "L'insuffisance de la production des bois d'œuvre dans le monde," par A. Melard, Inspecteur des Eaux et Forêts.

possessing the densest population, the most flourishing industries, the most active commerce, the greatest production of coal and iron ; in a word, all those which have been the seat of the oldest and most brilliant civilisations. The danger threatening them is evident, since the future of their commerce and manufactures alike is stringently dependent on the exporting countries. An examination of the resources of the latter will reveal the imminence of the danger.

14.—Austria-Hungary.

The total area of this country is 62,490,000 hectares, *viz*,—

Austria	30,020,000 hectares.
Hungary	28,220,000 ,,
Croatia-Sclavonia	4,250,000 ,,

The forests comprise 18,780,000 hectares, *viz*., —

Austria	9,710,000 hectares.
Hungary	7.540,000 ,,
Croatia-Sclavonia	1,530,000 ,,

Thus the whole empire has 30 per cent., Austria has 32·3 per cent., Hungary has 26·7 per cent., and Croatia-Sclavonia has 36 per cent. of their total surface under forests.

According to the census of 1890, the population of 41,358,000 comprises—

Austria	23,895,000 inhabitants.
Hungary	15,262,000 ,,
Croatia-Sclavonia	2,201,000 ,,

The amount of forest per head of population is thus : for the whole empire, 45 *ares* ; for Austria, 41 *ares*, for Hungary, 49 *ares* ; and for Croatia-Sclavonia, 69 *ares*.

This allowance, which is greater than that of France or Germany, provides Austria-Hungary with more than it at present needs, and thus allows of some timber export. The total annual production of timber and firewood is estimated as—

	C. metres.
Austria	27 500,000
Hungary and Croatia-Sclavonia ...	28,500,000

Of the Austrian share, as much as 47 hundredths of the total is timber. The fraction is a large one ; but it must be remembered that 70 per cent. of the Austrian forests consist of conifers, and that half of the rest is high forest. Austria thus produces annually 12,900,000 cubic metres of timber. The proportion of timber in the Hungary-Croatia-Sclavonia production is not stated. An assumption that the whole is of the same quality as the forests of the State in the same region, which yield one-third timber and two-thirds fuel, gives an estimate rather above than below the truth, and leads to the result that Hungary and Croatia-Sclavonia together produce annually 9,500,000 cubic metres of timber. This amount is less than Austria obtains from a similar area, but the distribution of species in Hungary, &c., is less favourable, *viz*., oak, 0·27 ; beech and other broad leaf species, 0·52 ; conifers, 0·21.

The total timber yield of the Empire is thus 22,400,000 cubic metres, or 1·19 cubic metres per hectare. This is certainly a maximum estimate, for it is greater than the production of the French State forests, which produce 1·07 cubic metres after deduction of all unproductive areas, and greater than the total for all the Prussian forests which yield 0·81 cubic metres.

The timber imports and exports for the years 1888 and 1898 are as follows (see Tables XXIV and XXV):—

		Quintals.	*Francs.*
1888	Imports ...	963,367	5,885,399
	Exports ...	18,923,583	120,077,721
	Excess Exports ...	17,960,216	114,192,322
1898	Imports ...	1,724,122	5,659,809
	Exports ...	33,487,823	204,195,354
	Excess Exports ...	31,763,701	198,535,545

The "exports" have greatly increased, and the "excess exports" are 13,803,485 quintals more. Austria-Hungary has thus so far been equal to the demands made upon her by other nations, especially by Germany; but will she be able to keep up the supply permanently, or increase it? This is improbable. The exports seem to be nearing the maximum possible, unless, indeed, the whole producing capital or standing stock is to be destroyed regardless of the future.

The total timber production being estimated at 22,400,000 cubic metres, and the "standing" or "rough" contents equivalent to the excess exports for 1898 being put at 6,800,000 cubic metres (see Table XXVI), there remain 15,600,000 cubic metres for internal consumption.

For a population of 41,358,000 inhabitants this is a liberal allowance, which is perhaps capable of sparing a little more to add to the excess imports. It is nevertheless to be noted that England, with a slightly smaller population, has been obliged to import, on the last five-year average, some 15,000,000 cubic metres (forest measurement); and that Germany, in spite of its 14 million hectares of forest, imported in 1898 an overdraft of 9,000,000 cubic metres. Austria-Hungary can thus only be expected to increase or even maintain its exports on the condition that its commerce and manufactures remain stationary. The contrary is the case. Austria-Hungary is making great strides in all branches of economic activity. The industries of extraction, like those of chemistry and mechanism, have received a great impetus, the birth-rate has risen, and the population is fast increasing.

It would thus be a great error to imagine that the Austro-Hungarian forests constitute a great reserve for other nations to draw on. The reserve itself is in danger from the continued development of internal consumption. The higher prices offered and

the greater facilities of disposal may prove too much temptation for the virtue of many forest-owners to withstand, and the result will be a diminishing outturn in quality and quantity. These fears are endorsed by a very competent authority, *viz.*, M. de Bedö, formerly Director-General of the Hungarian forests. In his great work on the economic and commercial aspects of the Hungarian State forests, he says: "The State of Hungary possesses no "excess production such as can for long admit of an increasing "consumption; on the contrary, in many forests the available "supply stands in need of increase."

15.—Norway.

A nation of sailors, in constant sea communication with wood-demanding nations, has naturally for a long time been in the habit of calling upon its forests to provide an export trade. No vessel needed to leave empty, consequently the mercantile marine was fostered, and is now one of the finest in Europe. It amounts to 1,550,000 tons, which is equal to that of Germany, and half as much again as that of France.

Unfortunately, Norway has overdrawn its timber income and impoverished its forests. The total area is 32,296,800 hectares, of which 6,818,000 hectares are forest; that is to say, 21 per cent., a proportion far too small for a country two-thirds of which consists of rocks, swamps, moors, glaciers, &c. No legal check or limitation binds the private individuals who own 86 per cent. of all the forests. Even the communes are not obliged to have their forests properly controlled by the State Forest Administration.

The Norwegian timber exports are thus likely to be of much less importance in the near future. They are already less than is supposed, and notwithstanding the increased demand of the last ten years, the excess *in volume* of exports over imports has not increased. This is seen from the figures given below for the external timber trade for 1888 and 1898 (see Tables XXVII, XXVIII, XXIX and XXX):—

		Cub. metres.	*Francs.*
1888	Imports ...	293,500	6,247,933
	Exports ...	1,802,837	43,469,579
	Excess Exports ...	1,509,387	37,221,646
1898	Imports ...	369,000	7,966,296
	Exports ...	1,848,882	54,678,723
	Excess Exports ...	1,479,882	46,712,427

The 1898 excess exports, consisting for the most part of sawn timber, are about equal to 2,000,000 cubic metres in the rough. It is not the timber trade alone which is ruining the forests of Norway. For twenty years past another foe has been at work, *viz.*, the pulp industry. So long as useful timber alone was saleable, the harm was limited. All the large or serviceable trees were cut

out, but at least the little ones remained to renovate the forest in course of time. Now that the pulp industry takes small trees, there is simply nothing left standing. The following figures show the growing importance of this industry in Norway. In 1875 the exports were only 8,500 tons, worth 944,000 francs; in 1888, they already amounted to 162,455 tons, worth 12,738,000 francs; and in 1898 they reached 315,274 tons, worth 24,050,000 francs. The volume "in the rough" required for this production in 1898 may be placed at 1,400,000 cubic metres.

16.—Sweden.

The Swedish forests, covering 18,200,000 hectares, amount to 40 per cent. of the whole country. Being principally pine and spruce, they furnish valuable produce, possessing strength, lightness, and elasticity. The yield is fairly high, except in the extreme north and on the high mountains, where growth is slow. They seem to be in better condition than those of Norway, and the Government concerns itself with their preservation.

In the northern provinces a private owner may not cut for sale any tree smaller than 8 inches diameter at 5 feet above soil. It has been proposed to enact similar regulations for other provinces. Such a course would be true wisdom, for the riches of Sweden lie in its forests, which are the support alike of its industries and of its external commerce. Their disappearance, or even their impoverishment, would be a national disaster.

Sweden is, then, for the present, a fine reserve of forest produce; but it is to be feared that it will not be able in the future to provide any larger supplies than it at present spares. Still less can it be expected to make up the deficiency that will soon be the visible result of increasing demands by importing countries, and restricted output from Norway and Austria-Hungary. Neither must it be forgotten that, in spite of a steady stream of emigration, the population is increasing, and that in a country possessing a severe climate and little mineral fuel, the consumption of firewood is considerable.

The imports and exports of timber for 1888 and 1898 are as follows (see Tables XXXI, XXXII, XXXIII. and XXXIV):—

		Cubic metres.	*Francs.*
1888	Imports	32,827	976,926
	Exports	5,319,352	151,143,776
	Excess Exports	5,286,525	150,166,850
1898	Imports	177,404	4,706,854
	Exports	6,547,148	202,884,012
	Excess Exports	6,369,744	198,177,158

The volume "in the rough" of the excess exports for 1898 may be stated as 9,000,000 cubic metres. This enormous figure is still inferior to the annual requirements of the English market

alone, which demands no less than the equivalent of 15,000,000 cubic metres in the rough.

The pulp industry has also taken a great impetus in Sweden. The exports of this material, which were 38,473 tons in 1888, have risen to 181,474 tons in 1898, worth 21,574,000 francs.

The Norwegian pulp exports are mostly in the wet state. Those of Sweden, on the contrary, include a large proportion of dry pulp, so that, weight for weight, the Swedish pulp represents a higher value and a larger amount of wood. The volume in the rough representing Swedish exports for 1898, must be about 1,000,000 cubic metres.

17.—FINLAND.

The Grand Duchy of Finland, belonging to Russia since 1809, has hitherto possessed a separate administration. It therefore is treated separately, a course justified by the importance of its forests. The soil of Finland is composed of old primary rocks and granites, and forms a plateau on which are scattered lakes innumerable. The forests cover 22,500,000 hectares, or 60 per cent. of the total area of the country. It might be expected that the legitimate annual production of so large an area would suffice both for the needs of 2½ million inhabitants and for the export trade. Nothing of the sort. Local consumption for fencing, building, fuel, &c., reaches proportions unheard of elsewhere, unless perhaps in Canada. It is said that each inhabitant burns on the average 7 cubic metres annually. The export trade has been pushed so greedily, that the forests already show signs of reduction. Big trees are becoming scarce. In 1889, a "*standard*" of sawn stuff was obtained from 33 $\frac{8}{10}$ths logs. It now requires on the average 40 logs.*

Like most of the European forests, those of Finland have reached the stage when the cutting must be strictly limited to the amount annually produced by the soil, unless the wood capital itself is to be destroyed.

The exports of 1898 amounted to 3,315,389 cubic metres, worth 89,010,380 francs (see Table XXXV). The imports were insignificant, the volume is not stated, and the value was only 771,984 francs. The volume in the rough necessary to provide the exports is 4,500,000 cubic metres.

The pulp industry is as yet of less importance in Finland than in Sweden and Norway. Nevertheless the 1898 exports included 20,400 tons of pulp and 21,800 tons of millboard. In 1877 both these articles only amounted to 3,600 tons.

18.—RUSSIA.

In 1897 Russia exported 146,239,495 francs worth of wood, being 144,233,100 francs for timber, and 2,006,395 francs for

* See the Report of M. Evensen, of the French Consulate at Helsingfors, dated 6th March 1899, in the *Moniteur officiel du Commerce* of 1st June 1899.

firewood (see Table XXXVI). In the same year the imports were worth 12,207,368 francs (see Table XXXVII. The figures for 1898 were not yet compiled). Russian statistics include "firewood" imports and "timber in the rough" under one head. It may be accepted that the imports and exports of firewood are equal, since the external trade in this material consists simply in the local exchange of produce between various points along the land frontiers. Accepting this guide, it is seen that the excess timber exports is equal to the difference of the total imports and exports, *viz.*, 146,239,495 less 12,207,368, or in round numbers 134,000,000 francs.

The customs returns only record the value; but it is possible to form some idea of the volume, because 87 per cent. of the Russian wood goes to Belgium, England, Germany and France, countries whose records contain information as to the quantities entered from Russia; thus:—

	Cubic metres.
Belgium	... 416,400
England (2,314,400 loads) ...	... 3,274,800
Germany (16,726 500 quintals) ...	... 2,787,700
France (496,300 tonnes) ...	... 827,100
Total	... 7,306,000

The Russian exports of timber for 1897 were thus at least 7,300,000 cubic metres, mostly cut up, and equivalent to 10,000,000 cubic metres in the rough.

It is very unlikely that the Russian forests can continue to bear such a drain. European Russia with Poland, but excluding Finland, does not appear to possess more than 160,000,000 hectares of forest, or 32 per cent. of the total area; Russia, 488,900,000; Poland, 12,700,000: total 501,600,000 hectares.

The percentage of forest is thus a little greater than in Austria-Hungary, but less than in Finland and Sweden. The distribution of the forests is very irregular; they are thick in the north, of moderate extent in the centre, and deficient in the south. The Russians are the most rapidly-increasing people of Europe. Under Peter the Great, in 1722, they were only 14 millions; at the end of the eighteenth century they were 36 millions; under Nicholas I. they were 65 millions, and the last census in 1897 showed them to be 103,600,000 (Russia, 92,200,000, Poland, 9,400,000). The consumption of wood is enormous. The country-houses are almost always wooden, and have to be often re-built on account of the frequency of conflagrations. River navigation is well developed, and requires a large number of boats. The climate is severe, and coal is only abundant in Poland and the south. This industry is still undeveloped; in 1897 the outturn of coal was only 10 million tons against 205 millions yielded by the English mines.

The timber demand is increasing more rapidly than the population; for Russia, once purely agricultural, is now becoming

strongly industrial. The progress in this direction is remarkable. For instance the production of cast-iron, 1861, 286,000 tons; 1881, 450,000 tons; 1897, 1,871,000 tons.

The forest production, on the other hand, far from increasing, has been diminished through the great havoc that has been wrought among the forests during the century. The forest area in the north is still large, but growth is very slow there; and it would be a great misfortune if overfelling should be allowed to destroy or injure the network of forests which modifies the polar winds. Russia is an immense plain, over 2,000 kilometres from the Arctic Ocean to the Black Sea, without a single sheltering chain of mountains. It is then of the utmost importance that the country should be traversed by great bands of forest, in order that the extremes of climate may be somewhat modified in favour of agriculture.

It is therefore to be expected that the Russian output will be influenced by two reducing causes, *viz.*, the increase of local consumption, and the extension of a due amount of care and conservancy over the existing forests. By the middle of the new century, fifty years only, Russia will have 150 million people, with immensely developed factories, mills, foundries, &c., of all sorts. By that time timber exports will have ceased, and Russia will be only too happy if precautious taken in time have succeeded in assuring a supply equal to her own wants.

19.—Roumania.

Out of 13,100,000 hectares, Roumania has about 1,800,000 under forest, or about 14 per cent. It is thus a poorly wooded country, and the present fact of its being an exporting country is only explainable by the sparseness of the population, which is under 5 millions. The imports and exports vary greatly from year to year, which shows that the forests are worked without any proper regulations, and gives cause for serious anxiety as to their future. This irregularity entrains the use of averages for comparison. From 1894 to 1898 (see Table XXXVIII), the timber imports averaged 22,638 cubic metres and 1,576 tons, worth 573,406 francs. The exports averaged 46,585 cubic metres and 48,000 tons, worth 5,112,524 francs. There was thus an excess export of 23,947 cubic metres and 46,424 tons, worth 4,539,118 francs. The excess exports may be considered equivalent to 120,000 cubic metres in the rough, a very small contribution to the huge deficits of England, Germany, &c.

20.—Bosnia and Herzegovina.

These provinces are well wooded; the total area is 5,100,000 hectares, of which 2,700,000 hectares or 53 per cent. is forest. Three-fourths of the forests are controlled by the State, for itself or for religious communities. An extent of 1,200,000 hectares has been leased to industrial or commercial companies. This is no

doubt an excellent way of getting an easy and immediate revenue out of forests; but it is very doubtful whether such a way is legitimate with regard to the maintenance of production and of the forest capital. According to the French Consul, the annual outturn is at present 1 million cask staves, 250,000 cubic metres of wood, in the rough, squared, or firewood, and 800,000 hectolitres of charcoal. Most of these things are exported.

North America.

Outside Europe, North America is the only place where vast and dense forests can be found economically exploitable, and capable of furnishing wood of all useful kinds at cheap rates. Canada and the United States therefore require examination.

21.—UNITED STATES.

The forest area of the United States is not precisely known. It is supposed to be rather less than 200,000,000 hectares, a large figure by itself, but not at all large when compared with the extent of the Union; 200,000,000 out of 783,600,000 hectares, excluding Alaska and the Great Lakes, only works out to 25 per cent. or little more than Germany.

The destruction of forests, begun three hundred years ago, goes on unremittingly. Eminent men, fearful of the future destiny of a country denuded of forests, cry aloud in vain. Private and particular interests are stronger than everybody's business. The Union possesses hardly any forests between the Atlantic and the Mississippi, and private owners have every liberty and facility for plundering in a few years the stores that nature devoted so many careful centuries to produce.

In early days it was naturally necessary to clear and make room for the colonists, but now it is high time to see that clearing does not ruin them.

Between the Mississippi and the Pacific, the Union still possesses large public estates, but forests are too scarce, being almost entirely absent in the prairie States, scarce on the eastern slopes and on the plateau of the Rockies, and only become considerable in the north-west and on the Pacific slope. There they were and often are of great beauty, being full of conifers of unusual size. Unfortunately, the needs of colonisation, the unbridled abuses, excessive grazing, and fires, are exhausting and destroying them at a great rate. Their magnificence, far from being a protection, is fatally attractive to the speculator. In the west certain reserves have been constituted, and are not to be alienated. They cover 8,400,000 hectares, or a little over one per cent. of the total area of the States. However beneficial in *quality* their action may be, the area is so small that the *quantity* of this action can be barely perceptible. Europe thinks a great deal of these reserves. America is less optimist. It is instructive to read the report of the Committee which the National Academy of Sciences at Washington

sent to study them on the spot, dated 1st May 1897. Almost everywhere the Committee found depredations and damage from fire and pasturing. A few extracts may be interesting :—

(Page 17)—"With the exception of the National Park, whose boundaries are effectively and cheaply watched by detachments of the U. S. Army, your Committee was unable to find any indication of serious effort made by the Government to protect the public domain forests against illegal fellings and grazing, or to prevent or extinguish forest fires. An exception may be mentioned in the case of the northern end of the Cascade River in Oregon, where, in August, a single agent of the Department of the Interior was found actively and successfully employed in driving off several great flocks of sheep which had been devastating the reserve for weeks."

(Page 19)—"Signs of depredation were visible in all the reserves visited by your Committee. In the Pacific Reserve, Washington State, they were seen in the higher parts of the forest, forming a belt round Mount Rainier, a place much frequented in summer by tourists, who set fire to the conifers for the pleasure of seeing them blaze. This insane proceeding, which destroys in a few minutes trees which took centuries to grow, has greatly spoiled the foreground of one of the noblest landscapes in the States.

"The forest reserve of the Cascade chain has greatly suffered, from forest fires which have destroyed a great part of the best woods, and from sheep grazing which has been particularly excessive on the dry slopes of the north and east.

"The forest reserve of the Sierra is annually invaded by sheep, the numbers of which have so increased since their expulsion from the neighbouring National Park, that they now swarm up to the highest Alpine meadows."

(Page 20)—"In the grand Canyon reserve of Arizona, 2 or 3 square miles at one point near the edge of the Canyon, and one square mile at another point, have been enclosed by settlers in the last two years, or since the establishment of the reserve. Considerable quantities of wood are cut for local use, and mining establishments have been set up along the slopes of the Canyon. In the summer of 1895, the Howard Beef Company of Flagstaff pastured 5,000 sheep in this reserve.

"In the forest reserve of the White River plateau, in the north-west of Colorado, there is a saw-mill using wood cut in the reserve, and the whole of the timber used by another saw-mill further south, and by the town of Meeker, and by the settlers of the Upper White River valley, comes out of the reserve.

"The Pike's Peak, Plum Creek, and South Platte reserves have all suffered from terrible fires, which have destroyed the most valuable timber. What remains is freely taken by miners and railway contractors, and on the journey to the sources of the Colorado in Cripple Creek your Committee saw many railway

sleepers cut in the reserve openly stacked by the side of the high road. Among all the places visited, nowhere has your Committee found such contemptuous disregard for the rights of Government as in this region of the Colorado, and it is evident that under present conditions forests must speedily disappear from all the reserves of Colorado."

If such things exist in forests that are supposed to be protected against harm, what must be supposed to go on in the others?

Notwithstanding the manifest exhaustion of their forests, the United States continue to export; but they are simply dissipating their forest patrimony. M. Fernow, a very competent authority, states that even now the internal demand is sufficient to absorb the whole of the legitimate normal production of the forests.

The population of the United States, which was 63 millions in 1890, is increasing at the rate of 2 per cent. annually, and must be now 75 millions. This is not a great total, and in twenty years' time the people will certainly number 100 millions. As in the meantime the forest is sure to have diminished, it is certain that by then all timber export from the United States will have ceased, or will be compensated by imports from Canada.

The external trade in common timbers for the fiscal year July 1897 to June 1898, is as follows (see Tables XXXIX and XL):—

			Francs.
Imports	...	...	... 47,724,341
Exports	...	...	... 147,260,909
Excess Exports	...	...	... 99,536,568

The United States Customs do not state the quantities in many cases, so that any estimate of volume is impossible. It will be noticed that the imports are considerable. In certain States, near the Canadian boundary, the forests are already unequal to the demands of building and industry, and timber has to be imported. In the north-western and south-western States, on the other hand, the demand is less, the forests are less exhausted, and an export trade still exists.

22.— CANADA.

The Canadian timber trade dates only from the beginning of the nineteenth century, when the ports of northern Europe were closed to England by the Continental blockade. Until then the forests had been almost untouched, for the population was scanty and almost confined to the banks of the St. Lawrence. The present situation is very different. For eighty years past immense destruction has gone on: sometimes for towns, villages, agriculture, &c.; at other times for pure loot without the slightest regard for reproduction. The Canadian forests consist mostly of conifers, in which wholesale fellings, made without leaving a sufficient

number of seed-bearers are simply ruinous. The forest is either destroyed outright, or, takes ages to recover.

Fires are also a serious cause of devastation in the forests of Canada. They are caused by the negligence of lumbermen, hunters and travellers, who go away leaving their camp fires burning; also by the farmers, who burn their lands or rubbish without taking any precaution to prevent the fire spreading. It is the case that the fires have destroyed more than even the lumberer's axe. Some of these fires have been immense. In his "Primer of Forestry," Gifford Pinchot describes the Miramichi fire of 1825: "It commenced its most destructive course at about 1 in the afternoon of the 7th October at a place 60 miles above the town of Newcastle on the Miramichi, in New Brunswick. Before ten that night it was 20 miles below Newcastle. In nine hours it had destroyed a piece of forest 80 miles long by 25 miles wide. Almost every living being on 1½ million acres was exterminated. Even the fish were found in heaps on the river banks. The towns of Newcastle, Chatham, Douglastown and others were destroyed, besides 590 scattered buildings: 170 persons and nearly 1,000 cattle perished."

In spite of what they have had to endure, the Canadian forests are still exceedingly rich. Their area, put at 323,000,000 hectares, is nearly 38 per cent of that of the whole Dominion. The distribution is very unequal. In the north, beyond the limit of tree growth, there is none. In the territories adjoining the Prairie States of the United States there is little. On the Pacific slopes and in British Columbia (75 per cent.), there is very much. The Atlantic provinces of Ontario, Quebec, New Brunswick, &c., are also well wooded.

It would be a great error to consider this great wealth inexhaustible. Up to the present, the finest, fastest-growing, and most magnificent forests have borne the brunt of the attack. Working northwards the crops will be found less and less rich, and the trees more and more stunted, till a limit is reached where the rigour of the climate forbids any encroachment by man. The destruction of the belt of northern forests, which now somewhat moderates the severity of Canadian winters, would cause the limit of vegetation, whether forest or farm, to be driven southward, practically diminishing by so much the habitable area. It must thus not be supposed that the whole of the Canadian forest area is covered with fine or even with workable forest.

The local consumption, estimated at 40 million cubic metres for 5 million people, is very heavy, besides which Canada contributes supplies to England, the United States, and many other places. Every year the trade is extending into the Far East, the Pacific, Australasia, &c., and Canada will be the only source of supply remaining to satisfy urgent demands when Austria-Hungary and Russia shall find themslves obliged to cease exporting. Canadian outlets are thus bound to increase rapidly

and if the present system of cutting all saleable trees, instead of limiting fellings to the annual production of regular areas is to continue, the wealth will rapidly disappear.

The exports of timber for the year, July 1897 to June 1898, were valued at 138,294,043 francs (see Table XLI). The statistics are too incomplete to permit any estimate of volume. The pulp industry is expanding vastly in Canada, the exports being as below:—

1890	...	...	...	...	415,000
1893	...	...	...	...	2,000,001
1897	...	...	...	...	3,845,000
1898	...	...	...	...	6,276,000

This progress is a threatening omen for the young and half-grown trees that would be left standing, if the demand for timber alone had to be met.

The imports of timber are small. In 1897-98 they were only worth 11,350,136 francs (see Table XLII). They consist partly of high-priced woods from the United States which are used for cabinet work, and can hardly be classed as common timbers.

The list of countries able to export timber is now ended. It may be judged incomplete, because it includes only Northern and Eastern Europe and North America; Asia, Africa, Central America, South America, Australia, being all left out.

It may be urged that these continents, hardly yet explored, contain vast forests, only awaiting the axe and capable of many centuries' supply. Such expectation would be a gross error, as is shown below.

23.—Asia.

Asia is a continent that has seen the most ancient of all civilisations be born, grown up, decline and disappear. Its soil is littered with ruins. From a forester's point of view it is not a new country but an used-up one almost everywhere. In Mussalman Asia (Turkey, Persia, Turkestan, Afghanistan, Arabia) deserts are alternated with steppes, and with naked mountains browsed bare by sheep and goats.

The celebrated forests of Lebanon, whence the Phœnicians drew their navies, have all but disappeared. The same is the case with the forests girdling the basins of the Tigris and Euphrates, which formerly supplied the great capitals of Nineveh, Babylon, Susa, &c. The fine forests that were quite recently to be found in the Caucasus, are now in great danger. There is so much hurry to cut them, that foreign contractors are called in. It were far wiser to leave them in peace for the local industries which cannot now long delay their appearance in the valleys below.

British India possesses hardly enough woods to supply its own 287 millions of people. Its forests would have already disappeared if Government for the last thirty years had not taken energetic measures towards conservancy. It can still export

70,000 to 80,000 cubic metres of teak, almost entirely from Burma (see Table XLIII), but this only amounts to the one hundred and fiftieth part of the British consumption.

In Indo-China it is also admittedly high time to stop the destruction.

China, with 380 jostling millions of people, has no forests of consequence. Up to the present, its timber imports have been small. In 1898 they were only worth 3,626,729 francs (see Table XLIV). But a great change is taking place. The Chinese Empire is being opened, if not to western civilisation, at least to western industrial processes. Railways and factories may already be seen. The soil contains vast coal resources which are now being brought under regular working. The time is at hand when China will bid for much wood in the world's markets. This will be obtained from British Columbia and the Western States of America, and China will in return contribute to the exhaustion of their forests.

Japan's 12 million hectares of forest may, if carefully husbanded, suffice for the needs of her 44 million people and their wonderfully progressing industries. But they cannot be considered as any resource for other countries that hunger for timber. Japan has 5 or 6 million people more than France, and it has been already shown that France with her 9½ million hectares of forest is yet obliged to buy 3 million cubic metres "rough" equivalent.

In 1897, Japan's imports were slightly larger than her exports (see Table XLV).

Imports	1,250,826
Exports	909,782
Excess Imports	341,044

Siberia possesses great forests, but not so much as might be supposed if the area, greater than all Europe, be compared with the population of 5,700,000 people. Part of Siberia lies outside the zone of tree growth, and another great part is occupied by vast grassy plains. It is principally in the southern mountainous regions that forests are found. They do not appear as yet to have provided any exports to Western Europe, and if such occur in the future, they are not likely to be large. Siberia is not favourably situated for sending common timber cheaply to England, France or Germany. Its rivers are frozen for months; they flow into the Arctic Ocean, which itself is not the most accessible of seas. Shippers might risk the length, cost, and danger of the voyage for some valuable mrechandize, but for woods there would be small inducement. Indeed, it may be supposed that the cost of transport would be so great, that the forest owner would find no profit. As to the Trans-Siberian Railway, its length between Lake Baikal and the Baltic is about 6,000 kilometres (3,600 miles). The actual cost of felling and carriage, without any allowance for

profit, *plus* the freight from the Baltic to England or France, would together amount to more than the timber would fetch when sold at destination. Besides, the opening of the railway will allow Siberia to become populous and to open up her immense mineral wealth. The local consumption of wood will become far more extensive than is foreseen at present. The railway will soon place Siberia in communication with the Gulf of Pechili, a much nearer market than Europe, so that any possible current of exported timber will flow surely east and south to China and Australia rather than west.

It is necessary to add that the extreme climate of Siberia imperatively dictates the maintenance of extensive forests, if the remainder of the country is to remain habitable. It is to be supposed that the Russian Government will have the wisdom to veto all attempts at mere plundering of its great Asiatic possession.

(*To be continued.*)

A Visit to the Earl of Yarborough's Woods.

By E. Mc'A. Moir.

The extensive woods of the Earl of Yarborough occupy the northern part of the wolds of Lincolnshire, and constitute an important feature in the scenery of this part of England. The Lincolnshire wolds, or range of low chalky hills on which the woods are situate, consist of an undulating series of chalk hills belonging to the Lias formation, and are a continuation of the more important Yorkshire wolds extending across the Humber river into Lincolnshire for a distance of about 60 miles. The soil is generally dry, but in good many places the chalk is covered with a sandy loam with occasional beds of clay of medium thickness and good quality.

The height of the Lincolnshire wolds varies from 200 to 800 feet above sea-level, the highest point being at Pelham's pillar situated in the middle of the Brocklesby woods, and which constitutes an important landmark to the surrounding country.

The Brocklesby and Manby woods include the main portion of the Earl of Yarborough's forest estate, and cover an area of nearly 5,000 acres, besides which there is an extensive wooded part kept for ornament, and in the middle of which Brocklesby manor, the family seat of the Earl of Yarborough is situate. The total area of the Earl's property in Lincolnshire amounts to about 50,000 acres, so that the forest area representing 10 per cent. of the whole, may be considered a fair proportion under wood, in comparison to most other English properties, where the percentage is generally much lower.

The Earl's woods are in charge of Mr. W. B. Havelock, trained forester, a gentleman of great practical experience in

sylviculture, and who conducted the undersigned and Mr. Fisher through the woods, and took the greatest pains to explain all matters of interest to us in an intelligent and careful manner.

The planting of the Brocklesby woods on the Lincolnshire wolds was commenced by the first Earl of Yarborough in the year 1787, and up to the end of the year 1823 no less than 12,552,000 trees, consisting principally of oak, ash, larch, beech, Scotch fir, elm, &c., had been planted in a systematic and careful manner.

In order to commemorate the event a solid freestone pillar about 120 feet high was erected on the highest point in the middle of the woods with a record of the planting work inscribed thereon. A detailed record of the area and number of trees planted from the commencement of these operations has been carefully kept, and up to the end of the year 1899 a total number of 21,346,500 trees of all kinds have been planted out.

The only years during this long period in which no planting work was done, were the years 1881, 1882 and 1883, when for financial and other reasons the work was temporarily discontinued, but since that time it has gone on regularly.

The maximum number of trees planted in any one year was 6,58,890, and the average number planted during the last twelve years was 190,500; the largest proportion of which was larch, this being the most useful tree to grow. In 1887, many of the old woods planted during the last century had become mature, and owing to the early thinning out of larch from fear of disease attacking it, most of these woods were considered too thin to stand any longer, so the plan of clearing 50 acres per annum, and re-planting the area was commenced, and regularly carried into effect, year by year, ever since.

The system adopted in the formation of these woods consisted in the planting of broad strips, commencing in the most sheltered places; the trees being planted 5 feet × 4 feet apart. All plantations were fenced by means of live hedges, or by posts and rails, or wire fences, and the planted area was carefully intersected by broad grass glades or rides, which form quite a marked feature of these woods.

It should be noted that in this case the main object of these broad lines is not fire conservancy, as forest fires are of rare occurrence; but principally to allow free passage and galloping space for fox-hunting, which pursuit forms quite an important portion of some men's business in this part of England.

The maintenance of these glades in proper hunting condition, and the providing of suitable cover for the numerous foxes, have therefore to be carefully considered in conducting forest operations on this estate.

From the records of planting work, and the inspection of the forests, it appears that larch and ash are the two most important

species cultivated in the Brocklesby woods, and by far the most satisfactory growth is that of ash, which species does remarkably well in some parts of these plantations.

The ash tree often attains a girth of 6 feet in a hundred years, and the timber is much appreciated in the London market as being exceptionally tough and superior in quality.

At the local auction sales first-class ash timber sells at rates varying from 2*s.* to 2*s.* and 4*d.* per cubic foot, and poles at 1*s.* per cubic foot, and even small pegs for stack thatching purposes fetch 1*s.* 3*d.* per bundle of 120, and are always in demand.

Large-sized well grown ash trees are numerous in certain parts of those woods, and we examined one tree growing on the avenue between the Hall and the family mausoleum, 7 feet in girth, with a clean bole of 50 feet, and which was said to be about hundred years old. Ash is probably at present the most valuable of the European forest trees, and is supposed to thrive only in special localities, such as on alluvial land near river banks, or in damp ravines, and not on chalk or limestone hills.

We found the ash trees specially flourishing in a wood about fifty years old, from which the larch had been cut; and in some other plantations we noticed a very good natural regeneration of the species from suckers, which were not, however, being encouraged as much as they might have been, many of the best stems of shoots having been cut down injudiciously when cleaning operations were last undertaken.

Sycamore also thrives well in the Brocklesby woods, and we measured one of a group 14 feet in girth and with a good bole, 30 feet long. The timber, however, fetches a much less price than ash, *viz.*, from 1*s.* to 1*s.* 4*d.* per cubic foot only.

The larch we saw at the Brocklesby woods is generally vigorous and healthy at least up to the age of fifty years, and one we saw near the Hall measured 8 feet 8 inches in girth, was about 100 feet high and must have been nearly a hundred years old.

In some of the plantations, however, where the soil is too stiff, we noticed unmistakeable signs of disease, but fortunately in these places there was a fine stock of hardwood trees to take its place when cut out about the age of fifty or sixty years. Larch timber at the annual sale fetches from 1*s.* to 1*s.* 6*d.* per cubic foot.

The principal new plantation examined by us was one called the Jubilee plantation, which was formed in 1897 in commemoration of the late Queen Victoria's Jubilee year.

This plantation occupies the site of some old-abandoned fields, and is situated partly in a hollow and partly on sloping ground well up near the top of the wolds.

It is rectangular in shape and comprises an area of about 42 acres, and is surrounded partly by cultivation and partly by other plantations.

The soil, over about ¾ of the area, especially in the hollow part, consists of sandy loam, and in the remainder it is of a light chalky nature.

The main reason why the site was abandoned for agricultural purposes was that it always had the reputation of "drying up," even after a moderate drought, so that the place was not very favourable for plantation operations, as subsequent events have shown.

It having been decided to fence the plantation by means of live hedges of hawthorn, a belt or ride 6 yards wide between the plantation and the hedges was left, so that when the trees grow up they may not overshadow and suppress the hedge.

Two straight rides, 8 yards wide, running from north to south, were also laid out across the plantation, and these are intersected by another broad line running at right angles, from east to west, so that the whole area is divided up into six compartments of about 6 acres each.

The acreage taken up by the ride, *viz.*, 6 acres, seem to be rather out of proportion to the remaining area planted, but Mr. Havelock explained that arrangements for facilitating for hunting being an important consideration in the formation of these woods, the construction of broad lines or rides with this object in view has to receive special attention.

As the plantation during its early stage was certain to be liable to injury from rabbits, it has been surrounded by 3½ feet wire netting, 6 inches of which is let into the ground so as to prevent the rabbits from burrowing underneath.

The planting material consisted of the following species, *viz.*, larch, ash, beech, sycamore, oak, Scotch fir, spruce, Austrian pine, &c. The trees were planted in lines 4 feet apart; the plants in the lines being situated 3 feet apart, so that 2,722 plants were used per acre.

Pits were not dug, but the trees were simply notched in with the spade, the planting work being done during November and December, which are the two best months for planting in the wolds.

As the larch is the most profitable species to cultivate for general use on a large scale, and as it reaches saleable dimension sooner than the ash, about ⅔ of the plants used were of this species, the other kinds being planted in about equal proportion.

All the plants used for this plantation were grown in the local nurseries, but some of them had to be carried 20 miles by means of carts. The total number of trees at first planted out was 1,02,000, and the original cost of the plantation, not including fencing and supervision, amounted to £172, *i.e.*, £4 2*s.*, or about Rs.60 per acre.

Up till July 1898 all the plants did well, but during that month a severe drought took place which destroyed a large number of the trees; the larch having suffered most, the Scotch fir, ash and beech having stood better.

This necessitated the renewal of 43,600 trees during the following November and December, Scotch fir and beech being mainly planted and the extra cost of the operation amounted to £68.

The total cost of the plantation therefore amounted to £241 or about £5 15*s.* per acre.

As stated above, this did not include the cost of fencing and supervision which may be put down at £2 5*s.* per acre, so that the total cost of the plantation probably amouted to about £8 or Rs.122 per acre.

All the plants are now fairly well established, and the plantation is doing well, considering the unfavourable nature of the soil and adverse climatic conditions. After the Jubilee plantation we visited two other adjoining plantations of fifteen and twenty years of age respectively.

These consisted mainly of larch, sycamore, ash, oak, &c., and judicious thinnings had been lately made, *i.e.*, only the dead and dying trees had been removed in a careful manner, and the result of the operation seemed to be most satisfactory.

The height of the trees in these plantations averaged 25 to 30 feet respectively, the larch being 16 inches in girth and the oak 23 inches in circumference. Nearly all the sycamore were holding their own very well, and promised eventually along with the ash and oaks to produce a good crop when the plantations reach their exploitable age at hundred years.

The larch poles after being creosoted meet with a ready sale at 50*s.* per 100, or are sawn up and used for fencing, and the other thinnings are sold for fuel, for which there is a considerable local demand.

A good deal of self-sown birch trees was observed in the plantation which were about to be removed, for if left they would soon choke out the hardwoods.

Various other plantations of a similar nature were visited by us, where we observed that the planting, thinning and cleaning operations had been carried out in a careful and very intelligent manner.

The rotation of the Brocklesby woods being fixed at about hundred years, Mr. Fisher considers it hardly worth while planting oak in an extensive scale, as it is liable to be suppressed by the more rapid growing and more useful larch, and as it cannot attain fair dimension at hundred years, the planting of oak should be confined principally to the park, where it is wanted mainly for ornamental purposes.

From the above account it may be concluded, that the management of the Earl of Yarborough's woods is being conducted in an intelligent and practical manner, and consists in the rearing

of mixed woods of larch, ash, oak, Scotch fir, &c., up to the age of hundred years, when areas of about 50 acres are annually cut and re-planted.

The annual revenue from the Earl's woods during recent years is said to vary from £5,000 to £6,000 per annum, and the expenditure amounting to about £2,500, the net revenue probably amounts to about £2,500 or 10s. per acre per annum. As regards the experimental cultivation of exotic trees, we examined a fine Pinetum in which we saw some good specimens of the following species, most of which were planted about sixty years ago. *Sequoia gigantea*, *Picea orientalis*, 71 feet high and aged about sixty years old. Also *Pinus cembra*, *Carya alba*, *Juglans nigra*, *Picea morinda*, cedar of Lebanon, Deodar, Douglas pine, &c., all of which exhibited for their age very respectable dimensions.

In another part of the woods near the family mausoluem, there is a fine grove of cedar of Lebanon, aged about hundred years, some of which have attained 15 feet in girth and 80 feet in height and which are flourishing, though some had been damaged by wind. The picturesque character of the broad rides or glades through the Brocklesby woods, is maintained by lopping half through, and then binding and pegging down the numerous Portugal laurels which border them in many places, the crowns of which soon take root in the rich humus, and they thus form an evergreen edging to the sides of the rides, and at the same time form good cover for the foxes and other game.

As regards the plague of rabbits in the young plantation, which is such a fruitful source of tribulation in all European planting works, they are of course kept well in hand by the foxes, also by the extensive use of the wire-fencing already referred to; and it may be noted that it is now fairly well established, that, as in the case of rabbits in Australia, the home rabbits also are developing, jumping or rather climbing powers, so that it not unfrequently happens that after all the trouble and expense incurred on fencing the young plantations, a certain number of the most energetic rodents manage to get inside by climbing over the fences.

II.—CORRESPONDENCE.

The Burma Forest Bill, 1900.

BEING in camp, I have only just received the May Number of the *Forester*, and have therefore only now seen "F. G.'s" further remarks on the present subject, for the first time. Consequently, I trust "F. G." will forgive me for not replying to his letter so promptly as he has done to mine.

"F. G." fails to see the justice of my conclusions, and states that, although the same view is commonly held, it is not justified

by the law. If this is really so, it is important that it should be clearly proved for the benefit of those unfortunates who, like myself, have gone astray from the path of law and justice, so that we may be convinced and sin no more. In his letter at present under discussion, however, "F. G." has produced no adequate reasons to support his theory, that it is illegal for a Forest Officer acting under Section 67 of the Indian Act to release property which has been seized as liable to confiscation, without first realizing the value of such property. If "F. G." has kept his best and most substantial arguments until the last, I trust he will produce them in his reply to this.

"F. G." unfortunately persists in reading only the first paragraph of section 67, which fits in with his theory, and entirely ignores the existence of the second paragraph of the same section. Section 67 (1) confers definite powers, and section 67 (2) prescibes the procedure to be followed when these powers are exercised. "F.G." remarks, that "section 67 (*a*) permits a Forest Officer to take *compensation for the offence suspected;* section 67 (*b*) authorizes him to *release property that has been seized*, but *only* on payment of its value." This is certainly true; but it is no less certainly true that when a Forest Officer, having decided a case by ordering the payment of compensation *only* under section 67 (1) (*a*), realizes this sum of compensation, he is then *compelled*, by the provisions of section 67 (2), to release any property that may have been seized as liable to confiscation *without realizing the value thereof.*

It will be noticed that if "F. G.'s" theory is correct, and property cannot be released under section 67, except on payment, then, in section 67 (2), the words "the property, if any, seized shall be released," become superfluous and unnecessary, seeing that, if the value of the property has been realized, the release of the property is already insured by section 67 (1) (*b*).

The present correspondence is only concerned with (using "F. G.'s" own words) "the releases of property under attachment, *when an offence is compounded*, and as the procedure to be followed in compounding cases is prescribed by section 67, we should naturally expect to find the necessary provision regarding the release of property, which is at present under discussion, in this section, and in this section only. "F. G.," however, being unable to find the necessary provision in section 67, searches for it elsewhere, and, apparently, satisfying himself that he has found what he requires in section 60, he makes this extraordinary statement, "the *existence* of section 60 proves that section 67 does not contemplate the release of property without payment." In other words, the curious line of argument adopted by "F. G." appears to be that the framers of the Indian Forest Act were—(1) so careless as to omit all provision for the release of property without payment from section 67, in which section it should obviously have been included, and yet they were (2) so careful as to provide a special section (section 60) to atone for the omission

made from section 67. This seems to be a most unreasonable assumption, and it is obvious that, until it is proved that section 60 is not primarily intended to apply to cases which do not come within the scope of section 67, the existence of section 60 proves nothing whatever in connection with section 67, and furnishes no clue as to the manner in which section 67 is to be interpreted.

There is, I think, no doubt that section 60 is primarily intended to apply to cases in which an unwarrantable seizure of property has been made under section 52, and when it is consequently advisable to secure the release of such property as soon as possible, and to summarily stop all proceedings. In such cases, there would be no "reasonable suspicion" that an offence had been committed, and consequently no final order could legally be passed under section 67. As section 60, then, has a definite object of its own, which is essentially distinct from that of section 67, it cannot be said that section 60 is intended to supply a provision which has been omitted from section 67, or that the existence of section 60 proves that such an omission has been made.

"F. G." has referred me to section 60, and, in return, I trust he will allow me to refer him to Baden-Powell's "Forest Law," p. 439.

The last paragraph on this page runs as follows:—

"Under section 60, the Local Government may empower any officer to direct the immediate release of property seized. This will enable errors to be corrected at once without putting the person interested to the trouble and expense of a trial or appeal." A footnote on the same page referring to this paragraph says:— "In the North-Western Provinces Government has empowered all Conservators and Deputy Conservators to exercise this power; but this was hardly intended, for it is obvious that if a subordinate made a seizure, and his official superiors thought the seizure unnecessary or undesirable, they could order its release and refuse to proceed, in the ordinary course of their official duty as controlling officers, without any special power. What is meant is, that the Commissioner or other such superior, Civil or Police authority, should be vested with power to summarily interfere and stop the proceedings if he thought the seizure unwarrantable. It is in connection with these proceedings that, under section 61, a Police Officer or Forest Officer is threatened with punishment for a vexatious or altogether unnecessary seizure."

CAMP JABALPUR: *7th May*, 1901. R. S. HOLE.

Rotation and Possibility in Selection Forests.

IN Mr. Gleadow's very interesting article in the March Number of the *Indian Forester*, on "Rotation and Possibility in Selection Forests," we are recommended to regulate the possibility by fixing

the proportion of trees to be felled. The question at once arises—how is the proportion to be fixed?

In the May Number we read that Dr. Schlich says, in speaking of the rotation in selection fellings, that the length of the rotation is determined by the quantity cut at each felling. I would enquire if this is not an inversion of the actual process. To take Dr. Schlich's example of coppice-with-standards, surely no author of a working-plan would lay down the rule "fell one standard out of four," unless the resulting rotation of 150 years was found to be the most suitable one. In other words, *the length of the rotation* must determine the proportion of trees to be felleds.

In selection fellings, too, it would appear that some estimate of the average number of years in which one crop is replaced by the next, *i.e.*, the rotation must form the basis of calculation, whether this period represents the actual age of a mature tree, or merely the average number of years in which a tree attains a certain girth. Mr. Gleadow concludes by calling this rotation "a paper one," which means, I take it, that he thinks it of no importance; but nevertheless if it be on the same paper that the all-powerful proportion is worked out, it is not to be lightly treated. Even if so much be granted, the step from Dr. Schlich's simple example to the fixing of the proportion in a regular high forest under the selection system is very great; for not only is the number of mature trees available at each felling not an obvious proportion of the crop, but we have also to obtain a satisfactory check on the cutting of smaller trees under Dr. Schlich's second and third laws of sylviculture. To the uninitiated a possibility by volume might appear a more hopeful affair. Further, to take the case of forests which are not regular, but from which, for sylvicultural reasons, an unfair proportion of the trees which will be mature at the next time of asking (class II) have been removed. Such forests are perhaps not unknown in the province of Oudh. At the next fellings age-class I will occupy too small an area, while age-class II will be in excess—if we aim at bringing about a normal distribution, considerable fellings must take place among the trees in age-class II, which are relatively more numerous than mature trees, areas being equal. Hence the proportion fixed for a regular forest will no longer hold, and it is difficult to see how a correct figure is to be arrived at without some of those "clawings and blazes," to avoid which appears to be one of the chief objects of the method under discussion.

At first sight, indeed, it would seem impossible to fix such a rule as "one oak out of four, and one beech out of three" without going to and fro in the forest; and I have no doubt that a further elucidation of the system advocated by Mr. Broilliard will be generally acceptable.

BAHRAICH:
9th May, 1901.

F. F. R. CHANNER.

Coppicing in Unprotected Forests.

In a letter under the above heading in the March issue of the *Indian Forester*, H. H. H. enquires whether coppice shoots which come in the way of a fire, are invariably killed. I think there can be very little doubt that this is not the case, and that under ordinary circumstances even where the growth of grass is fairly abundant, there is always a certain proportion of shoots which escape destruction. Of course it will depend on circumstances, such as species, amount of dry grass, season of fire, and so on, as to the degree of injury caused; but I think, we may allow, that the conditions in the case of a broad fire-trace, say, from 100 to 300 feet wide, which has been cleared of tree growth, are fairly unfavourable, and yet it will be found that if the periodic clearing (by cutting) of the tree growth is abandoned, in spite of the annual firing, such a line will in time cover itself with coppice shoots. I know of more than one such line, and there must be many examples throughout India.

On lines which are annually cut and fired, of course the effects of fire on the shoots themselves are not observable, but such lines should afford ample information as to the effect of fire on the coppicing power of the parent stool. Here, too, I think the general opinion would be that so far as fire-traces are concerned, annual firing does not destroy the tree growth quickly enough.

I am inclined to believe that in any area where grazing and browzing are not excessive many of the species mentioned by H. H. H. would give useful coppice shoots even in spite of periodic fires if properly coppiced, though whether the season immediately preceding the rains is the best for the operation is another question.

That many of the shoots would be injured and some destroyed by the fires, there can of course be no doubt; but still in most cases some will survive. An examination of the root stock of young stems on regularly burnt areas, such as fire lines, is instructive, as showing the wonderful power of recovery from the effects of periodic burning many, if not most, of the species mentioned by H. H. H. possess; indeed, had they not this power few of our forests in the dry and intermediate zones could have escaped destruction. I think it is more than probable that the majority of the stems now standing in such forests, and which originated before the time of fire-protection are not the original seedling shoots, but coppice shoots produced from the stools of stems destroyed more than once by fire or otherwise.

G. A. F.

Destruction of Game in the Central Provinces.

As Mr. C. C. Hatt has mentioned my 'non-de-plume' in his letter regarding the destruction of game in the Central Provinces which was published in the *Indian Forester* for May 1901, may I be allowed to say a few words on the subject?

It is an accepted fact that the possession of firearms, licensed and unlicensed, in the hands of professional *shikaris*, is at the bottom of the destruction of big game in the Central Provinces and in various other parts of India. Bows and arrows, nets, nooses, spiked pitfalls (most cruel of all traps), account for a very small percentage of the game killed, and it makes little difference to the head of game whether these are prohibited or not; but the enormous destruction of deer—chiefly does and fawns—by spearing and clubbing to death that goes on in Assam during flood time on the Brahmaputra "churs," and, for all I know to the contrary, on partially submerged islands in other big rivers in India and Burma should be put a stop to.

Almost all licenses for guns in the possession of natives in the Central Provinces are granted "for the protection of crops." Naturally in such a country as India the crops are of paramount importance, and if any species of game is found to do so much damage to crops that its extermination becomes necessary, such species should disappear.

But are firearms used for the purpose for which they are licensed? I believe they are not; and if my belief is a correct one, it may be safely assumed that they are not necessary for that purpose. It is not the night-time watcher seated in his *machan* overlooking a rice *khet* or wheat field that uses the gun. Where deer, antelope and pig are plentiful and visit cultivated fields at night, ingenious arrangements of rattling kerosine tins and wooden clappers are considered quite sufficient to scare them away. Where wild elephants are common I must admit that it often takes nothing less than a bullet to drive away a herd grazing in a paddy-field, and an exception as to gun licenses in the case of tracts where these animals are common might be made. From my own experience I should say that, except to make a noise during certain festivals, a native never expends a charge of powder and slugs unless he has a reasonable expectation of bagging game, and as this end is most easily attained by sitting over a water-hole or salt lick, almost all game is killed in this way.

I have seen no practical suggestions in *The Asian* and any other papers for improving the present state of affairs, except the calling in of all firearms. I do not see how any satisfactory compromise can be arrived at; guns for the protection of crops must be either entirely prohibited or allowed as now. If allowed, the granting of licenses must still be left to the discretion of the head of the district. Many Deputy Commissioners are keen sportsmen, others know nothing and care less about game preservation,

and the haphazard issue of licenses by a non-sporting Deputy Commissioner will destroy the good work of half-a-dozen sportsmen who preceded him.

LONG TOM.

Life-History of Hyblæa puera.

A GOOD deal has appeared lately in the *Indian Forester* concerning the life-history of *Hyblæa puera*, and some discussion has arisen concerning its pupation; but I do not think the explanation given by Mr. Osmaston in the May Number for the pupation of the insect in the rolled-up edges of small teak seedlings can be entirely correct.

Early in the rains of 1899 great damage was done in the Yeni Reserve, Pyinmana, Upper Burma, by this insect. The undergrowth consisted almost entirely of a dense mass of young bamboo (*Cephalostachyum pergracile*), generally about 4 to 6 feet high, and the pupation took place in the bamboo leaves. The leaves were not merely rolled up at the edges, but were firmly folded like a sheet of note-paper, more or less transversely, and usually about two inches from the apex. There were plenty of dead leaves on the ground, so that it can hardly be for want of them that the insect pupated in the leaves of the teak seedlings in the Poona Nursery.

It looks as if the larva lets itself down after defoliation is complete, and pupates in the first convenient place it reaches. It should not be difficult to settle this point. If it is as I suggest, then we may expect to find the pupa in any tree or shrub, and only in dense forest, where undergrowth is absent, on fallen leaves.

As regards the identity of the insect, I think there can be no question. I found both the larva and the pupa in the folded leaves, and Colonel Bingham named it from the description which I gave at the time.

In conclusion, I might add that in the case which I have mentioned, the tallest trees only were attacked. Teak saplings and poles invariably escaped defoliation, or, if attacked, the injury was confined to the upper banches.

G. E. S. CUBITT.

Defoliation of the Palapilly Teak Plantation.

THE teak plantation of Palapilly, in the Cochin State, has been recently found attacked by a caterpillar, a few specimens of which I send you herewith for identification. The attack began by the end of March, *i.e.*, when the summer heat began to increase. Beginning from one corner they defoliated the whole plantation of 800 acres in about a fortnight's time, leaving behind the fibrous nerves and nervules. Their number was so enormous, that the fall

of their excreta on the dried leaves during the stillness of night sounded like the fall of a heavy drizzle in a full canopied forest. They secrete out through their anal aperture a strong silky white fibre, by the assistance of which they shift themselves from leaf to leaf, or build their cocoons to hibernate. They disappear entirely if a single heavy shower falls; but re-appear and renew their devastations by the continuance of a week's drought.

I shall feel highly glad if you or any of your readers suggest a remedy which would save the young teak saplings from the raids of this caterpillar.

PALAPILLY: 11*th May*, 1901. } K. G.

III.—OFFICIAL PAPERS AND INTELLIGENCE.

Imperial Institute.

Quarterly Report on enquiries conducted for the Government of India in the Scientific and Technical Department. By Professor WYNDAM R. DUNSTAN, *M.A., F.R.S., Sec.C.S., Director of the Scientific and Technical Department of the Imperial Institute.*

I HAVE to report on the progress of the investigations which have been conducted in the Laboratories of the Scientific and Technical Department on Indian subjects during the last three months. Before doing so, I wish to mention that in consequence of an increased grant made to the Department by the Royal Commissioners of the 1851 Exhibition, it has been possible to add two skilled assistants to the staff, and to commence the equipment of an additional laboratory adjoining those at present occupied by the department. It is intended that this new laboratory shall be chiefly devoted to mineral investigations, and one of the new assistants has been selected on account of his special experience in such work.

The investigations at present in progress include tanning materials, medicinal plants, fibres, gums, India-rubber and possible substitutes for this substance.

In connection with the systematic examination of tanning materials, which has been in progress for some time, advantage has been taken of the presence in England of Mr. Ribbentrop, late Inspector-General of Forests, to revise the programme of operations proposed, and to arrange for the commencement of new experiments likely to be serviceable in assisting Indian enterprise in this subject. In particular, Mr. Ribbentrop has had several conversations with me on the best method of preparing tanning extracts in India, and as to the apparatus which is most suitable to use for this purpose.

In a previous report I have drawn attention to the richness in tannin of the pod-cases of *Cæsalpinia digyna* (Report on Indian Tanning Materials, Part II, 18th April, 1899) and of the special suitability of this material for the preparation of a tanning extract. My report, being a preliminary one, was stated in guarded terms, emphasising the fact that it would be necessary to examine the substance on a larger scale before forming a decisive opinion as to the practical value of the material. I requested that a supply of about one hundredweight of the material should be sent for trial in a tan-yard. In a Flying Seal letter, dated 31st May 1899, Dr. Watt reports the despatch of two further samples of the pods, from Assam and Burma respectively, which are now under investigation. The quantity sent, *viz.*, 40 pounds of each, is insufficient for the conduct of all the necessary practical experiments which I had in view. If it is at all likely that a regular commercial supply could be arranged for from India, I would again suggest the desirability of sending the larger consignment. Since the publication of my preliminary report, a considerable number of enquiries for the pods from merchants, brokers and tanners, have been received here, and also by Dr. Watt. It would appear from the Flying Seal letter referred to, that Dr. Watt had not at that time found it possible to arrange for the commercial supply of large consignments. I may mention that within the last few days I have received a letter from New York, asking for full particulars about this material. I am asked whether it could be transplanted in tropical America, and whether a supply is available in London. It is obvious that the matter may be one of commercial importance.

Considerable progress has been made with the investigations of the Indian Aconites, and another part of the enquiry is now approaching completion.

In a previous report (Annual Report, 1st May, 1900) I have alluded to the probable value of *Hyoscyamus muticus* as a commercial source of hyoscyamine. In a memorandum recently forwarded to India (9th January, 1901), enclosing a paper on "The Alkaloid of *Hyoscyamus muticus* and of *Datura stramonium* grown in Egypt," reprinted from the Journal of the Chemical Society (January, 1901), I have pointed out that this same plant is abundant in Egypt, and the examination of the Egyptian plant has shown that it apparently contains a larger proportion of hyoscyamine than that grown in India. As, however, only one sample of Indian *Hyoscyamus muticus* has been examined, I have asked for a further supply, at the same time drawing Dr. Watt's attention to the demand that has already arisen for this material both in this country and on the continent.

As I am writing on the subject of medicinal plants, I may allude to the recent appearance of the "Indian and Colonial Addendum" to the *British Pharmacopœia*. I agree with the opinion expressed in a recent letter from Dr. Watt that the

inclusion in an Addendum to the *British Pharmacopœia* of a number of drugs, the chemical and therapeutic properties of which are little if at all known, is most undesirable. The enumeration of these drugs can only be of use in indicating the principal Indian and Colonial drugs which need investigation, but this is not the purpose of a *Pharmacopœia*. Of the Indian drugs included, only one has received anything like complete investigation in reference to its chemical constituents and medicinal properties, and that is *Podophyllum Emodi*, the examination of which was conducted in this department with the assistance of medical experts. It appears to me unfortunate, to say the least, that this Addendum should have been issued by the General Medical Council with the implication that the inclusion of the Indian drugs had been suggested or approved by the Indian authorities. It would appear from the statement in Dr. Watt's letter that this is very far from having been the case.

The work of examining the constituents of the latexes of the rubber plant and other similar plants, has been somewhat interfered with by the considerable delay which has occurred in the arrival of specimens despatched from India by Dr. Watt. I may mention that specimens stated to have been despatched from Calcutta last July (Flying Seal letter No. 2736/32) have not yet reached the Institute. I have drawn Mr. Royle's attention to this circumstance, and have alluded to it in my last memorandum to Dr. Watt.

(Sd.) WYNDHAM R. DUNSTAN,

January, 1901. *Director, Scientific and Technical Dept.*

IV.—REVIEWS.

Forest Administration in Cochin State during 1900.

THE forests of Cochin State are under the management of Mr. V. Alwar Chetty, an Extra-Assistant Conservator of Forests, lent to the State by the Madras Government, and the report for the year 1900 shows that in one direction at least Mr. Alwar Chetty is making great progress. The area of forest in Cochin is about 600 square miles, the net revenue in 1899 was Rs.33,000, and during the year under report it amounted to Rs.1,33,000. None of this revenue was obtained from the villagers of the State who are allowed free-grazing, fuel and timber for their own legitimate requirements. Most of it was derived from the sale of railway sleepers, keys and fuel.

Mr. Alwar Chetty points out that "the net result of the year was a surplus of 1·3 lakhs of rupees, being 43 per cent. of the total collections. In the Madras Presidency, the net result of Forest Administration in 1898-99 was only 23 per cent. of the total collections."

We are not in a position to state that Mr. Alwar Chetty is managing the Cochin forests in a more satisfactory manner than the Madras authorities are managing theirs, though we believe it to be quite possible, but we do notice in the report that very little has been done during the year to improve or even to maintain the forests in their present condition. The removal of teak and other valuable timbers during the year were very large, and it is quite certain that the Cochin forests cannot stand this drain on them for many years without deteriorating greatly.

Under "natural reproduction," it is stated that in some parts there is excellent natural reproduction of teak in spite of uncontrolled fires. This is difficult to understand, and it would be interesting to hear more about it.

The State proposes to open out the Nelliampathy forests, and with a view to this is constructing a couple of timber slides and a tram line some 15 miles in length. The services of a competent Engineer have been obtained from Europe to carry out the works, and it is hoped they will be successful.

The report mentions that the State elephants are put through three courses of medical treatment each year, but no details are given of the treatment or of its object. Too little is known of the management of elephants, and this seemingly drastic treatment might well be made public.

Under "Demarcation" it is stated that the demarcation consists of a cleared line 20 feet broad with dry-stone cairns measuring 5 feet in height and 6 feet in diameter at the base. The average cost was only Rs.11 per mile. If the work was thoroughly done, it was marvellously cheap, as clearing a 20-foot line in a West Coast forest is no easy matter.

Forest Administration in the Jodhpur State during 1899-1900.

THE Jodhpur "Progressive Forest Report" for the year 1899-1900, like many other Forest Reports of the famine year, records no progress at all. Nevertheless the forests under State administration fully proved their usefulness, as they afforded free-grazing for cattle, various kinds of food for man, and all the fuel required for the famine relief camps. They also supplied work for many people who were unwilling to join relief camps.

As departmental operations consisted chiefly of fuel work, nearly 200,000 cubic feet having been extracted, we should have liked to know how the forests were worked to yield this. It is difficult to understand why, in spite of this unexpectedly large demand for fuel, the 100 acres prescribed for coppice felling in the Dhao Working Circle dwindled down to only 10 acres.

The energy of at least one of the Range Officers seems to have been somewhat unduly directed towards compounding forest

offences, he having, during the year, single-handed, disposed of as many as 299 cases in which 758 persons were involved and Rs.3,246—about a fourth of the gross revenue from all sources—were realized as compensation; and this in a year of severe famine, and notwithstanding the "policy of forbearance" that is said to have been inculcated.

The financial results show a deficit of Rs.5,288 which is certainly not more than might have been expected. The gross revenue from all sources was Rs.14,755.

It is satisfactory to note that the Jodhpur Forest Staff consists almost entirely of men trained at Dehra Dun, who had attained high places in the pass-list of their respective years, and whose work is appreciated by the Superintendent, himself also a trained officer.

VI.—EXTRACTS, NOTES AND QUERIES.

Insect attacks on Terminalia Chebula.

THE myrobalans of *Terminalia chebula*, commonly called *harra*, being one of the most important minor forest products of this Division, this tree receives considerable attention; and the time of its flowering and fruiting and the development of its fruit are duly noted. Last season the harra crop was practically a total failure, and this was caused by (1) the depredations of a defoliating caterpillar, and by (2) the attacks of a gall insect.

In July, 1900, harra, together with several other trees including teak, *Anogeissus latifolia*, *Adina cordifolia* and *Stephegyne parvifolia*, were absolutely defoliated. I was unfortunately unable to leave headquarters at the time, and I did not succeed in getting specimens of the attacking larvæ from the harra trees themselves. Simultaneously with this defoliation in the district, however, an equally severe attack was made on the various garden and avenue trees in Jubbulpore itself. Larvæ clustered on the trees in enormous numbers and teak, *Millingtonia hortensis* and *Albizzia Lebbek* were, among others, completely defoliated. I collected several of these larvæ and the moth which emerged from them proved to be *Hyblæa puera*. At the same time as this occurred, the forests in the neighbouring district of Damoh were also attacked by a defoliating caterpillar, and specimens of the insect collected by the Divisional Officer were subsequently also identified as *Hyblæa puera*. I am therefore inclined to think that this insect is also the culprit in the case of the damage done to harra.

In consequence of this wholesale destruction of foliage, the teak and harra trees were practically devoid of flower and fruit, and the majority of the harra flower which was produced never developed on account of the attacks of a gall insect. In September, 1900, I noticed that the flowering spikes of many

harra trees were covered with round bodies of a dark-red colour, bearing a superficial resemblance to the fruit of a species of small fig. It appeared that the flowers instead of developing into the usual myrobalans had, owing to the attack of a cynipid insect, merely produced these small galls.

Specimens of the galls were sent by me to the Indian Museum for identification in October, 1900. The insects which emerged from the galls were pronounced to be chalcids, and were forwarded by the Museum authorities to Mons. André, France, for identification. Mons. André, however, has been unable to do more than identify the insects as chalcids, and he surmises that they are parasitic on the cynipids which produce the galls. If this surmise is correct, and nothing but chalcids emerged from the considerable number of galls sent by me, it appears that the gall insect is subject to very widespread parasitic attacks in face of which it can scarcely develop to any extent or do any considerable damage. There appears, however, to be a possibility that the chalcids themselves are primarily responsible for the formation of the galls, and it is hoped that further observations and the collection of additional specimens will settle this point which is of considerable importance in harra-producing tracts.

JUBBULPORE: 18*th April*, 1901.

R. S. HOLE,
Divisional Forest Officer.

Flowering and Seeding of Manwell Bamboos (Dendrocalamus strictus) in the Central Thana Division, Bombay Presidency.

THIS bamboo known as Manwell all over the Thana district flowered in the Mokhada Hills, which form the western projection of the Ghats over an area of about 3 square miles in the reserved forests of the village of Assa, in December, 1900 and January, 1901, and the seeding occurred in March. The flowering was not entirely gregarious, but very nearly so, and was confined to the mature clumps. A clump here and there seemed to escape.

In the Wada Range, which is in the central portion of the district, I observed the flowering was sporadic and scanty.

In the Bassein Range on the Sea Coast, the flowering was a little more copious than in Wada, but not gregarious. I am informed that at Yewa, a village in the Kalyan Taluka of South Thana, the Manwell bamboo planted in the village also flowered this (1901) season, and that about half-a-dozen clumps in the forests close by flowered as well. In these cases the flowering was not confined, it is said, to the mature clumps only, but also to the younger ones. In 1899, I met with a solitary clump of the same species in seed in the Bhiwandi Range of the South Thana Forest Division.

IDENTIFICATION.

Specimens of the flower and leaves of the bamboo were despatched to the Superintendent, Calcuttta Botanical Gardens, who identified the species as *Dendrocalamus strictus*.

METHOD OF COLLECTION OF SEED.

While in the Assa Forest, in March 1901, I found the wild tribes gathering the bamboo seed for home consumption, and also for sale in the neighbouring native State of Jawhar. The outer culms of each clump are cut one by one at about 4 feet from the ground, and each culm bearing seeds is laid on the ground, which has been previously cleared and swept. The culm is well beaten with a stout stick till all the seeds from it have fallen.

The fallen seeds with husks are carefully collected and winnowed by children. It appears that on being taken home, the seeds are crushed in a mortar. One adult is said to be able to collect 2 to 3 seers, *i.e.*, 4 to 6 lbs. of seed per diem. Seed was also collected and sold in the Jawhar State (which is adjacent to the Assa Forest) at Re.1 per 16 adholies, *i.e.*, 64lbs. I have a few pounds available for distribution if required.

G. M. RYAN.

The Flowering of the Bamboo in Travancore.

AT a time when the flowering of bamboo is observed in other parts of India, it may be of interest to learn that a few clumps of the common bamboo of Travancore (*Bambusa arundinacea*) which the natives of the country call *ola mula*, or *olay mungil*, are flowering here and there. It is generally supposed that this phenomenon is the precursor of a general seeding of the species.

About this time in the year 1876 there was a general seeding of this class of bamboo in the country and an utter destruction of it. In all likelihood there may be a general flowering next year.

T. PONNAMBALAM PILLAI.

Dipsas forstenii.

IN Blandford's edition of *Boulenger's Reptilia* and *Batrachia*, this snake is not recorded as occurring in Burma.

I took a specimen on the 16th of March in the Toungoo district, and wish to put the same on record.

It is a powerful and fierce snake and can distend its throat after the manner of certain lizzards when angry. But as this distention can only be seen to advantage from the side, I am at a loss to account for its object. The compressed body shows it to be more or less a tree-snake, and the specimen I took had swallowed a partially fledged bird about the size of a mina.

The snake is probably rare in Burma, as I have no native of the province who has yet recognized it.

JAS. D. HAMILTON.

Forestry in Great Britain.

It is probably known to most people that for the supply of our requirements in the matter of timber, as in that of food-stuffs, we depend largely upon imports from abroad. But it may be doubted if many beyond the comparatively few who have given special attention to the subject have realized the fact that the annual cost to the country of these imports amounts to somewhere about twenty-five millions of pounds. It has been often urged that it would be worth some trouble to prevent this large sum, or a portion of it, going out of the country, and it has been pointed out that a proper system of forest management would bring about this result. Of course, so long as the foreign supply is ample, and the price of imported timber is less than that at which it is profitably produced at home, our markets will continue to absorb foreign produce as heretofore; but these conditions which have hitherto prevailed are, in the opinion of experts, not likely to continue. For some years past, this and cognate questions have attracted considerable attention, as witness the writings of recent date noted below, * all of which are deserving of careful perusal. The burden of all of them may be summed up in the phrase cited by a writer in the *Times* of March 17th, 1899: "Cotton," it is said on the other side of the Atlantic, "was once called King; but King Cotton is a lesser potentate than King Timber must soon become." In other words, the world's demand for timber in outrunning the supply under present methods, and an appreciation of timber values is therefore setting in, which is likely to be permanent and progressive. Cheap timber is probably a thing of the past in this country. To some such a declaration will only appeal as the old cry of "wolf," and they may argue that any scarcity of timber will be balanced by the substitution for it, in many cases, of other suitable products; and such substitution has, no doubt, in the past taken place; as for example, in ship-building. But it must be remembered, that facility of transport has by now led to inroads into the world's timber capital in practically every timber-producing region, and the ruthless destruction of virgin forest without attempt at regeneration has brought us now within measurable distance of the end of the natural supply; and further, in recent years, the applications of timber to other purposes than those of construction; as for example, in the manufacture of wood-pulp, have made it an efficient substitute for other products, and thus the demands for it have been multiplied and may be yet increased.

* "Forest Management with Suggestions for the Economic Treatment of Woodlands in the British Isles" (*Trans.* Surveyor's Inst., 1900); "Canadian Trade with Great Britain (*Contemp. Review*, January, 1900); British Forestry and its Prospects" (*Trans.* Roy. Scot. Arbor. Soc., Vol. XIV, Part II, 1900); "Deficient Production of Timber in the World" (*Trans.* Eng. Arbor. Soc., Vol. IV, Part III, 1900); "Outlook for the World's Timber Supply." Report of lecture by Dr. W. Schlich (*Journal* of Society of Arts, March 1.).

In these circumstances, then, not from any sentimental ideas connected with the growing of timber at home, but from the standpoint of business principles, the question of the growing of timber in Great Britain to an extent which shall in some measure make us less dependent upon foreign supply, is one which has now assumed practical importance.

That wood can be profitably grown in Great Britain, even under the unscientific methods now in operation, has been amply proved; that under a system of scientific management crops of timber could be raised to yield a certain and adequate return upon capital is demonstrable. What lies at the bottom of the absence of such crops in this country is want of appreciation, from land-owners down to the working forester, of the right principles upon which they can be grown. There is, speaking generally, no practice of scientific forestry in Great Britain. Other immediate causes there are which have contributed more or less to the neglect of scentific forestry in Britain, for instance, tenure of land, the claims of sport—this probably one of the most influential factors—the rating of woods, and so forth. These are obstacles, and no doubt will remain so, in the way of tree-planting; but assuredly were our landed proprietors, land agents and foresters better instructed in the methods of growing timber and in the possibilities of remunerative crops, less would be heard of them as such. It is difficult to instil into those who have been brought up in other traditions the fact that trees which are to yield a crop of timber must be grown under rules as definite as those which govern the cultivation of ordinary agricultural crops, because the time which is required for the maturation of the crop and the securing of the final yield exceeds the lifetime of the individual. Yet it can only be when this fundamental fact has been realized that a supply of marketable home-grown timber will be available in Great Britain.

These are not, it is gratifying to note, wanting indications that already some proprietors, even the Government, are appreciating the necessity and the advantage of cultivating their woods upon rational lines. Working-plans for the economical management of woods have been prepared and adopted upon estates of the Earl of Selborne in Hampshire—of which an account will be found in the Transactions of the Royal Scottish Arboricultural Society already cited—of the Duke of Bedford at Woburn, of Mr. Munro Ferguson at Raith and Novar, and in the Forest of Dean the Government has similarly arranged a working-plan. These working-plans, which are a novelty in the country, are worthy of study by those who own woodlands, for they indicate the method which ought to be followed upon every estate where it is desired to grow wood for profit. Hitherto proprietors who may have desired to cultivate their woods on scientific principles may have met with the difficulty of obtaining expert advice; but such a difficulty no longer exists, for there are in

this country now retired forest officers of the Indian service, to whom proprietors may readily go for sound and safe guidance. At the same time we cannot hope that the cultivation of crops of timber in this country will attain the dimensions which it must do if it is to affect to an appreciable extent the market supply of timber until means for the acquisition of knowledge of scientific principles underlying it are available to those to whom woods belong and to those who have the direct management of the woods. Within the last decade several trustworthy text-books upon forestry have appeared, but our only school for instruction in forestry at the present time is that of Cooper's Hill. Cooper's Hill is, however, open only to entrants to the Indian Forest Service, and there is no institution in the country to which any one desiring a thorough acquaintance with the principles of forestry can go. Our Universities are now alive to the claims of agriculture as a subject of study, and agricultural colleges are being formed in different districts. How long will it be before the Universities recognize that forestry also is worthy of attention, or the agricultural colleges take up the subject in their curricula? It is matter of common knowledge that a committee appointed by the Secretary of State for India recently reported in favour of the transference to Cambridge of the forest school from Cooper's Hill. As yet, however, no action has been taken upon the recommendation. The Secretary of State may rest assured that such a transference would be a reform meeting with the hearty approval of men of science, and the presence at Cambridge of such a school would give an opportunity to under-graduates connected with the landed interest to obtain some acquaintance with a subject of intimate concern to them. The influence of this upon the prosperity of the country would ultimately be most beneficial. As has been said above, ignorance is the real cause of our present condition as a wood-growing country, and until systematic instruction is provided in some of our Universities or colleges, there will be no great reformation in forestry practice, although there may be amelioration through the action of intelligent and far-seeing individual proprietors.

NATURE.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

June 4th, 1901.

EAST INDIAN TEAK.—The London market has again been a little brighter, and without any change in quotations there has been a fair general demand. The deliveries for May amount to 1,313 loads, as compared with 750 loads for May last year, and for the past five months to 6,203 loads, against 4,225 loads for that

period in 1900. The Dock stock is now less than it was last year. Floating cargoes continue rather unsaleable.

ROSEWOOD—EAST INDIA—Should not be shipped, as stocks are ample.

SATINWOOD—EAST INDIA—The demand continues very quiet, and sales are not frequent, the stock being quite sufficient.

EBONY—EAST INDIA—Would sell readily and well, if sizeable and sound.

PRICE CURRENT.

Indian Teak,	per load ...	... £10 15*s.* to £16 15*s.*
Rosewood,	„ ton ...	... £5 to £9.
Satinwood,	„ super. foot ...	... 5*d.* „ 12*d.*
Ebony,	„ ton ...	... £9 „ £13.

Denny, Mott and Dickson, Limited.

WOOD MARKET REPORT.

London, 3rd June, 1901.

TEAK—During May the landings in the London Docks consisted of 572 loads of logs and 336 loads of planks and scantlings, or a total of 908 loads, as against 3,971 loads for the corresponding month of last year. The deliveries into consumption were 1,192 loads of logs and 307 loads of planks and scantlings, together 1,499 loads, as against 714 loads in May, 1900.

The Dock stocks at date analyse as follows:—

	8,342	loads of	logs as against	10,707	loads at the same date last year.		
	5,359	„	planks „	3,750	„	„	„
	31	„	blocks „	7	„	„	„
Total	13,732	loads.		14,464	loads „	„	„

The above figures show a very satisfactory continuance of the improved demand for logs which commenced in April, but the consumption of planks and scantlings scarcely justifies the recent volume of import of such conversions. In respect to logs, shippers continue to show their readiness to meet any falling off in the consumption by restricting shipments, rather than submit to any reduction on *f. o. b.* rates. Supplies afloat are therefore unprecedentedly small, and, so long as shippers in India continue to show "the courage of their opinion" by refusing to ship to Europe, excepting on a parity with the rates they obtain from the Indian, Chinese and Japanese consumers, so long should the log market on this side hold good, be the demand for consumption dull or brisk.

During May, consumption has been of a sound, if somewhat restricted character. The producers at the shipping ports continue, however reluctantly, to appreciate that they, like shipowners,

must recognize the falling off in the volume of trade; and they are either restricting their supplies or lowering rates to induce business where it is necessary to market their stocks. Whilst these re-adjustments are taking place business is difficult; but there seems no good reason to doubt that markets can soundly adjust themselves to the new conditions of business so long as finance is kept on a safe basis, which the profits of the recent years of brisk trade should help to facilitate.

Market Rates of Products.

Cardamoms	...	... per lb.	2*s.* 3*d.* to 3*s.* 6*d.*
Croton seeds	...	... „ cwt.	25*s.* to 35*s.*
Cutch	...	... „ „	23*s.* to 35*s.*
Gum Arabic	...	... „ „	23*s.* to 35*s.*
Do. Kino	...	... „ „	1*s.* 6*d.* to 1*s.* 9*d.*
India-rubber, Assam		... „ lb.	2*s.* 2*d.* to 2*s.* 6*d.*
Do. Burma		... „ „	2*s.* to 3*s.*
Myrobalans, Madras		... „ cwt.	6*s.* to 7*s.*
Do. Bombay		... „ „	4*s.* 9*d.* to 9*s.* 6*d.*
Do. Jubbulpore		... „ „	4*s.* 3*d.* to 7*s.*
Do. Bengal		... „ „	4*s.* 6*d.* to 6*s.*
Nux Vomica	...	... „ „	7*s.* to 10*s.*
Oil, Lemon-grass	...	... „ lb.	4½*d.*
Orchella weed	...	... „ cwt.	10*s* to 12*s.* 6*d.*
Sandalwood Logs	...	... „ ton	£20 to £50.
Do. Chips	...	... „ „	£4 to £8.
Sapanwood	...	... „ „	£5 to £5 10*s.*
Seedlac	...	... „ cwt.	50*s.* to 57*s.*
Tamarinds, Calcutta		... „ „	10*s.* to 11*s.*
Do. Madras	...	... „ „	7*s.* 6*d.* to 11*s.*

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Insufficiency of the World's Timber Supply.*

(*Continued from page* 411.)

24.—AFRICA.

The distribution of rainfall divides Africa into four zones parallel to the equator:—

(1) The Atlas and Mediterranean slopes.
(2) The Sahara.
(3) The equatorial zone.
(4) The South African zone.

The Atlas forests have been devastated by twelve centuries of Mussulman occupation. Their timber hardly suffices for the actual population of Northern Africa. Their only real riches consist of several hundred thousand hectares of cork oaks, which furnish an article of very great utility but outside the scope of the present work.

The Sahara has no forests, for the little scattered groups of shrubs found in the depressions cannot be dignified by that name. Trees are only represented by the cultivated palm of the oases. Egypt belongs to the Sahara zone. It owes its fertility to rains that fall near the equator; it has no forests, and in 1897 it imported 12,838,000 francs worth of timber.

In the South African zone (Cape, Orange River Colony, Transvaal, &c.) forests are rare. Being suitable for European colonisation, and possessing great mineral deposits, the consumption of wood already far exceeds the production, although the population is still scanty. Thus, in 1898, the imports of timber into the Cape (see Table XLVI) were worth 8,742,210 francs, while the exports were worth only 167,057 francs. South Africa must thus be included among the regions of insufficient forest production. The total of the three regions

* Translation by F. Gleadow, I.F.S., F.R.M.S., of "L'insuffisance de la production des bois d'œuvre dans le monde," par A. Mélard, Inspecteur des Eaux et Forêts.

just mentioned, where wood is scarce, amounts to two-thirds of all Africa. There remains the equatorial region. The popular imagination clothes this with immense virgin forests able to replace Canada and Sweden in the market. The forests of equatorial Africa are, however, much less rich and extensive than is thought. Approaching the African coast by the Gulf of Guinea, between 10° north latitude and 4° south latitude, there is a wooded zone 70 to 100 kilometres wide, watered by the Atlantic rains. Beyond this are found savannahs, covered for hundreds of kilometres with coarse grass and scrub. Such is the Soudan, the French and the Belgian Congo up to the edge of the great forest that covers the upper basin of the Congo and its tributaries. Equatorial Africa thus consists of two great forest masses, the coast and the centre, divided by a vast area devoid of trees. What are these forests worth? Botanically their worth is great, the number of species being very large. "On a single hectare it is hardly possible to find two or three trees of the same species." Evidently, this botanical value is very contrary to a commercial value, for most of these interesting species have neither size nor utilisable qualities to recommend them. Much of the growth is climbers, very valuable for rubber possibly, but not timber. In consequence of the very mixed nature of the crop the trees that are commercially useful are drowned in the mass, difficult to find, and represent but a small revenue per acre when found. A profitable market requires large quantities of material of the kinds most common in use, delivered at a low price in the consumer's locality. The richest forests in the world commercially, those of Sweden, are botanically very poor. They have only two principal kinds, the Scots pine and the spruce.

It is said that the equatorial forests contain many precious cabinet woods, dye-woods, &c. These are not what the European market wants; the demand for them is very small; the use of dye-woods is probably coming to an end shortly, thanks to the progress made with chemical dyes. Both classes of wood in fact would become unsaleable if landed in our ports on a large scale. What the great European industrial nations want is a light, easily-workable timber, props for mines, and cooperage wood. The former has hitherto been supplied very cheaply by the conifer forests of Europe and North America. The latter can only be had from the oaks grown in temperate climates.

In equatorial forests the great variety of species increases the cost of extraction considerably, because the utilisable trees are scattered, and in order to cut and remove them it is necessary to cut and leave a good deal of useless stuff. A virgin forest is one in which man has never interfered with the natural struggle for existence among the various species and individuals. The struggle is the more intense on account of the heat and moisture.

The forest is therefore full of dead and dying trees, and contains much damaged material which is wasteful in cutting up. Another matter which diminishes the value of equatorial forests is the difficulty of transport. In northern climes the forests in winter are covered with a mantle of hard snow on which the wood is cheaply brought to the river's edge, whence, on the break up of the ice, it is floated to the saw-mills and ports. The equatorial forest is very different. The soil, encumbered with shrubs and climbers, hidden by immense grasses, often swampy or rain-sodden, offers no facilities for transport. Roads have to be cleared at great cost, and are overgrown as soon as their use ceases. The rivers, very variable in their speed and depth, and full of obstacles, are but ill-suited for floating, and many of the tropical species being heavier than water cannot be removed by this means. Lastly, the plateau of Central Africa comes to a precipitous edge facing the sea, so that on these steep slopes and cliffs the river navigation is interrupted. To avoid these interruptions the Congo railway was built. Its cost was high. Consequently the rates charged are such as only passengers and valuable goods can afford to pay.

Hence it seems that the virgin forests of Africa are not to be depended on as a resource against the increasing deficiency in Europe.

25.—Central and South America.

Mexico is within the tropics, but thanks to its general elevation between 1,000 and 2,000 metres, it has only a semi-tropical climate. Its forests can provide no common timbers for export, since the supply is insufficient for local wants. In the fiscal year 1896-1897, the imports were worth 2,213,000 francs, and the exports only 22,000 francs.

Little need be said about equatorial America, and in particular the Amazon forests, for the same conditions are found there as in tropical Africa. The Amazon is indeed in its lower reaches more navigable than the Congo, but in both continents the forests consist of the same tangled mixture of species, and consequently present the same poverty of material suitable for the European market. There are the same difficulties of working and the same obstacles to transport.

A great part of the Argentine Republic is composed of vast grassy plains called pampas. The forests are to be found to the west and north-west, on the Andean slopes, or in the north, where the climate produces forests of equatorial nature. Although the population is only 4½ millions, Argentina consumes already a considerable quantity of foreign timber (see Table XLVII). In 1898 its imports were worth 26,552,230 francs. Inclusive of billets of quebracho wood, the exports were worth 9,992,120 francs, but quebracho is sent to Europe to make tannin extract, and not as a timber. Excluding quebracho, the exports were only worth 579,100 francs.

Far from being a future source of supply, the Argentine Republic, with its increasing population, will be a further drain on the existing resources of North America.

26.—Australia.

The great Australian continent, with an area of 2,946,691 square miles (763 million hectares), is credited with 78,984,000 acres (or 32 million hectares) of forest, or about 4 per cent. This very small proportion is easily explained. The interior of Australia, with a rainfall less than 20 centimetres (8 inches) is unfit for tree growth, and produces nothing but scrub and grass.

Is there any chance that these very insufficient forests will be properly cared for? Unfortunately the negative may be foretold with certainty in a country which lives by sheep, and in 1896 possessed 89,745,000 of them.* There is no possible *modus vivendi* between sheep and forests. In pastoral countries the forests universally disappear. Rules and prohibitions are useless. They can only be enforced in moist years when outside grazing is good. The sheep then multiply, because food is plenty. When the dry year comes the forest is sacrificed. The public interest is asserted to require that the breeders must be saved from ruin at all costs. The forests are opened, the hungry animals fall on the youngest and tenderest regeneration and annihilate it. The forest never recovers, but presents many pretty and open glades, which soon become ugly blanks. The next stage is that of a park-like pasture with a few trees in groups or singly. The end is now at hand. The trees are killed by the trampling of the soil under them, or by the lopping, barking, and bruising they suffer, and the park is succeeded by the bare plain or the naked hillside cut up by ravines. Sometimes the ruin is completed at once; for the shepherds are fond of extending their boundaries or "improving the grass" by burning the forest. (*The above might have been written of India with absolute truth. The "road to ruin" passes before the eye as in a cinematograph.*—Transl.)

Such is the history of millions of hectares of old forests in the countries round the Mediterranean. Such will be the history of Australia. The celebrated English writer Froude, who visited Australia about fifteen years ago, deplored the destruction of forests in a remarkably energetic passage:—

"We again plunge into the woods; the ravines become "wilder and wilder, the eucalyptus trees taller and taller; the "trunks run up straight and bare for 200 feet, 'like the masts of "some great Admiral,' before giving rise to the smallest branch. "Trees so matchless ought to be preserved, but the soil which "bears them is valuable, and they are doomed to destruction.

* A statistical account of the seven Colonies of Australasia, 1897-98, by T. A. Coghlan, Government Statistician of New South Wales.

"Government makes laws, but in a democracy the people do "just as they please. Greed and practice are master, the laws "are only paper. A cut is made at a yard above ground, the "bark is ripped off, the circulation of sap stops, the tree dies, the "leaves wither ; the branches remain for a few years naked and "phantasmal, then they break off and fall. Sometimes the "forest is burned outright; hundreds of trunks may be seen "burnt and blackened on one side, but only half-dead on the "other. The eucalyptus grows fast, and can be replaced when "the disappearance of trees begins, as it will begin, to affect the "climate. But the hardwoods and the acacias, small though "they be beside the giants, yet attain considerable dimensions "and require a century to mature. Wood is worth money, and "on all sides there is cutting and carrying. The demon of "destruction is in the air." *

The destruction is nevertheless insufficient to satisfy the needs of Australia. In 1896 the three colonies of New South Wales, Victoria, and South Australia had to import 20 million francs worth of wood. New Zealand, with its mild and moist climate, and its great mountain chains, possessed magnificent forests of conifers that would bear comparsion with those of the northern hemisphere. They are being cut as fast as it can be done. The timber goes to Australia, to New Caledonia, and even to England. The 20 million sheep of the colony are acquiring daily extended grazing grounds. On the other hand, the mountain streams are in the straight way to become eroding torrents.

27.—Conclusion.

This long review of the forest resources of our globe leaves a feeling of sadness almost amounting to anguish. It is sad to think of so much wealth gone for ever, dissipated by the carelessness and greed of men, when care and due protection would have preserved and improved it. These riches have profited little to those who have squandered them. Forest destruction, however profitable to contractors, dealers, and carriers, seldom leaves much profit to the landowner. The price of wood sold in distant markets consists of 90 or 95 per cent. for costs of felling, transport, wages, &c., and 10 per cent. or only 5 per cent. or less, for the owner.

There is cause for serious anxiety in the fact that 215 millions of people, the most advanced and powerful nations of Europe in commerce and industry, cannot find timber to meet their needs within their territories. Outside Europe, ancient empires like China, equally with young and unlicked cubs like South Africa, Argentina, Australia, &c., have alike to face a serious and growing deficit of wood-production.

* "Oceana, or England and her Colonies," by J. A. Froude. Tauchnitz edition, page 134, re-translated from the French.

There are but seven countries at present able to supply large quantities of timber. Five are in Europe, *viz.*, Austria-Hungary, Sweden, Norway, Finland and Russia. Two are in North America, *viz.*, Canada and the United States.

It has been shown that the available surplus of Austria-Hungary, of Russia, and of the United States, is seriously threatened by increase of population and by industrial development; and that of Norway by the abuse of the axe. There remain only three sources of supply in which confidence can be placed for yet a little time. These are Sweden, Finland, and Canada.

They are absolutely and hopelessly insufficient.

If Sweden, Finland and Canada were to attempt to supply all the countries which reach out their hands for timber, their normal production, and their forests too, would be disposed of completely in a very short time, revenue and capital alike.

A timber famine is thus within sight.

The rise in forest produce, especially high class produce, which must be expected, will only serve to hasten the evil day. Wood-production, in which *time* is the principal factor, indeed, obeys economic laws other than those which govern industrial or agricultural production. As a general rule, any increase of price paid by the consumer has the effect of stimulating production. But in the case of wood-produce, an increase of price incites thoughtless owners to realise the capital slowly accumulated by preceding generations. Hence an increased demand means increased destruction of capital and consequent diminution of permanent revenue (or legitimate output) in timber.

The situation is therefore full of peril, and the need of instructing public opinion is urgent.

Wherever it is not too late the destruction of forest must be stopped, either by legislation firmly and strictly applied, or by persuading landowners that their true interest lies in safeguarding their capital or timber-producing (revenue-producing) stock, and in cutting no more than the annual production of the soil, which is the revenue or (timber) interest on the (timber) capital. The pleasant and evil fiction, that a new country should be "developed" by destroying its forests, must be reproved. The production of timber should be the aim of every cultural operation and working-plan whenever possible. Formerly it was held that private owners could not undertake the production of timber, because of the low rate of interest returned by a capital invested in high forest. Now that the customary interest on stable securities has got below 3 per cent., and is likely to go still lower, the conditions are changed. It seems probable that a private owner can now keep standards over coppice at a profit at least equal to what he would get from other securities. He can also in his fir woods grow sawyer's

timber returning him 2 or 3 per cent. on the capital involved, without reckoning anything for the very certain rise that must take place in the price of timber. These ideas are not generally received, and should be as widely spread abroad as possible.

The increase in the value of timber will also doubtless contribute to diminish waste and induce care in the disposal of the material, so that nothing is used as firewood that can possibly be utilised as timber.

Forest property should also not be burdened with taxes inflicted on the pretext that forest-owners are rich, for such an idea is inaccurate. There are in France forests taxed up to 25 per cent. and 20 per cent. of the gross revenue, and yet, notwithstanding this heavy contribution towards public expenses, these properties receive no kind of public protection and the owners are obliged to pay private guards. This undue taxation of forest property seems to be the custom in other countries also, for Gifford Pinchot attributes to this cause the rapid destruction of certain forests in the United States. "These taxes are very heavy, for in many cases they annually amount to 5 per cent. or 6 per cent. of the sale value of the forest, so that owners are unable to both pay the taxes and keep the forests. Consequently they are driven to cut or sell their forests as soon as may be, without care for the future. When the wood has been removed, the owners refuse to pay any more taxes, and the ruined lands are resumed by the State.* Many thousand square miles of forest have been devastated by unbridled fellings, because the heavy taxes obliged the owners to make a clear sweep of their woods instead of managing them so as to maintain a perpetual income." ("Primer of Foresty" by Gifford Pinchot.)

There is not a country in Western or Southern Europe which has not thousands, or perhaps millions of hectares of waste land, or land whose agricultural possibilities have come to an end. All these lands should be afforested.

The State ought to be very liberal indeed to forest-owners, by exempting them from taxation, by free distribution of seeds and seedlings, and by offering them gratuitously the advice of its technical officers.

It should not hesitate to acquire parts of such lands.† Purchases of hilly tracts where torrents exist are certainly very useful, and should be persisted in because they fulfil an

* Compare the cases of Oudh and elsewhere, where Government granted large areas of excellent forest to individuals on condition of their bringing it under cultivation. These astute gentry at once cleared the land bare of forest, put the proceeds into their pockets, and sat smiling contentment, till it pleased Government to pass orders that, as the experiment had failed, the land might be resumed.—(*Translator.*)

† Compare the action of the Bombay Government in disforesting by indirect means vast areas just where forest is most needed by the people.—(*Translator.*)

important public object. But such purchases are rather works of defence against the forces of nature than investments in timber forests. Occasionally, no doubt, rich forests may be found on the borders of a torrent or on precipitous country, but their proper and natural place is in the plains, on the plateaux, or on mountains of moderate character. It is there that oak or fir forests should be maintained. Formerly the idea was to clear the plains and plant the mountains. It was a mistake. Forests are no less needed in the plains than in the hills. The plains furnish timber that cannot be obtained from the hills, and all plains are not good for agriculture.

There is not a moment to be lost. Forest produce cannot be procured at a moment's notice like a loan of cash. It requires a century or a century and a-half to produce sawyer's timber, and the famine will begin ere fifty years are past.

APPENDICES.

The following tables are derived from official documents published by the States concerned.

To facilitate comparisons, all the various foreign units of quantity and value have been reduced to the metric system in these tables.

EQUIVALENCE OF UNITS.

Quintal	= metric cwt. = 100 kilog. = 1·968 cwt.
Tonne	= metric ton = 1,000 kilog. = ·984 ton.
Ton	= 1·016 metric tons.
Cwt.	= ·508 quintal = 50·80 kilog.
Kilogramme	= 2·20 lbs. av.
lb. av.	= ·4536 kilog.
Metre	= 39·37 inches.
Sq. metre	= 10·764 sq. ft. = 1·196 sq. yd.
Cub. metre	= 35·3148 cub. ft. = 1·308 cub. yd.
Cub. centimetre	= ·061 cub. inch.
Inch	= 25·4 millimetres = 2·54 centimetres.
Foot	= ·3048 metre.
Yard	= ·9144 metre.
Sq. inch	= 6·45 sq. centimetres.
Sq. foot.	= ·0929 sq. metre.
Sq. yard	= ·836 sq. metre.
Cub. inch	= 16·387 cub. centimetre.
Cub. foot	= ·028317 cub. metre.
Cub. yard	= ·764 cub metre.
Sq. mile	= 259 hectares.
Hectare	= 100 ares = 2·47 acres.
Are	= 3·954 poles.
Shilling	= 1·25 francs.
Franc	= 10 pence nearly.
Florin	= 100 kreutzer = 1 gulden = 2 shillings.
£ sterling	= 25 francs = 20 marks.
Mark	= 1 shilling.
Rouble	= about two shillings.
Krona	= 13 pence.
Load	= 40 cub. ft. hewn, or 50 cub. ft. unhewn.

TABLE

GREAT

Imports of Common Trade

Kind of Produce.		QUANTITIES AND VALUES			
		1894.		1895.	
		Loads.	£ Sterling.	Loads.	£ Sterling.
Hewn	Fir ...	2,122,975	2,845,690	2,008,206	2,726,302
	Oak ...	110,716	667,383	108,508	630,799
	Teak ...	44,333	465,709	59,466	574,882
	Unenumerated	60,038	208,981	84,581	249,453
Sawn	Fir ...	5,314,788	11,537,617	4,926,426	10,105,483
	Unenumerated	131,699	361,916	135,560	390,433
Staves of all sizes (cooper's wood).		132,145	541,797	144,751	594,615
Totals ...		7,916,694	16,629,093	7,467,498	15,471,967

		QUANTITIES AND VALUES			
		1894.		1895.	
		Cubic metres.	Francs.	Cubic metres.	Francs.
Hewn	Fir ...	3,004,010	71,768,302	2,841,611	68,757,336
	Oak ...	156,663	16,831,399	153,539	15,908,751
	Teak ...	62,731	11,745,181	84,144	14,498,524
	Various ...	84,954	5,270,501	119,682	6,291,205
Sawn	Fir ...	7,520,425	2,90,978,701	6,970,893	259,904,281
	Various ...	186,354	9,127,522	191,817	9,846,720
Staves of all sizes ...		186,985	13,664,120	204,823	14,996,190
Totals ...		11,202,122	419,385,726	10,566,509	390,203,007

No. 1.

BRITAIN.

Woods from 1894 *to* 1898.

IN ENGLISH UNITS.

1896.		1897.		1898.	
Loads.	£ Sterling.	Loads.	£ Sterling.	Loads.	£ Sterling.
2,135,080	3,026,595	2,485,716	3,584,949	2,024,268	2,978,329
145,358	862,011	177,501	1,020,771	167,314	947,589
66,367	705,224	74,474	867,083	58,917	693,629
85,985	295,544	87,974	307,836	81,256	271,092
5,877,449	12,926,526	6,843,368	16,115,306	6,204,787	14,572,461
154,043	454,054	181,124	524,625	158,570	483,479
138,393	656,246	126,745	569,572	139,120	646,075
8,602,675	18 926,200	9,976,902	22,990,142	8,834,232	20,592,754

IN METRIC UNITS.

1896.		1897.		1898.	
Cubic metres.	Francs.	Cubic metres.	Francs.	Cubic metres	Francs.
3,021,138	76 330,726	3,517,288	90,412,414	2,864,339	75,113,457
205,682	21,739,917	251,164	25 743,845	236,749	23,898,195
93,909	17,785,749	105 381	21,867,833	83,368	17,493,323
121,669	7,453,620	124,483	7,763,624	114,977	6,836,940
8,316,590	326,006,986	9,683,366	406,428,017	8,779,773	367,519,988
217,971	11,451,242	256,290	13,231,042	224,377	12,193,340
195,826	16,550,524	179,344	14,364,606	196,855	16,294,012
12,172,785	477,318,764	14,117,316	579,811,381	12,500,438	51,934,255

TABLE

GREAT

Exports of Common Trade

	QUANTITIES AND VALUES			
	1894.		1895.	
	Loads	£ Sterling.	Loads.	£ Sterling.
				(a)—*Home*
Rough, hewn, sawn, or split.	1,296	11,488	597	3,993
				(b)—*Foreign or*
Hewn (roughly or squared). Fir ...	1,354	7,240	1,990	8,141
Hewn (roughly or squared). Oak ...	1,191	6,784	1,391	7,705
Hewn (roughly or squared). Teak ...	4,851	55,275	4,744	50,685
Hewn (roughly or squared). Various ...	602	4,169	636	3,349
Sawn Fir ...	17,802	62,068	9,365	60,688
Sawn Various ...	888	6,610	750	4,269
Staves of all sorts ...	5,622	45,548	6,149	47,409
Total ...	32,310	187,694	35,025	182,246
Total Exports ...	33,606	199,182	35,622	186,239

	QUANTITIES AND VALUES			
	1894.		1895.	
	Cubic metres.	Francs.	Cubic metres.	Francs.
				(a)—*Home*
All kinds	1,834	289,727	845	100,703
				(b)—*Foreign or*
	45,718	4,733,643	49,560	4,596,244
Total Exports ...	47,552	5,023,370	50,405	4,696,947

No. II.

BRITAIN.

Woods from 1894 *to* 1898.

IN ENGLISH UNITS.

1896.		1897.		1898.	
Loads.	£ Sterling.	Loads.	£ Sterling.	Loads.	£ Sterling.
Produce.					
763	5,911	1,299	8,568	745	6,642
Colonial Produce.					
1,458	5,747	1,539	8,048	2,630	12,690
713	4,560	914	5,092	576	3,637
6,573	76,138	7,683	93,502	5,088	60,721
284	1,794	372	1,760	392	2,281
32,787	115,523	22,919	84,675	24,523	86,209
835	5,256	1,186	8,052	1,269	8,082
4,538	35,714	5,166	41,536	7,582	67,768
47,188	245,032	39,779	242,665	42,060	241,388
47,951	250,943	41,078	251,233	42,805	248,030

IN METRIC UNITS.

1896.		1897.		1898.	
Cubic metres.	Francs.	Cubic metres.	Francs.	Cubic metres.	Francs.
Produce.					
1,080	149,075	1,838	216,085	1,054	167,511
Colonial Produce.					
66,771	6,179,707	56,237	6,120,011	59,515	6,087,805
67,851	6,328,782	58,125	6,336,096	60,569	6,255,316

TABLE No. III.

GREAT BRITAIN.

Value of the Imports of Common Woods from 1884 *to* 1898.

Year.	*Value in thousands of £ sterling.*				Total value in thousands of francs.	Quinquennial averages in thousands of francs.
	Hewn wood.	Sawn wood.	Staves.	Total values.		
	£	£	£	£	Francs.	
1884 ...	4,673	9,236	555	14,464	364,782	
1885 ...	4,637	9,598	539	14,774	372,600	
1886 ...	3,422	8,205	532	12,159	306,650	340,077
1887 ...	3,250	7,894	565	11,709	295,301	
1888 ...	4,059	9,667	590	14,316	361,050	
1889 ...	5,637	13,144	694	19,475	491,160	
1890 ...	5,005	11,093	669	16,767	422,864	
1891 ...	4,501	9,385	589	14,475	365,060	414,602
1892 ...	4,886	11,172	594	16,652	419,963	
1893 ...	4,049	10,266	513	14,828	373,962	
1894 ...	4,188	11,899	542	16,629	419,385	
1895 ...	4,181	10,696	595	15,472	390,203	
1896 ...	4,889	13,381	656	18,926	477,318	477,213
1897 ...	5,780	16,640	570	22,990	579,811	
1898 ...	4,891	15,056	646	20,593	519,349	

TABLE No. IV.

BELGIUM.

Trade Woods for 1898.

Class of material.	IMPORTS.		EXPORTS.	
	Cub. metres.	Francs.	Cub. metres.	Francs.
(a)—*Timber.*				
Oak and Walnut — Rough or unsawn ...	20,365	2,443,800	2,409	289,080
Oak and Walnut — Split	3,648	583,680	853	136,480
Oak and Walnut — Sawn	100,436	18,580,660	3,710	686,350
Other kinds — Rough or unsawn ...	150,371	7,819,292	2,440	126,880
Other kinds — Sawn — Beams ...	8,813	458,276	22	1,144
Other kinds — Sawn — Others ...	752,909	60,985,629	6,951	563,031
Other kinds — Planed	10,819	930,434	103	8,858
(b)—*Unclassed.*				
Rough or unsawn pieces, girthing less than 75 centimetres at the thick end.	444,780	12,453,840	11,845	331,660
Total ...	1,492,141	104,255,611	28,333	2,143,483

TABLE NO. V.

BELGIUM.

Imports and Exports of Timber (exclusively) from 1860 to 1898

Year.	Imports.		Exports.	
	Cub.metres.	Francs.	Cub. metres.	Francs.
1860	172,993	16,080,000	15,561	1,540,000
1870	292,252	18,771,000	36 088	2,619,000
1880	512,673	51,517,000	28,297	2,743,000
1890	645,151	62,273,000	33,733	3,400,000
1894	778,926	68,594,000	18,124	1,665 000
1895	752,822	66,412,000	19,719	1,788,000
1896	907,303	78,677,000	18,563	1,777,000
1897	1,022,881	89,898,000	16,592	1,705,000
1898	1,047,361	91,802,000	16,488	1,812,000

TABLE NO VI.

NETHERLANDS.

Imports and Exports of Common Woods in 1898.

Class of Material.	Value in florins.	Value in francs.
(*a*)—IMPORTS.		
Wood for shipbuilding and carpentry. Not sawn ...	17,040,386	
Wood for shipbuilding and carpentry. Sawn ...	30,506,342	
Firewood	185,033	
Wood for hoops	810	
Hoops for casks	6,473	
Staves rough for casks...	1,842,819	
Totals ...	49,581,863	104,121,913
(*b*)—EXPORTS.		
Wood for shipbuilding and carpentry. Not sawn ...	7,568,249	
Wood for shipbuilding and carpentry. Sawn ...	29,145,756	
Firewood	293,760	
Wood for hoops	12,435	
Hoops for casks	1,623,435	
Staves, rough	2,297,649	
Totals ...	40,941,284	85,976,696
Excess Imports ...	8 ,640,579	18,145,216

TABLE NO. VII.

SWITZERLAND.

Imports and Exports of Common Woods in 1888.

Class of Material.	Imports.		Exports.	
	Quintals (metric cwt.).	Francs.	Quintals (metric cwt.).	Francs.
(a) – *Firewood.*				
Softwoods	527,489	1,054,878	115,539	184,507
Hardwoods	793,102	1,744,824	218,449	488,200
Total Firewood ...	1,320,591	2,799,702	333,988	672,509
(b) – *Charcoal.*				
Charcoal	82,305	740,745	42,068	384,132
(c) – *Timber.*				
Common building timber, round or rough hewn ...	251,256	1,017,024	357,428	1,305,722
Vine props	11,864	100,844	3,715	19,593
Common timber sawn. Softwood planks ...	292,880	2,196,600	307,979	1,842,408
Common timber sawn. Hardwood planks, laths, cooper's wood in the round sawn to length and partly split.	172,749	1,630,025	109,454	638,080
Shingles, roofing ...	6,760	87,880	187	3,903
Total Timber ...	738,509	5,032,373	778,763	3,859,706
GRAND TOTAL ...	2,141,405	8,572,820	1,154,819	4,916,347

TABLE NO. VIII.

SWITZERLAND.

Imports and Exports of Common Woods in 1898.

Class of Material.	Imports.		Exports.	
	Quintals (metric cwt.)	Francs.	Quintals (metric cwt.)	Francs.
(a)—*Firewood.*				
Firewood ... Broad leaved ...	767,299	1,715,583	221,769	439,815
Firewood ... Coniferous ...	631,885	1,380,923	50,832	106,224
Total Firewood ...	1,399,184	3,096,506	272,601	546,039
(b)—*Charcoal.*				
Charcoal	92,716	795,304	18,244	147,539
(c)—*Timber.*				
Timber ... Broad-leaved ...	133,787	941,265	34,223	214,798
Timber ... Coniferous ...	368,546	1,879,585	210,209	772,867
Vine props	11,620	99,931	3,341	18,372
Cooperage, rough	39,570	853,760	93	1,390
Other oak, sawn, &c. ...	211,864	3,811,570	4,968	44,423
Planks, &c. Broad-leaved ...	80,591	811,264	15,312	136,920
Planks, &c. Coniferous ...	848,908	7,658,905	60,749	565,346
Beams, sleepers, &c., not of oak	62,196	485,129	3,646	32,366
Total Timber ...	1,757,082	16,541,409	332,541	1,786,482
GRAND TOTAL ..	3,248,982	20,433,219	623,386	2,480,060

TABLE NO. IX.

GERMANY.

Imports and Exports of Common Woods in 1888.

Class of Material.	Imports.		Exports.	
	Quintals (100 kilogrammes).	Marks (= shillings).	Quintals (100 kilogrammes).	Marks (= shillings).
(a)—*Timber.*				
Building and carpenter's timber in the round, undressed.	18,156,920	49,932,000	2,752,879	10,323,000
Building and carpenter's timber dressed lengthways,	5,509,222	44,074,000	2,964,193	29,642,000
Sawn timber	7,013,623	34,577,000	2,530,766	17,462,000
Staves, cask { Oak ...	838,121	8,381,000	486,784	5,839,000
Staves, cask { Other ...	54,777	219,000	27,817	139,000
Timber carted direct from forests to dwellers in frontier zone.	831,700	2,287,000	...	...
Total Timber ...	32,404,363	139,470,000	8,762,439	63,405,000
Value in francs	...	172,176,000	...	78,273,000
(b)—*Charcoal.*				
Charcoal	41,192	206,000	225,096	1,351,000
Value in francs	...	254,000	...	1,668,000
(c)—*Firewood.*				
Firewood	1,464,903	2,930,000	1,712,482	3,425,000
Value in francs	...	3,617,000	...	4,228,000
GRAND TOTAL ...	33,910,458	142,606,000	10,700,017	68,181,000
Value in francs	...	176,047,000	...	84,169,000

TABLE No. X.

GERMANY.

Imports and Exports of Common Woods in 1898.

Class of Material.	Imports.		Exports.	
	Metric cwt	Marks.	Metric cwt.	Marks.
	(a)—*Timber.*			
Building and carpenter's timber in the round, undressed.	25,856,080	115,496,000	1,900,104	9,501,000
Building and carpenter's timber dressed lengthwise.	6,678,417	70,123,000	105,400	1,318,000
Sawn timber ...	13,986,059	104,895,000	1,280,506	10,500,000
Cask staves { Oak ...	736,547	9,280,000	32,733	491,000
Cask staves { Other ...	92,836	418,000	23,005	127,000
Total Timber ...	47,349,948	310,212,000	3,341,748	21,937,000
Value in francs ...	...	370,312,000	...	27,081,000
	(b)—*Charcoal.*			
Charcoal	103,256	620,000	95,073	666,000
Value in francs ...	...	765,000	...	822,000
	(c)—*Firewood.*			
Firewood	1,871,093	4,210,000	1,203,581	2,708,000
Value in francs ...	...	5,197,000	...	3,343,000
GRAND TOTAL ...	49,324,297	305,042,000	4,640,402	25,311,000
Value in francs ...	...	376,574,000	...	31,246,000

TABLE No. XI.

DENMARK.

Imports and Exports of Common Woods in 1898.

Class of Material.	Imports. Francs.	Exports. Francs.
(a)—*Timber.*		
Oak	906,011	18,965
Broad-leaved species	55 166	...
Pine, fir, &c.	29,263,085	35 553
Pieces for buildings and boats	861,056	3,429
Totals ...	31,085,318	57 947
Excess Imports ...	31 027,371	
(b)—*Firewood.*		
Firewood	1,450,157	5,025
Excess Imports ...	1,445,132	
GRAND TOTAL ...	32,535,475	62,972
GRAND EXCESS IMPORTS ...	32,472,503	

TABLE

FRA

Imports of Common

Class of Material.	1894.		1895.	
	Metric tons.	Francs.	Metric tons.	Francs.
				(a)—*Tim*
Oak ... In the rough ...	2,744	205,800	1,665	124,875
Oak ... Sleepers ...	314	21 980	32	2,240
Oak ... Squared or sawn, thicker than 8 centimetres.	10,933	1,093,300	9,075	907,500
Oak ... Squared or sawn, less than 8 cm.	44,633	7,061,775	39,742	6,403,915
Oak ... Cooperage ...	181,587	36,317,462	114,780	22,955,936
Walnut	1,648	311,420	1,792	276,360
Various Rough or round, poles, posts, &c.	95,921	4,016,644	101,188	3,963,593
Various Sleepers ...	7	385	...	...
Various Squared or sawn, thicker than 8 centimetres.	117,485	8,223,950	108,033	7,562,310
Various Squared or sawn, less than 8 cm.	959,223	80,511,580	938,549	78,869,740
Various Cooperage ...	952	104,703	1.430	157,278
Paving blocks ...	...	...	...	5
Small split or sawn stuff (band-boxes, &c.).	4,915	1,228,789	4,260	1,064,918
Conifer billets for cellulose	120,971	2,298,449	119,729	2,274,851
Wood-wool or shavings ...	2,923	438,520	2,109	316,345
Miscellaneous... ...	497	74,606	520	78,018
Total Timber ...	1,544,753	141,909,363	1,442,904	124,957,884
				(b)—*Fire*
Billets and faggots ...	35,842	645,156	32,540	585,720
				(c)—*Char*
Charcoal	5,891	515,463	6,264	548,100
GRAND TOTAL ...	1,586,486	143,069,982	1 481,708	126,091,704

No. XII

NCE.

Woods from 1894 *to* 1898.

1896.		1897.		1898.	
Metric tons.	Francs.	Metric tons.	Francs.	Metric tons.	Francs.
ber.					
1,389	104,175	2,087	156,525	2.355	200,175
17	1,190	61	4,270	578	46,240
8,368	8.6,800	9,081	903,100	8,065	887,150
35,820	5,833,345	40,203	6,542,480	43,014	7,120,175
134,814	26,962,760	122,133	21,984,004	115,235	20,742,263
2,523	378,230	2,229	311,270	2,470	406,080
121,910	5,008,089	113,478	5,190,212	130,777	5,673,254
31	1,798	2,444	146,640	...	...
117,961	8,729,114	118,887	9,273,186	122,8-9	9,585,342
1,041,026	92,502,700	1,086,852	99,671,686	1,019,767	93,559,406
2,506	275,636	1,989	218,826	1,560	171,589
18	1,071	8	458	14	864
4,516	1,128,998	4,747	1,186,696	4,877	1,219,252
124,173	2,359,287	129,161	2,454,116	131,663	2,501,597
2,074	311,083	2,810	421,453	1,654	248,080
776	116,334	464	69,562	546	81,876
1,597,922	144,550,610	1,636,637	148,539,484	1,585,464	142,443,853
wood.					
31,944	574,992	34,166	614,988	30,064	541,152
coal.					
6,435	563,063	6,342	554,925	5,527	483,613
1,636,301	145,688,665	1,677,145	149,709,397	1,621,055	143,468,118

TABLE

FRA

Exports of Common

Class of Material.		1894.		1895.	
		Metric tons.	Francs.	Metric tons.	Francs.
					(a)—
Oak ...	Round or rough ...	9,913	793 040	7,027	562,160
	Sleepers ...	25,141	1,885,575	13,168	937,600
	Squared or sawn, thicker than 8 centimetres.	6,187	619,635	2,707	284,235
	Squared or sawn, less than 8 cm.	2,617	397,315	2,919	462,525
	Cooperage ...	3,292	691,340	3,069	644,573
Walnut		3,857	600,800	2,457	466,200
Various	Round or rough, poles, posts, &c.	771,946	30,922,510	738,070	29,573,874
	Sleepers ...	35,392	2,123,520	18,916	1,134,960
	Squared or sawn, thicker than 8 cm.	7,512	563,400	10,945	820,875
	Squared or sawn, less than 8 cm.	41,603	3,873,695	42,923	3,999,975
	Cooperage ...	937	103,097	978	107,609
Paving blocks		10	578	347	20,816
Small split or sawn stuff (band-boxes &c).		10,117	2,529,154	9,622	2,405,544
Conifer billets for cellulose		186	2,790	7	105
Wood-wool or shavings ...		61	9,108	64	9,669
Miscellaneous		390	58,455	442	66,308
Total Timber ...		919,161	45,204,012	853,661	41,547,023
					(b)—
Billets and faggots ...		59,873	957,968	49,909	798,544
					(c)—
Charcoal		11,586	903,708	6,258	488,124
GRAND TOTAL ...		990,620	47,065,683	909,828	42,833,696

No. XIII.

N C E .

Woods from 1894 *to* 1898.

1896.		1897.		1898.	
Metric tons.	Francs.	Metric tons.	Francs.	Metric tons.	Francs.
Timber.					
9,792	783,360	10,069	755,175	7,302	547,650
11,869	890.175	20,348	1,526,100	15,069	1,130,175
4,826	506,730	4,353	457,(65	2,250	236,250
3,238	5 7,765	4,355	690,625	4,843	774,755
3 597	755,423	4,039	767,319	3 815	724,917
3.221	778,400	2,327	708,800	3,12)	1,096,800
754,161	31,438,682	790,173	32,367,687	628,698	20,251,028
29,944	1,586,472	22,791	1,481,415	14,014	910,910
6,119	477,282	9,192	753,744	5,711	468,302
35,669	3,504,680	41 151	4,168,233	27,980	2,826,300
725	79,713	595	65,499	1,039	114,272
444	26,630	368	22,103	174	10,467
10,373	2,593,169	10,774	2.693,48)	9,393	2,348,219
575	8,625	179	2,685	...	...
23	3 483	17	2,556	62	9,240
353	52,928	234	35,107	464	69,646
874,959	44,343,517	920,965	46,497 593	723,934	31,518,931
Firewood.					
49,964	799,424	45,627	730,032	49,520	792,320
Charcoal.					
14,594	1,138,332	5,897	459,966	5,094	397,332
939,487	46,281,273	972,489	47,687,591	778,548	32,708,583

TABLE

FRA

Gross Volume standing timber corresponding

Class of Material.	Average Imports from 1894 to 1898.		
	Metric tons.	Volume in cubic metres.	Standing volume corresponding to the Imported volume, in cubic metres.
			(a)—
Oak ... Rough or round ...	2,048	2,560	2,560
Oak ... Sleepers ...	200	250	280
Oak ... Squared or sawn, larger than 8 cm.	9,105	11,380	18,970
Oak ... Squared or sawn, less than 8 cm.	40,682	50,850	101,700
Oak ... Cooperage ...	133,710	167,140	334,280
Walnut	2 132	3,810	5,860
Various Round or rough, poles and posts.	112,655	187,760	187,760
Various Sleepers ...	496	900	1,000
Various Squared or sawn, larger than 8 cm.	117,051	212.820	304,030
Various Squared or sawn, less than 8 cm.	1,009,083	1,834,700	2,621,000
Various Cooperage ...	1,688	3,070	6,140
Paving blocks	8	10	20
Small split or sawn stuff (band-boxes, &c.).	4,663	7.170	10,240
Conifer billets for cellulose ...	125.140	227.530	227,530
Wood-wool or shavings ...	2,314	4.210	6,010
Miscellaneous	561	1,020	1,460
Total Timber ...	1,561,536	2,715,180	3,828,840
			(b)—
Billets and faggots ...	32,911	50,630	50,630
			(c)—
Charcoal	6,092	...	46,860

No. XIV.

N C E .

to the average figures from 1894 *to* 1898.

Average Exports from 1894 to 1898.			Gross Volume standing timber corresponding to	
Metric tons.	Volume in cubic metres.	Standing volume corresponding to the exported volume, in cubic metres.	Excess of Imports.	Excess of Exports.
Timber.				
8,821	11,030	11,030	...	8,470
17,119	21,400	23,780	...	23,500
4,065	5,080	8,470	10,500	...
3,594	4,490	8,980	92,720	...
3,562	4,450	8,900	325,380	...
2,997	5,350	8,230	...	2,370
736,610	1,227,680	1,227,680	...	1,039,920
24,211	44,020	48,910	...	47,910
7,896	14,360	20,510	283,520	...
37,865	68,850	98,360	2,522,640	...
855	1,550	3,100	3,040	...
269	490	700	...	680
10,056	15,470	22,100	...	11,860
189	340	340	227,190	...
45	80	110	5,900	...
376	680	970	490	...
			3,471,380	1,134,710
858,530	1,425,320	1,492,170	2,336,670	
Firewood.				
50,979	78,430	78,430	...	27,800
Charcoal.				
8,685	...	66,810	...	19,950

TABLE No. XV.

SPAIN.

Imports and Exports of Common Woods in 1888.

Class of Material.	Units.	Amount.	Value in francs.
IMPORTS.		Rs.	Francs.
I.—Timber—			
Cask staves ...	each	12,313,000	11,697,350
Planks, beams, scantlings, logs and ship's timbers.	cub. metre	346,467	17,323,350
Total Timber ...	...	...	29,020,700
II.—Charcoal, &c.	kilogramme	40,531,000	3,972,038
Total Imports ...	...	...	32,992,738
EXPORTS.			
I.—Unworked timber of all kinds.	kilogramme.	19,178 045	1,534,423
II.—Charcoal ...	,,	4,099,169	307,438
III.—Firewood ...	,,	1,487,377	59,375
Total Exports ...	...	...	1,901,236

TABLE No. XVI.

SPAIN.

Imports and Exports of Common Woods in 1898.

Class of Material.	Units.	Amount.	Value in francs.
IMPORTS.		Rs.	Francs.
I.—Timber.—			
Cask staves, oak ...	each	12,428,000	11,806,600
Do. chestnut ...	,,	712,000	178,000
Planks, beams, scantlings, logs and ship's timber.	cub. metre	282,246	18,345,990
Total Timber ...	...	...	30,330,590
II.—Charcoal, &c. ...	kilogramme	35,135,000	3,162,150
Total Imports ...	...	...	33,492,740
EXPORTS.			
I.—Unworked timber of all kinds.	kilogramme	20,263,596	810,544
II.—Charcoal ...	,,	2,986,621	209,063
III.—Firewood ...	,,	2,436,349	97,454
Total Exports ...	...	...	1,117,061

TABLE No. XVII.

PORTUGAL.

Imports and Exports of Common Woods in 1897.

Class of Material.	Units.	Amount.	Value in francs.
IMPORTS.			
Cask staves	each	3,488,000	3,185,185
Beams and scantlings	cub. metre	13,399	706,042
Planks over 75 millimetres thick by 25 centimetres broad.	,,	8,660	469,073
Planks between 75 and 35 millimetres	,,	26,734	1,190,302
Planks between 35 and 15 millimetres	,,	3,472	137,665
Planks less than 15 millimetres thick	,,	3	1,042
Masts and yards	each	1,091	16,565
Total Imports ...	...	...	5,705,874
EXPORTS			
Wood in the rough	kilogramme	25,130,801	179,217
Rafters	running metre	738,476	123,934
Telegraph posts	each	732	1,03[illegible]
Laths	,,	61,409	4,906
Planks	running metre	1 648,897	270,413
Beams, scantlings, battens, sleepers...	,,	366,492	125,765
Total Exports ...	...	...	705,265

TABLE No. XVIII.

ITALY.

Imports and Exports of Common Woods in 1888.

Class of Material.	IMPORTS.		EXPORTS.	
	Metric tons.	Francs.	Metric tons.	Francs.
Charcoal.				
Charcoal	40,173	2,731,774	75,742	5,150,456
Firewood.				
Firewood	101,278	2,531,950	9,380	234,500
Timber.				
Round or rough dressed ...	70,175	3,859,625	12,702	698,610
Squared or cut lengthways ...	385,173	26,962,110	27,521	2,064,075
Small stuff	18,335	825,075	22,582	1,016,190
Total Timber ...	473,683	31,646,810	62,805	3,778,875
GRAND TOTAL ..	615,134	36,910,534	147,927	9,163,831

TABLE No. XIX.

ITALY.

Imports and Exports of Common Woods in 1898.

Class of Material.	Imports.		Exports.	
	Metric tons.	Francs.	Metric tons.	Francs.
Charcoal.				
Charcoal	10,190	611,400	32,443	1,557,264
Firewood.				
Firewood ...	91,288	1,643,184	12,170	219,060
Timber.				
Round or rough dressed	54,094	2,812,888	4,316	224,432
Squared or cut lengthways.	431,854	32,389,050	44,510	3,338,250
Small stuff ...	2,012	60,360	12,936	568,080
Total Timber ...	487,960	35,262,298	67,762	4,130,762
GRAND TOTAL ...	589,438	37,516,882	112,375	5,907,086

TABLE No XX.

GREECE.

Imports of Common Woods in 1897.

Class of Material.	Units.	Amount.	Value in francs.
Firewood.			
Firewood	kilogramme	760,054	5,953
Charcoal.			
Charcoal	kilogramme	2,231,739	87,177
Timber.			
Ship's timbers :—			
Pine or fir in general ...	cub. metre	10,522	706,984
" " beams and scantlings ...	"	8,162	546,854
Round timber, barked or not ...	"	2,778	223,628
Oak	"	404	32,522
Building timbers.—			
Pine and fir in the rough generally	cub. metre	18,717	1,245,039
" " beams and scantlings ...	"	1,090	73,030
" " round or log, barked or not,	"	85	5,695
Oak	"	353	36,712
Chestnut, elm, &c.	"	168	8,694
Cooperage.—			
Hoops of all kinds and sizes ...	kilogramme	708,435	38,741
Staves and headers	"	3,883,141	273,031
Beech in general	"	1,158,233	81,502
Total Timber ...	cub. metre kilogramme.	42,279 5,749,809	3,272,432
Total value of Imports ...	...	...	3,365,562

TABLE No. XXI.

GREECE.

Exports of Common Woods in 1897.

Class of Material.	Units.	Amount.	Value in francs.
Firewood.			
Firewood	kilogramme	38,202	895
Timber.			
Building timber	kilogramme	10,534	1,306
Ship's timbers	„	27,776	2,604
Total Timber ...	...	38,310	3,910
Total value of Exports ...	...	...	4,805

TABLE No. XXII.

BULGARIA.

Imports and Exports of Common Woods in 1898.

Class of Material.	Imports.		Exports.	
	Kilo-grammes.	Francs.	Kilo-grammes.	Francs.
European hardwoods for building, round or rough-dressed and walnut pieces	5,420,973	232,238	478,609	77,411
European softwoods for building, round or rough squared.	19,815,637	756,020	11,713,574	663,793
European hardwoods, sawn or otherwise, planks, staves, headers, &c.	8,205,297	595,079	1,580,098	98,348
European softwood planks, &c., &c.	24,691,595	1,511,493	66,064	5,785
Total ...	58,133,502	3,094,830	13,838,345	845,337

Perfume-plants. *

THE most profitable articles to export for long distances, such as from India to England, are those which contain much value in little space; perfumes for instance.

The orange flower is the one most certain to be profitable. Orange-flower-water is only *produced*, at Nice, Cannes, Grasse, &c., to the extent of 465,000 litres (one litre = 1¾ pints); whereas the *exportation* of that article amounts to more than 1,000,000 litres, not including the amount used in France. Over 500,000 litres have thus to be concocted from leaves, and the result is a very inferior product neither desired by the consumer nor fit for the uses made of it. Paris alone imports 5 million francs worth of scented oils, fats, and essences. All France not improbably imports 12 millions worth.

It will be as well here to explain what kind of substances these are, and to note a few of the plants most useful for the purpose. (Mostly those found in India as well as in New Caledonia are here included.)

There are several ways of extracting perfume from flowers; for instance, the pneumatic method, the ether method, the sulphide of carbon method, &c. These methods require special machinery, and are suitable for regular manufacturers. Those who wish to work them are referred to special works on the subject. There are three other methods which are capable of profitable use, namely, '*enfleurage*' (cold absorption), *warm maceration*, and *distillation*.

Enfleurage.—Formerly, oil of Ben † was considered the oil *par excellence* for perfumery, because of its great affinity for volatile perfumes, and especially because it does not soon become rancid. It has now almost disappeared from the French market, because of its high price and the heavy duties payable on its importation. It is replaced by fine olive oil; but, if obtainable, its use assures a real superiority and consequent greater profit. It would be easy in this country to extract the oil by means of a simple form of oil-press, the seeds being collected from the nearest trees. [The commonest native name is '*soanjra*' (horse-radish tree), the long pods when green are cooked and eaten, the flowers and roots also.—*Transl.*]

The process is quite easy. Pieces of flannel or coarse cotton cloth are soaked in the oil and spread on frames of wire. These frames with cloth are piled one on another with a layer of flowers between each. So they remain for 50 or 60 hours till the flowers have lost all their perfume. Fresh flowers are then

* Abridged (and adapted to India) from Dr. E. HECKEL in "the Revue des Cultures Coloniales," by F. GLEADOW, I.F.S. The perfume industry is easy to work, requires little machinery, and seems likely to repay enterprise.

† This is stated to be *Moringa pterygosperma*, whose "nuts" (? seeds) yield about 25 per cent. of their weight of an excellent oil able to absorb from flowers certain perfumes which are destroyed by heat.

substituted until the cloth has acquired a strong odour. The oil is then extracted from the cloths by heavy pressure. The frames may even be dispensed with, the layers of cloth and flowers being simply piled one on another.

Warm maceration.—This process is almost as simple, and anyone can work it at small cost. Take a few pounds of lard or other animal fat, melt it in boiling water in a very clean vessel. Let it cool so that all impurities fall to the bottom of the water. The grease will solidify in a cake on top. Take it carefully out, and if it retains the slightest smell repeat the operation with fresh water and a pinch of salt or alum. When a perfectly odorless cake is obtained, drain it well and melt it over a sandbath, or in a vessel surrounded by hot water. Raise the heat and continue till all water contained in the grease has evaporated. The same result may be obtained by thoroughly working the grease like butter and removing the drops of water that are squeezed out. The grease must then be brought to a heat just sufficient to keep it fluid. As many flowers as it will hold are then put in, and the whole is kept at this temperature for 24 hours. At the end of this time renew the flowers and repeat the operation for about a week. A grease is finally obtained worth 8 to 10 francs a kilogramme (say 3 or 4 shillings a pound). The calculation of profits is simple. At Cannes and Grasse the flowers of "Cassie" (*Acacia Farnesiana*) for instance, cost 5 to 7 francs the kilogramme. A kilogramme of grease requires 2 kilogrammes of flowers. Labour included, a kilogramme of scented grease is thus worth at least 10 francs in the market. When a sufficient quantity has been prepared it is carefully packed in tins or in bottles and sent to Europe. Each vessel should bear clearly written and exact information as to the weight of grease, the quantity of flowers used in it, the time they remained in soak, &c., so that the purchaser may have, besides his own tests, a reliable basis for the price he may give.

In order to extract the essence from this grease or pomade, the latter is just melted and dropped by very small drops into the purest alcohol, in which it remains for ten or twelve days. The essence is then obtained by distillation. The resulting products are, on the one hand, the pure essence, and on the other, a quantity of grease which still contains enough scent to be good for pomade-making. *

It has been already mentioned that certain flowers will not endure treatment with heat. Cold *enfleurage* † may be carried out by means of special frames with glass bottoms. Lard has been mentioned, but mutton fat or any kind of grease will do, provided only that it is clean and perfectly free from smell.

* What becomes of the alcohol is not stated. Nor are the relative proportions of alcohol to the original grease and to the final essence.—(*Transl.*)

† Is cold *maceration* meant? The passage is concise to obscurity.—(*Transl.*)

The process of distillation is well known, but it can only be applied to flowers whose perfume is not destroyed thereby, to leaves, roots, barks, stalks, seeds, resins, &c.

PERFUME-PLANTS.

Orange (Citrus aurantium).—The orange is entitled to precedence. The commonest kind, the sweet orange, was introduced into New Caledonia from Tahiti, and grows luxuriantly. The oranges unfortunately cannot be utilised and rot on the ground. They would yield a wine which, when well made, is equal to Madeira, and fetches 2 to 3 francs a bottle in France.

For perfumery the '*Bigaradier*' orange is the best. Its fruit is not edible, but its flowers have a superier scent. Three kinds of essences are obtained from the orange tree:—

(1) From the flowers. '*Néroli Portugal*' from the sweet orange is worth 200 francs (£8) a kilogramme (2¼lbs.). '*Néroli bigarade*' from bitter oranges is worth 500 francs (£20) per kilogramme. One thousand kilogrammes of flowers should yield 300 grammes of essence.

(2) From the pericarp (orange-peel), this essential oil is worth 20 to 25 francs (16 to 20 shillings) the litre. Five kilogrammes of peel yield 312 grammes of essence. It also appears that 100 kilogrammes of oranges * in 100 litres of water yield 1 litre of essence. This result seems to have been obtained from dry peels, but it is better to use them green. The peels are rolled in a vessel whose interior is armed with needle points projecting 2 millimetres (1 line or $\frac{1}{12}$ inch) from its interior surface. The essence pours out and escapes by a hole in the bottom of the vessel.

(3) From the leaves and small green fruits (called *essence de petit grain*).

The flower yields two perfectly distinct scents, according as the extraction has been by *distillation* or by *maceration*. In order to scent a kilogramme of grease, 8 kilogrammes of flowers have to be used in 32 operations, that is to say, 250 grammes of flowers are macerated at a time in the kilogramme of grease. The perfume thus obtained is far superior to that got by distillation. Besides the orange there are various kinds of citron. The essence of citron is worth 16 to 20 francs a kilogramme.

Bergamot—(Citrus Limetta).—This comes mostly from Italy, 100 fruits yield about 85 grammes of essence worth 36 to 50 francs. For some years past a fungoid disease has afflicted the Italian citron trees and considerably raised the price of an essence that is the basis of many perfumes.

* So stated, but dry peel seems to be meant.—(*Transl.*)

Eucalyptus citriodora.—The leaves yield on distillation a delicious essence resembling citron, 1 kilogramme and 700 grammes distilled at Sydney gave 11½ grammes of a pure and colourless essence.

Cassie (Acacia Farnesiana).—This comes next to the oranges, because its pronounced odour of violets * has raised it to a most important place in perfumery. The plant is a native of India, but its introduction into New Caledoina has been a nuisance to farmers on account of the way it is spreading. It is cultivated in Algeria and in France. It is said that a hectare in full production near Cannes brings in a gross revenue of 20,000 francs. This statement may need verification; but it seems to be the case that in the department of Var the Acacia when five years old gives on the average 1 kilogramme of fresh flowers per plant per season, worth 4 to 5 francs a kilogramme, and a hectare can carry 5.000 plants When dried in the shade, the flowers retain their perfume, 10 kilogrammes of fresh flowers yield 74 grammes of essence. Two kilogrammes of flowers will scent 1 kilogramme of grease. One person can gather 700 grammes of flowers in an hour. This plant also yields a gum as good as gum arabic. A plant two years old has yielded 60 grammes of gum, and a plant four years old 180 grammes. The bark and the pod are both rich in tannin. The flower will not bear distillation, *enfleurage* or maceration must be employed.

The "black wattle" (*Acacia decurrens*) of Australia has a flower possessing the same odour, and the gum was quoted on the London market in 1895 at 1,500 francs for the ton. The flowers of *Acacia Lebbeck* (? Albizzia Lebbeck.—*Transl.*) and those of the false guaiacum (*Acacia spirorbis*) are as yet unknown in perfumery, and would seemingly be fit companions with the "Cassie." †

Geranium capitatum grows exceedingly well in New Caledonia. The essence is worth 35 to 40 francs a kilogramme. That made in Algiers is worth more than the Indian variety. A kilogramme of leaves gives a gramme of essence. With two cuttings a hectare will produce about 40,000 kilogrammes of leaves, and these will yield 36 to 39 kilogrammes of an essence which resembles and frequently adulterates the essence of roses.

Heliotropium Peruvianum. When carefully grown, this plant may become a considerable shrub and will go on flowering for half the year. It is one of the safest and most paying of plants. The essence may be obtained either by enfleurage or by maceration. In France a great deal of artificial heliotrope is used, but the natural extract will always fetch its value. Good

* This resemblance has never occurred to me, though the smell is delicious. —(*Transl.*)

† The flower of Albizzia Lebbeck and odoratissima loses its delicious perfume and acquires a stale one almost immediately it is gathered. It would have to go straight from the tree to the grease.—(*Transl.*)

heliotrope pomade (genuine) is currently sold in London at 20 francs the half kilo. (about £14 or £15 a lb.) This perfume may be also obtained by the agency of carbon sulphide. M. Piver obtained 6 kilogrammes of it from the plants growing on 1 hectare at a cost of 3,000 francs, or 500 francs the kilogramme. Four grammes were sufficient to scent a kilogramme of pomade.

Jasminum grandiflorum. Grease or pomade scented with this fetches 7 to 15 francs according to quality. The flowers are worth 4 to 6 francs the kilo. at Cannes. A hectare of jasmin will yield about 2 kilos. of an essence which, when pure, is sold in France and Egypt at 500 to 550 francs an ounce (31 grammes) or 16 to 17,000 francs the kilo. A woman can gather 1 to 2 kilos. of flowers daily. In Algiers 100 plants give 150 kilos. of flowers annually. A hectare may carry 5,000 plants, the daily produce of which may be 50 to 60 kilos. of flowers, or 7,000 to 9,000 kilos. annually. One hundred kilos. of flowers yield 12 to 14 grammes of essential oil. One hundred plants yield 25 to 28 grammes. The oil obtained by distillation has always a strong and somewhat empyreumatic odour, and will bear no comparison with that which has been obtained by *enfleurage* or by ether extraction, much less with that of the natural flowers. The gathering should be done up to 9 A.M., and from 5 to 7 P.M. When it rains the wetted flowers have to be thrown away, because they lose their perfume and turn brown. The rainfall is thus a consideration.

Vetyver or *Khuskhus* (Andropogon muricatus).—The roots are worth 2 to 3, and very exceptionally 6 francs the kilo. According to Jeanneney's rough tests, the roots contain 1·3 per cent. of essential oil. A clump two years old may have 800 grammes of dried roots. The essence is brownish, soluble in alcohol, and worth 25 to 30 francs the kilo.

Citronella (Andropogon Schœnanthus).—The essence is worth 40 to 50 francs the kilo. It is much used in England (lemon-grass oil.—*Transl.*) and is obtained by distilling the leaves, which yield 500 grammes of essence per 100 kilos. of leaves.

There are many other plants not recognised in the trade as yet, but perfectly likely to give profitable results; for instance, the following:—

Lantana camara and *aculeata*, the unarmed and the thorny species. The latter especially is more free-growing than welcome, and as it cannot be exterminated might as well be utilised. The leaves and twigs are aromatic and might be distilled, as they furnish 250 grammes of essence per 1,000 kilos. This product might be used either in perfumery or in medicine. The leaves are used for colds and fevers.

Carica papaya, the male flowers of the *papaya*.

Beilschmiedia lanceolata, or musk sandal.—The bark and seeds yield an essential oil smelling somewhat like Russia

leather, 250 grammes of essence from 100 kilos of bark or seeds worth about 12 francs the kilo.

Santalum album and *austro-caledonicum*, well known.

Thespesia populnea, or Oceania rosewood.—The timber is valuable for cabinet work, and yields a fine brownish essence which would be excellent in perfumery. Worth about 30 francs the litre.

The Hill Tribes of Cochin.

THE hill tribes of Cochin are divided into the two principal classes of Malayars and Kadars. The former are found in the forests of Machad, Elnad, Paravattany and Palappilly, while the latter are confined to those of Kodassery and Nelliampathies.

The Malayars, again, are divided into the two sub-divisions of Konga (immigrants from the Tamil country), Malayars and Nattu (belonging to the country) Malayars. The former, as their name signifies, are said to have come from the neighbouring Tamil districts of Coimbatore and settled in the Cochin hills, while the latter claim to be the original settlers of the Cochin forests.

(1) The Nattu Malayars are not themselves divided into any different sections. They observe a sort of pollution towards their Konga brethren who are not allowed to approach them beyond a certain fixed distance. From the above it may be inferred that no sort of connection can possibly exist between the Konga and Nattu Malayars. The Nattu Malayars are copper-coloured, short in stature, and have invariably a triangular face pointing towards the chin. They have great powers of endurance as other jungle tribes, and live mostly on jungle minor products, the extraction of which forms their chief occupation. They speak a peculiar dialect formed, as it were, by an admixture of Malayalam and Tamil. They live in small huts built of bamboo, teak or reed-leaves, date-leaves, grass, &c. A Malayar village consists of not more than 10 or 15 huts of the above description. They are more clean than the Konga Malayars, who, I am informed, hardly take a bath in a week even in the hottest part of the year. They have curly hair and pouting lips, which are not thick. They are gentle and submissive, and may invariably be trusted to a great extent.

They live, as was said before, in villages of 10 or 15 huts, each of which contains a family. Under ordinary circumstances marriages take place between the members of different villages, but very rarely between those of the same village. It is a general rule that discipline can be more strictly maintained over a stranger than over one's kith and kin, and consequently the Mooppen or headman of the village can command greater control over the village individuals if inter-marriages are not allowed between members of the same village. Early marriage for

females is an exception; much more, therefore, is it for males. After marriage the couple live by themselves and can lay no claim whatever to any remuneration from their parents. Dowries, which consist of poonies (honeycomb-collecting baskets), &c., of daily use, are usually given. The married pair must live or starve by their own exertions. Children are not usually taught to read or write. Christian missionaries have recently directed their attention to educating the Malayars and proselytizing them. Both males and females take liberally to the pernicious habit of using intoxicating liquors even from their ninth year. Opium is resorted to but by few.

Pollution by the death of relatives is unknown among the Malayars. Similar to what is prevalent among the Nairs, they have a sort of dance in which both males and females take part indiscriminately. Intoxication, it need not be added, adds fuel to the dance.

I have heard it said that Malayars and Kadars do not give any name to their children till after a certain age. But so far as my enquiry goes, this is a mistaken idea. I have seen, both among Kadars and Malayars, children of 8 months' old being called Kali and Choundan.

Malayars have not advanced a bit in civilization. They have an inherent hatred for anything new, and cling obstinately to their old customs and ways of living.

(2) The Konga Malayars, who are not allowed to approach their Nattu brethren, are said to have immigrated into Cochin forests from the eastern British territories. They are darker in colour than the Nattu Malayars, and have social and religious customs similar to those of the others, but with one great difference. Their matrimonial arrangements are very peculiar. After the selection of the bride by the parents of the bridegroom, the latter comes for the first time to the house of the bride, whose parents then receive, in the presence of not less than four witnesses, a sum of not less than Rs.3 from the bridegroom as the price of their daughter. After the usual feastings and merry-makings the bride is taken to the house of the bridegroom. Subsequently, if at any time a divorce is resorted to on any account whatever, the bridegroom brings his wife to her parents and delivers her to them after recovering, in the presence of the same four witnesses, if possible, the price he gave at the time of his marriage. Marriage is, therefore, considered as a mercantile business, where the commodity, if found unfit for the purchaser, is returned to the owner and the value of the same taken back. Instances of the above are very rare, though it is sanctioned by the society.

(3) The Kadars who are confined to the Nelliampathies and Kodasseries (Adirappilly) are darker-coloured than the

above tribes, have pouting thick lips and curly hair, and are shorter and more muscular. The first sight of a Kadar reminded me of a Bushman whom I had the good luck to see at Madras in 1894. The Kadars do not mingle with the Malayars and the Nelliampathy Kadars consider themselves to belong to a class higher than that of their Kodasseri kinsmen.

Their social and religious observances and their ways of living are similar to those of the Nattu Malayars. They are more cunning and deceitful, and do not hesitate to utter bare falsehoods. Owing to their constant contact with coffee-planters they have become more civilized in appearance, though none of them know how to read or write.

The religion of the jungle tribes is a sort of Hinduism mixed with Fetichism. They worship Durga, evil-spirits, elephants, &c. Trees which they believe to be frequented by evil-spirits are not allowed to be cut, but are, on the other hand, worshipped. Wild elephants are worshipped, as also are their images. Tamed elephants are beleived to have lost the divine element in them by their association with human beings. Short-tailed black monkeys (Hanuman) are considered to be a sort of curse to the forests, and consequently they are hunted after and put to death whenever and wherever they are met with. Serpent-worship is unknown among the jungle tribes.

The jungle tribes are everywhere presumed to be under the Forest Department of the State within whose jurisdiction they live. They are granted certain concessions which are denied to the inhabitants of the low-country. Though this has been strictly true in Cochin in days of yore, a change has recently taken place. The constant contact of the jungle tribes with merchants who, coupled with the high wages that the jungle tribes receive from the European coffee planters who employ them largely in their malarious coffee estates, has tended a great deal to estrange the Malayars and Kadars from their old relationship with the Government. It would not therefore be out of place to state here that certain sets of rules which would enhance the right of Government to count upon the work to be extracted from the jungle tribes are highly necessary, since without them every kind of work in the forests is out of the question. It must, at the same time, be kept in mind that the presents distributed and the concessions granted to the jungle tribes should be strictly observed, and that any interference with their social and religious observances by low-country people should be duly enquired into and grievances redressed; and that the protection which they have a right to claim should be extended to them properly. To sum up, Government and jungle tribes should each be careful to perform their duty towards each other.

K. G. MENON,
Cochin Forest Service.

Trichur, 26th April, 1901.

II.-CORRESPONDENCE.

Fire-protection in the Nilgiris.

SIR,--May I draw your attention to the following extract from the letter of an Ootacamund correspondent published in the *Pioneer Mail* of May 24th last :—

"The Forest Department of the Nilgiris sees reason to make "a material change in its conservancy work. Finding its fire "traces round the deciduous forests on the slopes rather injurious "than beneficial, it has resolved to spend no more money on this "work of protection. The fire trace was so far efficient that it "kept the ravaging element out of the forests for some years, "which meantime were developing an extraordinary crop of "undergrowth. A year of drought reduced this mass of under-"growth to tinder, and if at such a time a fire accidentally entered "the forest, its ravages were much more serious than an annual "fire, in fact, it completely burnt the forest."

It is to be hoped that the report is untrue, and that fire conservancy on the Nilgiri slopes is not going to be abandoned just at the critical time. It is the natural result of successful protection for a period of years that a heavy crop of dry and dead grass should accumulate and that undergrowth should get thick, but this is what is wanted. A few more years of care and watchfulness and the dry grass will become 'humus,' while the tree-growth will thicken and prevent fresh grass coming up, and then fire-protection should be easy, for there will be little inflammable matter to burn.

J. S. G.

Rotation and Possibility in Selection Forests.

IN his article on the first page of our July Number, Dr. Schlich is perhaps unnecessarily severe on me. He must have jumped to the conclusion that my French training necessitated my quizzing "the Great German Professor." Nothing was further from my thoughts. The first dozen lines of my article should have made it clear to all that the whole thing was an attempt to represent M. Broilliard's views, my own being strictly confined to "local color." I have already translated and transferred Dr. Schlich's "*Revue*" article to the pages of the *Indian Forester* for May last, with half-a-dozen impartial lines of remark. The statement about Judeich came out of the "*Revue*," and I once more repeat that the selection method was not considered barbarous by French foresters at the time I was learning forestry, 1876—79, or else the fact was carefully hidden from me out of consideration for my youth and inexperience.

F. GLEADOW.

A Forest Department Gazetteer.

I WAS very glad to see Mr. Billson's suggestion at page 27 of the January Number. The idea is one which, when I was editor of the *Forester*, often occurred to me, only that my own project had a slightly different form. What I had projected was a "Forest Annual" which would give a list of the officers, staff, divisions, ranges, &c., of the department, somewhat in the style of the "Annuaire des Eaux et Forêts," but would go a step farther and give also brief descriptions of the units with their most important statistics. The sort of work I thought of would be arranged somewhat as follows:—

(1) A list of the Department according to grades, in order, from the Inspector-General down to the last grade of Rangers.

(2) A list of charges and the officers holding them on a specific date.

(3) Lists of the staff and students of the Forest Schools, Cooper's Hill, Dehra Dun, Poona, &c.

(4) A list in order of the 'promotions,' that is, of the officers appointed in each year, with, briefly, place of training (Nancy, Tharandt, Cooper's Hill, Dehra Dun, &c.); two lists really would be required, one for imperial, the other for provincial officers, and with marks like (*r*) for *retired*, (*d*) *deceased*, &c.

(5) Important information, like weights and measures, tables of useful number, revenue and expenditure, fire-protection areas of forest, and so on.

(6) Brief accounts of the character of the various Divisions, &c., the chief trees, objects of working, markets, and so on.

The whole would perhaps make a small book, and really, considering how useful the information would be, there seems no reason why the Government should not publish it with some officer at headquarters like the Assistant Inspector-General, who has easy access to the information, as editor. The difficulty would be with the first number, after ones would be easy to correct and bring up to date. May I suggest that perhaps (1) to (5) might be compiled and published at first, and that (6) might be added when the information is ready. A draft might be prepared for the School Circle and printed, and Conservators and Divisional Officers could then send similar ones for their charges. I am sorry to have delayed sending this. I wrote the above when I received the January Number, and then put it aside and forgot it.

J. S. GAMBLE.

Girdling of Spruce and Silver Fir to secure the Natural Reproduction of Deodar. *

THE state of the trees referred to by E. M. C., in the June Number of the *Forester*, furnishes an excellent example of

* See page 291.

how the girdling of inferior species, in a mixed forest containing deodar, should not be conducted. The work was done by the Taroch State Daroga, an untrained forester, full of zeal but lacking in sense and understanding. It is hardly an exaggeration to say that he girdled every spruce and silver fir he could get at. As these species were far more numerous than deodar, it followed that the canopy was lightened to such an extent that the soil speedily became covered with so dense a growth of shrubs and brambles that it was impossible for deodar seedlings to establish themselves on it. Had a moderate number of the trees of inferior species been judiciously selected for girdling in the vicinity of seed-bearing deodar, the results obtained would have been very different.

However, the undergrowth being now in possession of the soil, the point is how to get rid of it to such an extent as will allow deodar to replace the girdled fir. Probably the opening of the forest to the grazing of sheep and goats would not do much good, because in order to be effective in suppressing such undergrowth as is described, it would have to be so heavy as to give practically no chance of any deodar seedlings that might germinate, surviving its action. The Government of India have laid down that the grazing of sheep and goats is incompatible with rational forestry, and few will dispute the dictum. No doubt reproduction of deodar is found in forests which are browsed over by these animals; but at all events so far as my experience goes, where deodar forests are frequented by any but relatively small numbers of them it will be found that effective natural reproduction has very seldom occurred to any extent. It will be found, moreover, that in those cases in which some of the leading deodar shoots have at last succeeded in growing beyond the reach of the browsers, so that the seedlings have become saplings, it is more by chance than anything else; and then, generally, it has happened at the expense of the crop having been thrown back for a considerable number of years, which has operated adversely on the quality of the timber produced, and on the size and shape of the trees. In the particular case of the Shila Forest, probably the sheep and goats would make a large number of tracks between the bushes, which tracks would form the only open ground on which deodar seedlings could germinate successfully; but having so germinated they would be destroyed by the trampling of the browsers, even if they were not eaten by them.

I believe that the simplest and cheapest way of obtaining advance growth of deodar in the Shila Forest would be to wait until it was known which of the standing deodar were going to produce a fair supply of seed, and then to cut back the undergrowth near them as short a time before the fall of the seed as administrative reasons would allow. The seedlings would have a fair start under favourable circumstances, and if it were found, in the following year, that they had established themselves, the

undergrowth would be cut back again in order to prevent their being choked. The second cutting back would not cost much: it would have to be repeated for five or six years, but probably for not more than that. If it were done towards the end of the rains, it would probably only be required once a year; but even if it had to be done twice a year, and for seven or eight years in succession, it would be cheaper than planting, which seems to me to be the only alternative. I may point out that the proposed system would have the advantage of being able to be carried out more effectively by an untrained establishment than planting could be.

C. P. FISHER.

16*th June*, 1901.

E. M. C. in his letter does not make it clear whether the dense undergrowth he mentions existed before 1886, *i.e.*, when goat-grazing was allowed and fires occurred more or less regularly. Judging from the stock description, the forest would appear to be situated almost at the highest limit in which deodar will grow. Here, in Kashmir, we are troubled with the same question of not sufficient staff to carry out large planting operations; but we manage to sow up areas in wrecked forests, &c., where deodar is the principal species. I do not know what the undershrubs E. M. C. mentions are, but if *Parrotia Jacquemontiana* is one, he will find that it is very slow-growing, and when coppiced, takes a long time to recover. Up here in Kashmir, to ensure reproduction of deodar in wrecked forests containing scattered deodar and thick undergrowth, cutting by contractors of the thick stems of *Parrotia* for firewood has been allowed, and also the removal of certain other broad leaf species; failing this, it has been done departmentally in forests situated too far away to allow of the produce from the cuttings being sold as firewood, and the result so far has been good. As for allowing heavy goat-grazing, it is almost a dead certainty that the few young deodar plants and seedlings will suffer badly, unless some precaution of fencing is adopted, which is hardly practicable. Perhaps if the present young reproduction be examined, it may be found that it has grown up since 1886, *i.e.*, after the prevention of fires and goat-grazing, as E. M. C. remarks that "saplings and poles are very rare, having been destroyed by fires of past years."

In forests like these, progress can be made but slowly, and I think that if the areas where deodar grows best be taken in hand and improved by the thinning out of undergrowth and the letting in of a sufficiency of light by girdling, and helping this out by scraping the surface soil and then sowing in likely places, the result, though small, will, I think, be satisfactory. Even thinning the undergrowth and broadcast sowing of seed in the same way as adopted by nature, *i.e.*, amongst bushes, has a very excellent

result at times and costs next to nothing, but it should only be tried in places where deodar naturally occurs.

When the treatment has been discovered by which reproduction is best assured, other less suitable areas might then be taken up.

E. RADCLIFFE,
Divl. Forest Officer, Kashmir.

Harwan, 16th June, 1901.

III.—OFFICIAL PAPERS AND INTELLIGENCE.

The Maihongson Forests in Siam.

THE Siam Forest Department has been so often and, I fear, so justly reproached for not contributing to the *Forester* that I venture to send you extracts from an interesting report of Mr. J. G. F. Marshall on the celebrated (in Siam) Me Lan forest from notes taken by him on a trip in March, 1901. This Me Lan formed part of the Maihongson (the "Me Haung-thun" of the Kado returns) forest, the lease of which has just expired. It has now been released separately. But little work has ever been done in this forest owing to the extreme difficulties of extraction, but Messrs. The Bombay, Burma Trading Corporation, Limited, are now making an effort to overcome these with every hope of success. The whole area is a vast amphitheatre or "Kut" as Mr. Marshall calls it, and all the streams disappear under a high limestone ridge. The only possible means of extraction is to float the logs down to near the point of this disappearance and then drag them over the ridge. The logs eventually find their way into the Maihongson stream, and after floating for several miles through Karenni territory reach the Salween in Lat. 19°.

CHIENGMAI:
19th May, 1901. } H. SLADE.

SITUATION.

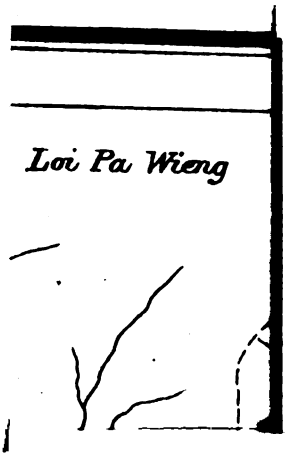
The Me Lan forest is situated in the sub-districts of Maihongson and Muang Heng in the Chiengmai State of N.-W. Siam. It is bounded on the north by British territory.

BOUNDARIES:—

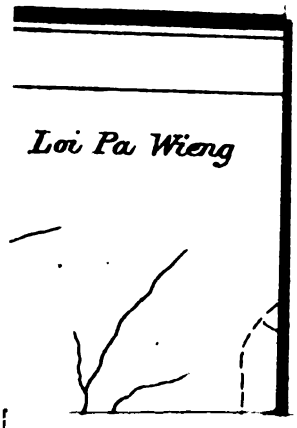
On the south by the Me Tan and H. Sam-poo watershed and the Kut Sam-sip range of hills; west by the watershed of the Me Pai and Kong Noi; and east by the Me Kong watershed.

PAST HISTORY.

Until within the last 15 years the only villages within the forest were Me Lanah and Ban Me Pem, both of which have



(trap). In places again there are cliffs of what looks very like limestone (I had no means of testing to make sure), and



maps. In places again there are cliffs of white rock very like limestone (I had no means of testing to make sure), and

grown considerably, the former from 5 or 6 to 25 houses and the latter from 2 or 3 to 15.

In addition there are now the following villages, *vide* map, Ban Me Pah, Ban Poong Net, Ban Loi Mon, Ban Mg. Chang, B. Kai Pa, B. Pa Mon, B. Sup Me Heng and a Chinese settlement of about 60 houses up the Me Lan above H. Maklet.

The influx is attributed chiefly to the annexation of Upper Burma, and consequent clearing out of dacoits from the Southern Shan States, except in the case of the Chinese settlers, who have only come here within the last three years.

The consequence of this comparatively populous condition is that game of all sorts which used to abound from elephants downwards has been driven to the head waters of streams and to the high range of hills which divides British from Siamese territory. Another consequence is extensive cutting of taungyas (temporary cultivation), chiefly, however, in evergreen forest; objects of cultivation being rice, pulses, pumpkins, yams and chilies. The Chinese also grow poppy extensively for personal consumption and sale in the Shan villages. A general dread of the forest appears to have existed for a long time owing, presumably, to its weird caves, tunnels and subterranean passages; indeed, even now it is very hard to get Shans to enter a cave or tunnel alone, or even with their own friends, although they will, more or less readily, accompany Europeans.

Old Workings.

Teak has been worked out for years on the upper slopes round and about Nam Howo and also below the Me Oo Moung, but never of large size; logs of not more than 7′ girth being the class chiefly extracted. Girdlings of all sizes were, however, extensively carried out throughout the area, and in January, 1898, 10,000 trees were girdled by Messrs. The Bombay, Burma Trading Corporation, Limited.

These were chiefly of large size, the consequence being that the seed-bearing qualities of very numerous trees were lost entirely for a succession of years, and in the practically absolute dearth of seed-bearers there is little or no recent reproduction and very few saplings. This point will be further discussed under the heading of "Natural Reproduction."

Aspect.

This is very hard to determine owing to its general character, but may be said to be chiefly S.-W. and S.-E.

Geology.

Most of the main ridges in the lower portion, *i.e.*, the south and south-west, are topped with huge rocks of volcanic origin (trap). In places again there are cliffs of what looks very like limestone (I had no means of testing to make sure), and

undoubtedly the stalactites formed, and in process of formation, in all the caves are largely composed of this mineral. The whole area strikes me as being the result of tremendous volcanic upheaval. I fear I am no geologist, however, and my conclusions may be wrong. The soil generally is a reddish gravel, feldspathic and granitic in origin.

Physical Features.

Pages could be written of the extraordinary features of this forest, a unique one among the timber-producing tracts of the east, if not the world. The most pronounced are what may be called, in default of a better word, the almost innumerable amphitheatres, ranging from hollows a few yards across, to the large ones of the Me Lan and Me Lanah which are roughly 2 miles and 3¾ miles broad and 23 and 8 miles long respectively.

The water collected by the catchment areas of these disappears underground, generally under a huge precipitous hill face or rocky bluff, to re-appear again in different places on the other side of the ridge. The most notable of these re-appearances is the cave from which the H. Kann flows (this is the reputed outlet of the Me Lanah, the Op Papoo and the cave from which the Me Kong Me Lan flows, both said to be outlets of the Me Lan.

The areas covered by these amphitheatres are at Kut* Sam-sip at the head waters of the Me Tann and H. Sam Poo, and the area lying between the head waters of the H. Heng up to and round Nam Ho-wo.

Another extraordinary feature is the innumerable caves and underground passages, notably the one near the mouth of the H. Heng on where the Me Lan runs under a hill in a tunnel 300 yards long and 30′ to 80′ wide and 20′ to 70 high, then the tunnel from which the H. Kann emerges. This has never been thoroughly inspected by a human being, although two assistants of Messrs. The Bombay, Burma Trading Corporation, Limited, went in over a mile until their torches gave out. This is locally supposed to be the outlet of the Me Lanah; then there are the caves at the disappearance of the Me Lan, a large cave at Nong Keo and innumerable others all over the country of more or less extent. It seems most probable that the whole of this area is undermined by innumerable tunnels and possibly by a huge subterranean lake.

The main outlets of water are at the Op† Papoo, the Me Kann and the Me Lan, which runs into the Me Kong. The Me Kann is a feeder of the Poong Sam Pik, which again runs into the Me Kong.

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* "Kut" is the Shan equivalent for these amphitheatres; "Kut Sam-sip" then means "Thirty amphitheatres."

† "Op" or "Awp" = Gorge.

Another peculiarity which I cannot vouch for from personal experience is the fact, attested to, however, by several of the Messrs. The Bombay, Burma Trading Company, Limited, assistants, that a rise in the disappearing stream in the hills does not necessarily mean a rise in their reputed outlets. For this, if a fact, I can offer no explanation.

General Character of Forest.

1. *Teak.*—To deal with the teak-bearing area first, which the broken line on the sketch map encompasses. It will be noted that this area is not by any means large, and from it have to be deducted all ridges and their immediately adjacent slopes which, as a rule, are rocky and barren, or are clothed with Pine (*P. Khasya*) and Eng (*Dipterocarpus tuberculatus*), all evergreen patches, which as a rule are, however, not extensive, and generally found along banks of streams, and last pure Eng forest of which there is a considerable area.

In the semi-evergreen forest teak of large size is fairly plentiful, but there is no reproduction and few or no unsuppressed saplings. The annexed statement shows two linear valuation surveys made. These are necessarily very rough, but were through fairly well stocked forest. The dotted line on sketch map shows their general direction.

Taken generally, the situation may be summed up thus. Nearly all teak over 6′ 6″ have been girdled, and a large number below that size. I estimate roughly that there are not more than 10,000 trees fit to girdle left, and of these at least half the number cannot be girdled under the isolated-tree clause of the lease. Saplings of 15 years old and upward are fairly frequent, but not sufficient to secure the future of the forest as a teak-bearing area of any importance. Reproduction is very poor indeed everywhere.

Natural Reproduction.

Reasons for absence of reproduction are chiefly:—

(i) Girdling of nearly all seed-bearers, some as long ago as 15 years and the most recent 3¼ years, and thus the total loss of seed crops during that period. It is estimated by Messrs. The Bombay, Burma Trading Corporation, Limited, that there are 10,000 old girdlings in the forests and 10,000 of their own girdlings.

(ii) Suppression by semi-evergreen forest and bamboos.

There is just a chance of a good crop of seedlings asserting themselves, in places where bamboos are now seeding, in say, three years' time after the same have fallen and been burnt; but I fear the chance is a very slight one owing to the rapidity with which the bamboo re-asserts itself to the ultimate exclusion of light-exacting species which have only a short start of them.

(iii) Rank growth of grass and consequent difficulty of seed to reach the ground if no fires occur, and certainty of destruction of the same if they do occur, before seed has established itself.

ARTIFICIAL REPRODUCTION.

It is not necessary to discuss this point, as the physical difficulties of extraction alone would imperatively forbid such being attempted, even if there were not large areas elsewhere, notably between Chiengmai and Paknampo and on the Thaungyin in which such operations should first be carried out.

(iv) *Trees other than Teak.*—There is one large tract of deciduous forest, the Me Lanah valley, which for no reason one can see, has not a teak tree on it, although its usual congeners are frequent. The principal species being Padouk (*Pterocarpus indicus*), Pyingado (*Xylia dolabriformis*), Thitya (*Shorea obtusa*), Thitsi (*Melanorrhœa usitata*), Sheenpya and Shaw nee (*Sterculias*) Eng (*Diptevocarpus tuberculatus*), Tong (*Anogeissus* sp.), Taukkyan (*Terminalia tomentosa*), *Bassia latifolia*, *Cordia Ehretioides*, *Morinda* sp., *Mallotus Phillipinensis*, *Melia* sp. with Thingan (*Hopea odorata*), Thitkado (*Cedrela toona*), Pyinma (*Lagerstrœmia* sp.), *Albizzia* and *Fici* of many species in the semi-evergreen and evergreen portions and several other trees I failed to identify.

Natural reproduction is bad throughout, chiefly owing to annually recurring forest fires, the growth of grass being rank owing to a very open leaf canopy.

The pine and Eng areas are practically of no value, resin is only extracted in very small quantities for local use from the former, and reproduction of both, owing chiefly to forest fires, is poor. The evergreen areas are practically the whole forest north of the broken line which defines the teak area on the north, in the hollows of all "kuts," and along banks of streams in many places.

These areas are intersected with frequent patches of bamboo (tinwa *Cephalostachyum pergracile*, and wagoke, *Oxytenanthera albo-ciliata*). The latter is seeding throughout the forest; Wabo, Myinwa, (*Dendrocalamus strictus*) and Wanet are also found; the first named in deep moist evergreen forest where it grows to great size. These evergreen and bamboo areas are chiefly selected for ya cutting; I have not come across a single instance, I am glad to say, of a teak-bearing patch being cut. The regrowth in such taungyas is usually a high rank grass, which gradually gives place to tree growth or bamboos. Except by the Chinese, yas are cultivated for two years. The Chinese cut fresh areas each year.

ANIMALS.

(i) *Man.*—There are five races inhabiting the forest, *viz*:—Shans, Chinese, Karens, Thaungthus and Musus (Mokesos). The most numerous are:—

The Shans who inhabit B. Me Pah, B. Me Lanah, B. Ung Chang, B. Kum Hoi and Muang Pem, B. Pamon, B. Sup

Me Heng. These people live ostensibly by paddy cultivation and taungya in B. Me Pah, Muang Pem and Me Lanah, and taungya alone in the other villages, eked out by a little dacoity and elephant-stealing at times and a good deal of shooting and fishing. A few also are now working for Messrs. The Bombay Burma Trading Corporation, Limited, on their road work and as elephant men and also for their foresters at timber felling, logging, &c.

The Karens' head-quarter village is Loi Mon, 2½ miles from the mouth of the Me Heng Luang up the ridge, between that stream and the Me Lang Heng. Their taungyas are in all the valleys round about.

These people are supposed to be the Karen pyu of Burma, but are nearly all at least half Shan. They dress exactly as do Shans, both men and women. They have a phongyi kyoung (Buddhist monastery) with a phongyi (monk) and four koyins (novices); there are no pigs in the village at all, and they are not at all timid; in fact I found them the pleasantest people I met in the whole valley, and the most hospitable. They speak Karen with a number of Shan words thrown in, and all know Shan thoroughly.

The Chinese settlement (I cannot term it a village as these people live in small congeries of huts of from two to twenty together) is dotted all over the head waters of the H. Wye, H. Pa Tope and H. Maklot, feeders of the Me Lan. These belong to the Ke Mraow tribe of Chinese hill-dwellers, the other is called Ke Tow by the Shans. Accounts as to their numbers living in these forests vary from 200 to 500. From what I saw of the three or four groups of houses I visited and the huge area taungya'd, I am inclined, to think the larger number the more correct.

Very few of them know Shan, but they can all talk Lao to some extent, and come from the country north of French Laos. The men do not wear pig-tails, but a small tuft of hair at the back of their heads, some of which is allowed to grow 6″ to 8″ long, but no longer apparently. They wear baggy trousers like Shans, with short coats of dark-blue home-woven stuff. The women wear regular quilts very little lower than the Karen, which are often quilted slightly and much pleated, with, at times, a more or less white jacket, generally open. These appear to me distinctly finer specimens of humanity than the men, and apparently breed prolifically, judging by the swarms of children one sees.

They raise large crops of paddy and opium, and also possess numerous pigs, fowls, goats and cattle. In a word, they appear by a long way the best to do in this tract. Like Chinese, as a rule, they are most industrious; it is only three years, for instance, since they arrived in these forests, and they have felled and cultivated, I estimate, at least 2,000 acres of fine forest land (evergreen). They pay no taxes, and if they go on as they are

now doing, in ten years' time there will not be an acre untaungya'd in the headwaters of the Me Lan.

They freely give their reason for trekking from their own country that there were no more forests to taungya, and it was too populous. I expect also that they had to pay taxes, or were otherwise wrung by Chinese officials.

Fowls, pigs, rice, vegetables, &., are fairly cheap; but, I fear, will not remain so long now that the B. B. C. have such a large establishment in the Me Lan.

Taungthus are not numerous, and those there are have become so strong Shan that it is hard for a Shan to distinguish them, and impossible for a European to do so. They live and intermarry with Shans and follow the same pursuits.

Musus ("Mokeso" Burmese).—These quaint primitive and extraordinary people are not found elsewhere in Siam, so I understand, nor have I ever met them or even heard of them in Burma. There are considerable numbers in south-west China and in the Southern Shan States; they live much as do Karens, but their villages are even more remote from towns and villages, and generally range from five to twenty houses on a ridge right at the head waters of streams with their taungyas below them; they are extremely dirty and seem to me to all suffer from itch, which they appear to take no steps to rid themselves of. They are Nat-worshippers, and have no idea, as far as I could judge, of a Supreme Being. When they are dressed in their best, generally at a wedding or upon coming into a town, they are really singularly picturesque figures, with large silver earrings and buttons, and sort of medallion brooches, the women that is; the men dress much as do Shans, but are wilder looking, more untidy and infinitely dirtier.

From what I have said above, one would think they were shy; but they are very far from being so, especially in their villages, where women and children swarm down to your camp and would relieve you of all you possessed if you gave way to their importunities. In towns they think nothing of walking up the steps of one's house and satisfying, or trying to satisfy, their insatiable curiosity. They live on the produce of their taungyas eked out with what they shoot, chiefly with a species of cross-bow and a deadly poisonous arrow, a cut even from which is said to be certain death.

Much could be written about these singular wild but fearless people, which cannot be contained in the short paragraphs of a forest report. They deserve special study.

ii.—Other Animals. My guide, who was last in this valley 12 to 14 years ago (and who is a typical old dacoit-looking Shan, a very powerful man, tattooed from head to foot, tells me that at that time elephants, bison, and sine (*Bos sondaicus*) were plentiful right down to the Me Pah village, and sambhar, to quote his own words, could be shot two or three in a day.

Now bison and sine are confined to the huge range dividing British from Siamese territory, seldom coming lower than the upper ridges forming the catchment area of the H. Heng Luang and Me Lan Heng.

Elephants are pratically non-existent, but rhino are said to be occasionally found in the high range alluded to above. Sambhar still are fairly plentiful, but are fast being exterminated.

I do not suppose a single moonlight night passes but one or more Shan hunters sit up at each of the saltlicks marked in the map and at others, and very often with fatal result. Bands of these hunters are repeatedly met. Gyi (barking deer) are fairly plentiful and the serow (I think from its tracks), and another mountain goat allied very closely to the gooral. Jungle fowl and imperial pigeon are very numerous in parts.

Tigers and panthers are conspicuously absent. I came across no pugs even, during the whole of my time in the forest.

Fish swarm in all the creeks, which is extraordinary considering the way they are fished by all and by all methods from dynamite to the hook. Every man appears to have a gun, generally a flint-lock, although a few possess Winchesters, which all appear to have been smuggled over from British territory, from Upper Burma, so the people were unanimous in telling me. The Chinese have the most extraordinary looking jingals with pistol handle and very long barrels. The price of a really fair flint-lock is wonderfully cheap, ranging from Rs.12 to Rs.20 at the very most, which shows that importation must be very frequent and plentiful.

Line of Export.

In old days the line of export was very much the line Messrs. The B. B. T. C. L. are now taking, but to avoid the slip which, though very short, is particularly steep and rocky, and ends in a dry rocky stream; they are cutting a road as shown in the map, or rather drag-path which will have its terminus in the Pong Sam Prik, an almost floatable stream, thus avoiding not only the slip aforesaid but a two-mile *aung* (pushing by elephants) and drag down the H. Kann and another mile and a half down the Pong Sam Prik.

Between the head of the slip and the head of the block-and-tackle path, the distance is $3\frac{2}{3}$ miles, the ruling gradient being 1 in 20, and the maximum 1 in 12 or approximately so. The part on which it is intended to use the block-and-tackle arrangement is only 810 yards, but is very steep in parts; if a cart-road could be in any way got up this part timber could be carted from B. Me Pah to the Pong Sam Prik at a greatly diminished cost. Apparently this is not feasible, at least, so it has been decided by Messrs. The B. B. T. C. L. and their advisers.

The work of dragging logs from B. Me Pah at the foot of the hills on the Me Lan side to the Pong Sam Prik, is at present

intended to be negotiated by the Corporation as they have not yet, so I understand, been able to get any one to take up the work on contract, although they may, and very probably will, do so later on when once the tackle is up and in full working order.

* * * * * *

VALUATION SURVEYS.

Me Lan.

Girdled Teak.				Green Teak.				
Over 8′ girth.	Over 6′, under 8′.	Under 6′, over 3½′	Under 3½′.	Over 8′.	Under 8′, over 6′.	Over 6′ under 3½′.	Under 3½′ over 6″.	Advance growth.
			No. 1.					
18	13	4	...	3	12	14	19	42
Per acre, 0·50	0·36	0·11	...	0·08	0·33	0·39	0·50	1·17
Total 124								
Length of line 1 mile × 100 yards = 36 acres.								
			No. 11.					
6	8	3	...	4	7	11	16	31
0·07	0·09	0·03	...	0·05	0·09	0·14	0·20	0·38
Total 86								
Line, 2¼ miles × 100 yards area = 81½ areas.								

J. G. F. Marshall,
Forest Officer, on Special Duty.

IV.—REVIEWS.

Forest Administration in the Bombay Presidency during 1899-1900.

In the Central and Northern Circles the attention of the staff was given not so much to forestry as to famine work, and that their work was appreciated is evinced by the manner in which the different Commissioners and Collectors have testified their approval in forwarding the various Circle and Divisional reports. Details of the famine operations carried out by the Forest Department are not given in the report, as they form the subject of separate reports; but it is understood that the chief work was the supply of fodder to affected areas from districts where it was not required, and the collection together of cattle from adjoining parts into areas where grazing was available. By these two measures the mortality among the more valuable cattle was to some extent lessened, and what this means to them the ryots have now had ample opportunity of learning.

The work of selection and settlement appears to be very well advanced throughout the Presidency. In the Southern Circle much demarcation remains still to be effected, but the work is being carried out in a thoroughly systematic manner through the agency of a special forest demarcation party which

is taking up the demarcation of a range at a time, and has demarcated 1,220 miles of forest boundary up to date. As there is said to be sufficient work remaining to occupy the party for another eight or nine years, it would seem advisable to expedite the work as much as possible by organizing one or more new parties.

The results of fire-protection during the year varied most curiously. In the Northern and Central Circles, where the drought and scarcity were severe, fires were fewer than usual and less extensive. The reason for this is discussed in the report. Some collectors attribute it to the absence of grass, while some forest officers deny this and attribute it not so much to the absence of grass as to the reluctance of the people to burn what they had in the absence of any knowledge as to when they might expect a fresh crop. In the Southern Circle, where the drought and scarcity were not nearly so severe, the fires were more extensive than usual, and this is accounted for by the fact that though the dryness was greater than usual, the people were fairly sure of their monsoon, and so set fire to the grass in many places with a view to getting an early fresh crop. In Sind, in spite of the dry season, fires were less harmful than might have been expected, only 4,269 acres having been burnt as compared with 9,230 acres in the previous year. This immunity has been attributed to the formation of special patrol parties whose attention was given to the prevention of fires and of forest offences within certain fixed areas.

During such a year natural reproduction was of course almost completely a failure, and little was possible in the way of artificial reproduction. In the Central Circle, however, where forest settlement has been completed, attention is being given to the reboisement of denuded areas. The idea is to take up the systematic reboisement of blocks of 500 or 1,000 acres in each range, the block to be surrounded by a wire-fence and planted up at the rate of 50 to 100 acres per year. In this connection a central nursery is being formed, and the following progress in its formation was made during the year under report. "The whole area, 366-1 acres, was wire-fenced, quarters were built for the resident Range Forest Officer, also a shed for seed and stores, both works being practically completed. Water channels were excavated connecting with other private channels from the main Mutha Canal, and beds were laid out sufficient to meet present requirements. Seed was collected from the various divisions of the Circle and sown to the amount of 590 maunds.

"The following are the details regarding the area, &c., of the nursery:—

Total area enclosed by wire	...	...	366-1 acres.
Total irrigable area	...	...	250 0 „
Total area which can be bedded, exclusive of paths between beds	...	...	83-0 „

The principle on which the nursery is being worked is as follows:—

The root-system of the plant must be developed and the crown-system suppressed in order that when the plant is put out into the forest it may survive the long month of drought by the help of the extra vitality which the enlarged root-system will store without the corresponding drain of an ordinarily developed crown-system subjected to a blazing sun.

The only means by which the above can be effected is by transplanting, whereby the crown-system will receive a shock that will retard its development and kill off for the time being the existing leaves, while the root-system will be fostered by artificial irrigation.

It is proposed to transplant three or four times in the nursery as experience may prove necessary, and to send the young plants out into the forests at the commencement of the rainy season. They will then have the whole of the growing season in which to establish themselves, and with everything in their favour in the way of moisture, they should, thanks to their abnormally developed root-system, have no difficulty in making such a start in life as will safely tide them over the ensuing hot season, by which time they will be safe once and for all.

It is calculated that on the final transplanting in the nursery the plants will be one dozen to the square yard, *i.e.*, 58,080 to the acre, which will give a grand total for the whole 83 acres under bed, of 4,820,740, a quantity which, it is estimated, will be sufficient to plant up specially 50 acres per range throughout the Circle in addition to supplying the requirements of the coupes of the year."

There is no doubt that in the future a great deal of planting will have to be done on denuded areas in many parts of India. This appears to be one of the most systematic attempts at reboisement which have been made in India, and it is to be hoped that it will be successful, and that we shall hear more about it.

VI.—EXTRACTS, NOTES AND QUERIES.

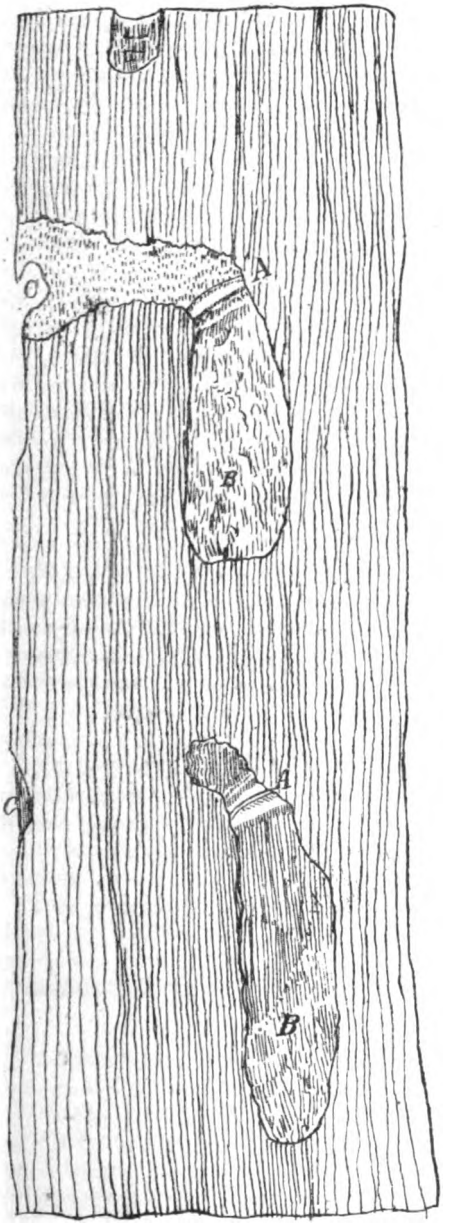
Notes on a Beetle injurious to Chloroxylon Swietenia in Ceylon.

Æolesthes induta.—Lewin. The Satinwood-borer.

(a)—*Description.*

THE beetle referred to belongs to the Longicorn family. The body is 1¼″ to 1½″ in length, and the antennæ from 1¾″ to 2″ more. It is dull-brown in appearance, with apparently no markings, and is covered with fine silky brown hair, but when turned about so as to get the sun to play on it, it gives one just the appearance of polished satinwood itself.

SKETCH showing chambers excavated by Longicorn Beetle in *Chloroxylon Swietenia*.



C = Mouth of chamber.

B = Pupal chamber.

A = Door shutting up chamber, composed of some calcareous substance.

The Imago emerges March.

Pupal chamber is excavated September and November.

Larva from April, May and October.

Egg laid in bark of dead and unsound trees.

(b)—*Life History.*

Flight.—At end of February and March.

The eggs are laid in the bark of newly-felled, dying or injured trees; so far as is yet known they do not attack healthy trees. A large number of eggs must be laid in each tree, as I have found as many as 30 larvæ in one small sapling, and never less than a dozen or so in one tree. The young larvæ when hatched commence boring a tunnel in between the bark and the sapwood. The tunnels are exceedingly tortuous, and completely ring the tree. The sapwood of the tree has precisely similar markings on it. The larva, when full grown, bores a hole into the sapwood, but sometimes penetrates as far as the heart-wood (my specimens went in about September, but I have known cases of them going into the wood earlier). Here he pupates shutting off his house from the outside world by a neat door made of some calcareous substance. I annex a sketch showing the chamber made, which is always of much the same shape and size. Here he remains until the end of the following February or March, when he undergoes his last change and emerges as a beetle. I am so far of opinion that there is only one brood a year, but this requires further investigation.

(c)—*Relations to the Forest.*

Any one walking through our low-country forests in Ceylon, throughout which satinwood is to be found, cannot help noticing scattered through the forest, either dead branches of living trees or young dead trees of satinwood, completely barked and studded with fairly large holes. This is the work of the *Æolesthes*. The effect of these tunnels is to cause the bark to drop off in large pieces.

Natives frequently wound the bark of the satin to obtain the gum, which flows fairly freely, and here the beetle generally finds an opening to attack.

'*Viscum orientale*,' a mistletoe, also grows on satin branches, frequently strangling and killing off the branch it is on; this is another chance for the borer, while trees growing on ridges are particularly liable to attack, as they so often have branches broken off by the wind. So far as I know, satinwood (*Swietenia chloroxylon*) is the only tree attacked by this beetle.

(d)—*Protective Rules.*

All satin logs felled for sale should be immediately barked, as then the beetle has no place to lay its eggs. Satin branches, not marketable, should be left as traps, for two or three months, and then all burnt off, as 20 to 30 larvæ will probably be found in each branch of any size, and hundreds could be killed off each year.

Frequent thinnings and quick removal of all sickly trees.

H. P. C. ARMITAGE,
Asst. Conservator, Forests, Ceylon.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Wood Circular.

July 3rd, 1901.

EAST INDIAN TEAK.—The deliveries for June amount to 1,471 loads against 962 loads for June last year, and 7,674 loads for the first six months against 5,187 loads in 1900. The stock continues slightly below that of last year, but ample for current demand. Planks have been more enquired for. The demand for floating cargoes has not improved, but there is little unsold wood available for prompt delivery.

ROSEWOOD, EAST INDIA—Remains dull, and stocks are more than sufficient.

SATINWOOD, EAST INDIA.—The stock is rather heavy and sales slow, as the demand is dull.

EBONY, EAST INDIA.—If really good and sizeable, would sell well.

PRICE CURRENT.

Indian Teak,	per load	... ...	£10 15*s.* to £16 15*s.*
Rosewood	,, ton	... ...	£5 to £9.
Satinwood	,, superficial foot	...	5*d.* ,, 12*d.*
Ebony	,, ton	... ...	£9 ,, £12.

Denny, Mott and Dickson, Limited.

WOOD MARKET REPORT.

London, 2nd July, 1901.

TEAK.—During June the landings in the London Docks consisted of 690 loads of logs and 488 loads of planks and scantlings, or a total of 1,178 loads, as against 506 loads for the corresponding month of last year. The deliveries into consumption were 1,156 loads of logs and 289 loads of planks and scantlings, together 1,445 loads, as against 1,020 loads in June, 1900.

The Dock stocks at date analyse as follows :—

	7,876	loads of	logs as against	10,155	loads at the same date last year.		
	5,558	,,	planks ,,	3,788	,,	,,	,,
	31	,,	blocks ,,	7	,,	,,	,,
Total	13,465		,,	13,950	,,	,,	,,

The above figures are much more satisfactory in respect to the demand for logs than for planks. Shippers continue to overestimate the outlet for planks and scantlings on this side. That such conversions are being more and more appreciated for domestic purposes, quite apart from ship and railway carriage building, is

incontrovertible; but when trade becomes dull and taxation burdensome, the tendency is rather to revert to cheaper woods for construction than to continue to replace them by the more expensive wood, however much teak has gained ground in the estimation of architects and the general public.

Market Rates of Products.

Tropical Agriculturist, July 1st, 1901.

Cardamoms	...	... per lb.	2*s.* 3*d.* to 3*s.* 3*d.*
Croton seeds	...	... ,, cwt.	25*s.* to 35*s.*
Cutch	...	... ,, ,,	22*s.* to 35*s.*
Gum Arabic	...	... ,, ,,	23*s.* to 35*s.*
Do. Kino	...	... ,, ,,	1*s.* 6*d.* to 1*s.* 9*d.*
India-rubber, Assam		... ,, lb.	2*s.* 6*d.* to 2*s.* 9*d.*
Do. Burma		... ,, ,,	2*s.* to 2*s.* 9*d.*
Myrobalans, Madras		... ,, cwt.	5*s.* to 6*s.*
Do. Bombay		... ,, ,,	4*s.* 3*d.* to 7*s.* 6*d.*
Do. Jubbulpore		... ,, ,,	4*s.* 3*d.* to 5*s.* 6*d.*
Do. Calcutta		... ,, ,,	3*s.* 6*d.* to 5*s.*
Nux Vomica	...	... ,, ,,	7*s.* to 10*s.* 6*d.*
Oil. Lemon-grass	...	... ,, lb.	4*d.*
Sandalwood Logs	...	... ,, ton	£20 to £50.
Do. Chips	...	... ,, ,,	£4 to £8.
Sapanwood	...	... ,, ,,	£5 to £5 10*s.*
Seedlac	...	... ,, cwt.	50*s.* to 55*s.*
Tamarind, Calcutta	...	... ,, ,,	10*s.* to 11*s.*
Do. Madras	...	... ,, ,,	7*s.* 6*d.* to 11*s.*

THE

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Thinnings.

By H.

A famous authority explains in a small-type foot-note on page 107 of the July number of the *Revue des Eaux et Forêts*, the class, *i.e.* degrees of thinnings (*Durchforstung*) known in Germany by the letters A, B, and C, and the difference between the new style described by D and what is understood by thinning (*éclaircie*) in France. As these explanations should be known by heart and be looming large in the mind of every officer who has thinnings to make, whether in pure sál poles or in mixed crops of deodar and *P. excelsa*, or of sandal and casuarina, we take the liberty of translating the little foot-note for the benefit of our readers.

"(*a*) The thinning A consists in the removal of dead wood only. The thinning B comprises at the same time the cutting out of all completely suppressed stems. The thinning C goes farther and includes for removal the distinctly slow-growing individuals, whose extreme tops only are mixed up in the canopy.

"(*b*) The thinning D differs essentially from the French *éclaircie*—

"*First*, because it includes a weeding, *i.e.*, the cutting out of a dominant canopy;

"*Second*, in that it provides for the removal from the main crop of only such stems as have incomplete or contracted crowns. It is also a harvesting cutting, whereas the *éclaircie* is a true improvement felling. This latter very often carries with it, particularly in mixed crops, the cutting out of the biggest and tallest trees when they are detrimental to individuals of a more precious kind or of better shape."

Is it not from the *éclaircie*, well understood and carried out with one's eyes on the canopy, that we may learn to thin successfully, rather than from the more narrowly defined *Durchforsten* A, B, C, or D?

A Teak-boring Mollusk.

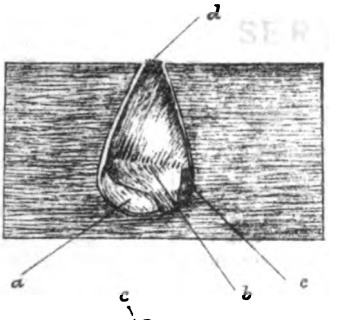
By R. S. Troup, *F. C. H.*

Martesia fluminalis is the name given to a mollusk which is prevalent in the brackish waters of the Pegu Canal, Lower Burma, and which causes a certain amount of damage to teak logs stored there for any length of time in the water. This particular mollusk is an estuarine species of the Pholad family, all of which are boring mollusks and will destroy anything but iron. Although normally found in estuarine waters, they have a tendency to spread above tidal influence into fresh water.

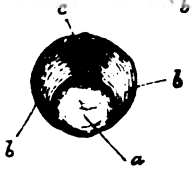
From the diagrams it will be seen that the creature is conical in shape, the boring end being the broad end. The largest specimens I have found measure three-quarters of an inch in length and half an inch in diameter at the base. It is whitish in colour, soft inside, with a rather thin shelly covering. An exterior examination of a teak log attacked by *Martesia fluminalis* reveals numerous small holes about one-sixth of an inch in diameter. On cutting the wood open the mollusk may be found in a cavity which it fits, the narrow end (orifice) pointing outwards towards the external hole in the log; it is evident, therefore, that the animal gets in when small and grows inside. As far as I have been able to ascertain, this mollusk does not burrow deep into the timber; the destruction, however, of the external layers of teak logs is a sufficient argument against the storage of teak timber in brackish waters where these animals abound.

A Teak-boring Mollusk

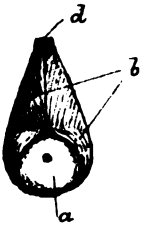
Martesia fluminalis
(actual size)



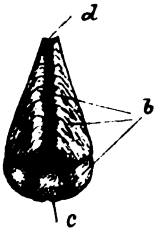
1. *Section of a piece of teak showing the mollusk embedded (side view)*



2. *View of mollusk from beneath*



3. *Front view*



4. *Back view*

a = Soft interior. b = shelly covering.
c = membranous plate. d = orifice.

Photozincographed at the Office of the Trigonometrical Branch, Survey of India, Dehra Dún, August 1901.

Regn. No. D. 800, I. F. - Aug. 1901 - 800

Insufficiency of the World's Timber Supply.*

(*Concluded from page* 463.)

TABLE No. XXIII.

SERVIA.

Imports and Exports of Common Woods in 1898.

Class of material.	Imports.		Exports.	
	Cubic metres.	Francs.	Cubic metres.	Francs.
	Firewood.			
Firewood ...	114,905	449,231	18,352	81,722
	Timber.			
Walnut logs ...	61	9,505	149	8,300
Oak staves for casks	32	1,870	4,266	281,476
Round or rough timber, scantlings, rafters and poles.	5,120	102,587	3,579	104,259
lanks, laths, floor-Pings and staircasing.	23,717	641,860	9	200
Vine-props, shingles and piles.	35	739	...	...
Total Timber ...	28,765	756,561	8,003	394,235
	Charcoal.			
	Kilogrammes.			
Charcoal ...	9,265	503	...	...
Totals ...	Cub. metres. 143,870 Kilogrammes 9,265	1,206,995	26,355	475,957

* Translation by F. Gleadow, I.F.S., F.R.M.S., of "L'insuffisance de la production des bois d'œuvre dans le monde," par A. Mélard, Inspecteur des Eaux et Forêts.

TABLE No. XXIV.

AUSTRIA-HUNGARY.

Imports and Exports of Common Woods in 1888.

Class of material.	Imports.		Exports.	
	Metric cwt.	Florins.	Metric cwt.	Florins.
		Timber.		
European hardwoods, rough.	109,720	384,992	481,430	1,733,148
European softwoods, rough.	296,013	355,216	6,814,593	10,221,889
European hardwoods, rough-dressed.	86,932	347,728	480,992	1,923,968
European, softwoods, rough-dressed.	135,876	211,967	1,500,042	3,000,084
Cooperage ...	132,750	995,625	2,060,514	15,453,855
Sleepers ...	40,832	57,165	336,094	672,188
Sawn hardwoods (veneers not included.)	21,888	87,552	808,327	4,849,962
Sawn softwoods (veneers not included.)	139,356	362,326	6,441,591	19,324,773
Total Timber ...	963,367	2,802,571	18,923 583	57,179,867
Value in Francs ...	...	5,885,399	...	120,077,721
		Firewood, Spent Bark, &c.		
Firewood, spent tan, &c.,	505,787	276,496	1,969,592	1,083,578
Value in Francs ...	...	580,642	...	2,275,514
		Charcoal and Charcoal Bricks.		
Charcoal and charcoal bricks.	11,944	27,471	359,744	899,360
Value in Francs ...	...	57,689	...	1,888,656
GRAND TOTAL ...	1,481,098	3,106,538	21,252,919	59,162,805
Value in Francs ...	...	6,523,730	...	124,241,891

TABLE No. XXV.

AUSTRIA-HUNGARY.

Imports and Exports of Common Woods in 1898.

Class of material.	IMPORTS.		EXPORTS.	
	Metric cwt.	Florins.	Metric cwt.	Florins.
	Timber.			
European hardwoods, rough,	114,164	193,166	752,568	3,485,699
„ softwoods „	990,526	965,009	16,278,531	32,265,965
„ hardwoods, rough-dressed.	44,973	89,946	343,155	1,687,432
European softwoods rough-dressed.	71,676	157,965	1,732,380	4,649,435
Cooperage	50,589	352,268	1,292,586	8,671,260
Sleepers	63,645	85,921	872,687	1,988,663
Sawn hardwoods (veneers not included).	51,650	151,818	1,451,361	9,355,527
Sawn softwoods (veneers not included).	336,899	699,054	10,764,555	35,131,902
Total Timber ...	1,724,122	2,695,147	33,487,823	97,235,883
Value in Francs ...	...	5,659,809	...	204,195,354
	Firewood, Spent Bark, &c.			
Firewood, spent tan, &c. ...	778,420	429,378	1,877,508	1,999,886
Value in Francs ...	...	901,694	...	4,199,761
	Charcoal and Charcoal Bricks.			
Charcoal and charcoal bricks	10,925	32,775	161,597	547,759
Value in Francs ...	...	68,827	...	1,150,294
GRAND TOTAL ...	2,513,467	3,157,300	35,526,928	99,783,528
Value in Francs ...	...	6,630,330	...	209,545,490

TABLE No. XXVI.

AUSTRIA-HUNGARY.

Gross volume standing in forest required for Imports and Exports of 1898.

Class of material.	Imports.			Exports.			Excess imports volume standing in forest.
	Metric cwt.	Cubic metres.	Corresponding volume standing in forest.	Metric cwt.	Cubic metres.	Corresponding volume standing in forest.	
European hardwoods, rough	114,164	14,270	14,270	752,568	94,070	94,070	79,800
,, softwoods, ,, ...	990,526	180,090	180,090	16,278,531	2,959,730	2,959,730	2,779,640
,, hardwoods, rough-dressed ...	44,973	5,620	7,020	343,155	42,890	53,610	46,590
,, softwoods ,, ,, ...	71,676	13,030	14,480	1,732,380	314,970	349,970	335,490
Cooperage	50,589	7,230	14,460	1,292,586	184,650	369,300	354,840
Sleepers	63,645	10,610	11,790	872,687	145,450	161,610	149,820
Sawn hardwood	51,650	6,450	12,900	1,451,361	181,420	362,840	349,940
,, softwood	336,899	61,250	87,500	10,764,555	1,957,190	2,795,990	2,708,490
Total ...	1,724,122	298,550	342,510	33,487,823	5,880,370	7,147,120	6,804,610

TABLE No. XXVII.

NORWAY.

Imports of Common Woods in 1888

Class of material.	Kilogrammes.	Value in kronen.
Hoops	558,768	68,700
Cooperage in the rough	813,471	56,900
,, finished	235,625	18,800
Miscellaneous	145,147,533	4,354,400
Total ...	146,755,297	4,498,800
Volume in cubic metres ...	293,500	...
Value in Francs ...	...	6,247,9[illegible]3

TABLE No. XXVIII.

NORWAY.

Exports of Common Woods in 1888.

Class of material.		Kilogrammes.	Value in kronen.
	Timber.		
Above 19 decimetres.	Planed wood of all kinds	551,984	13,799,600
	Sawn wood	504,717	9,787,700
	Beams, posts, telegraph poles, &c.	382,322	3,725,400
Below 19 decimetres.	Planking for boxes ...	36,922	701,500
	Barrel staves and cut up material.	87,775	1,459,800
	Props	196,265	1,472,000
	Sleepers	13,233	152,200
	Wood for cellulose ...	29,619	192,500
	Miscellaneous ...		9,400
	Total ...	1,802,837	31,300,100
	Value in Francs ...	...	43,469,579
	Firewood.		
Firewood and chips		94,469	831,300
	Value in Francs ...	...	1,154,509
	Total Exports ...	1,897,306	32,131,400
	Value in Francs ...	...	44,624,038

TABLE No. XXIX.

NORWAY.

Imports of Common Woods in 1898.

Class of material.	Kilogrammes.	Value in kronen.
Hoops	1,515,877	174,60)
Cooperage in the rough	1,503,671	105,300
,, finished	55,960	16,800
Miscellaneous	181,312,567	5,439,400
Total ...	184,388,075	5,736,100
Volume in cubic metres ...	369,000	...
Value in Francs ..	...	7,966,296

TABLE No. XXX.

NORWAY.

Exports of Common Woods in 1898.

Class of material.		Cubic metres.	Value in kronen.
	Timber.		
Over 19 decimetres.	Planed wood of all kinds	599,283	18,877,400
	Sawn wood	529,825	11,596,100
	Beams, posts, telegraph poles, &c.	387,928	4,558,600
Below 19 decimetres.	Planking for boxes ...	75,051	1,501,000
	Barrel staves and cut-up wood.	85,833	1,550,800
	Props	126,459	910,500
	Sleepers	5.285	60,800
	Wood for cellulose ...	39,218	258,800
	Miscellaneous ...	...	57,200
	Totals ...	1,848,882	39,371,200
	Value in Francs ...	...	54,678,723
	Firewood.		
Firewood and chips		124,940	762,100
	Value in Francs ...	...	1,058,404
	Total Exports ...	1,973,822	40,133,300
	Value in Francs ...	...	55,737,127

TABLE No. XXXI.

SWEDEN.

Imports of Common Woods in 1888.

Class of material.		Cubic metres.	Value in kronen.
	(I)—*Timber.*		
Pine or spruce	For carpentry or masts, at least 20 cm. diam. at the small end ...	8,256	247,680
	Ditto smaller ...	984	24,600
	Railway sleepers	300	4,500
	Beams, at least 20 cm. in the middle	306	6,120
	Ditto smaller ...	339	5,085
	Battens and scantlings, at least 5 cm. thick, and 10 cm. broad ...	1,082	32,460
	Planks, less than 5 cm. thick, and of any breadth	2,960	74,000
	Planks, &c., shorter than 2 metres	296	2,072
	Laths and small stuff	134	2,680
	Cooperage, staves and headers ...	2,841	71,025
	Miscellaneous	35	350
Other species	Cooperage, staves and headers ...	230	6,900
	Miscellaneous	15,064	225,960
	Total Timber ...	32,827	703,432
	Value in Francs ...	...	976,926
	(II)—*Firewood.*		
Firewood	Pine or spruce	26,951	134,755
	Others	74,937	749,370
	Total Firewood ...	101,888	884,125
	Value in Francs ...	...	1,227,873
	GRAND TOTALS ...	134,715	1,587,557
	Value in Francs ...	...	2,204,799

TABLE No. XXXII.

SWEDEN.

Exports of Common Woods in 1888.

Class of material.		Cubic metres.	Value in kronen.
	(I)—*Timber.*		
Pine or spruce.	For carpentry or masts, at least 25 cm. diam. at the small end ...	194,822	6,604,466
	Ditto smaller	34,320	637,666
	Telegraph posts	50	600
	Mine props	456,486	4,345,738
	Hoops and boathooks	801	8,811
	Sleepers	13,141	118,269
	Laths, small stuff, &c.	17,937	354,590
	Beams, at least 20 cm. thick in the middle.	90,246	1,882,532
	Ditto smaller	203,550	2,688,896
	Planks, battens and scantlings, at least 5 cm. thick, and 10 cm. wide ...	2,683,955	63,931,808
	Ditto less than 5 cm. thick, and of any width.	1,107,586	20,290,976
	Planed planks and matchboards ...	188 394	4,651,448
	Short pieces	258,174	1,706,530
	Cooperage	44,976	1,124,400
	Various	5,565	55,594
Other nativespecies	Cooperage	9,194	275,820
	Various	10,156	152,340
	Total Timber ...	5,319,352	108,830,484
	Value in Francs ...	...	151,143,776
	(II)—*Firewood.*		
Firewood	Pine or spruce	20,757	103,785
	Others	76,408	764,080
	Total Firewood ...	97,165	867,865
	Value in Francs ...	...	1,205,291
	GRAND TOTAL ...	5,416,517	109,698,349
	Value in Francs ...	...	152,349,067

TABLE No. XXXIII.

SWEDEN.

Imports of Common Woods in 1898.

	Class of material.	Cubic metres.	Value in kronen.
	(I)—*Timber.*		
Pine or spruce.	For carpentry or masts, at least 25 cm. thick at the small end	45,449	1,461,185
	Spars and masts from 25 down to 5 cm. diam. at the small end	76,076	1,076,475
	Beams, at least 20 cm. thick at middle ...	44	1,012
	Ditto smaller	1,147	13,191
	Scantlings and battens, at least 5 cm. thick, and 10 cm. wide	1,166	31,715
	Planks, less than 5 cm. thick, and of any width	5,704	136,896
	Planks and scantlings, less than 2 metres in length	8,299	60,998
	Laths, small stuff, &c.	217	4,080
	Cooperage...	2,223	31,455
Other native species.	Cooperage	1,596	39,900
	Various	35,483	532,245
	Total Timber ...	177,404	3,389,152
	Value in Francs ...	...	4,706,854
	(II) - *Firewood.*		
Firewood.	Pine or spruce	43,274	108,185
	Others	59,543	297,715
	Total Firewood ...	102,817	405,900
	Value in Francs ...	...	563,714
	GRAND TOTAL ...	280,221	3,795,052
	Value in Francs ...	...	5,270,568

TABLE No. XXXIV.

SWEDEN.

Exports of Common Woods in 1898.

Class of material.		Cubic metres.	Value in kronen.
	(I)—*Timber.*		
Pine or spruce.	For carpentry and masts at least 25 cm. thick at the small end ...	95,934	3,084,278
	Spars and masts, smaller... ...	71,426	1,010,678
	Hoops and boat-hooks	580	6,380
	Telegraph posts	5,301	63,612
	Oars and sculls	88	1,320
	Beams, at least 20 cm. thick in the middle	67,159	1,544 657
	Beams, smaller	251,382	2,890,893
	Railway sleepers	50,736	791,482
	Mine props	793,528	7,300,458
	Wood for making cellulose ...	10,420	62,520
	Scantlings and battens, at least 5 cm. thick, and 10 cm. broad... ...	2,667,066	72 544,195
	Planks less than 5 cm. thick, and of any width	1,629,905	39,117,720
	Planed planks and matchboards ...	451,819	12,763,887
	Short planks and scantlings ...	326,488	2,914,187
	Laths, shingles and small stuff ...	57,281	1,022,281
	Cooperage	45,465	643,330
	Various	6,532	65,320
Other native species.	Cooperage	1,807	45,175
	Various	14,231	213,465
	Total Timber ...	6,547,148	146,085,838
	Value in Francs ...	...	202,884,012
	(II)—*Firewood.*		
Firewood	Pine or spruce	16,156	40,390
	Others	55,067	275,335
	Total Firewood ...	71,223	315,725
	Value in Francs ...	...	438,479
	GRAND TOTAL ...	6,618,371	146,401,563
	Value in Francs ...	...	203,322,491

TABLE No. XXXV.

FINLAND.

Exports and Imports of Common Woods in 1898.

Class of material.		Cubic metres.	Value in francs.
	EXPORTS.		
	I.—*Timber.*		
Pine or spruce.	*In the rough*—		
	Masts, spars, logs, carpentry ...	178,900	2,594,051
	Dutch beams	3,286	78,864
	Mine props	367,831	2,574,817
	Billets for cellulose ...	378,184	2,647,288
	Various	117	1,404
	Squared or part sawn—		
	Common beams	454	18,160
	Other beams and squared logs	64,424	1,803,872
	Sleepers	9,522	142,830
	Laths and small pieces ...	65,360	1,307,200
	Oars and boathooks ...	2,299	41,382
	Sawn or part finished—		
	Sawn pieces over 2 metres ...	288,033	12,097,386
	Large scantlings	769,681	28,863,039
	Battens	936,515	32,778,025
	Planks	2,312	62,424
	Sawn beams	122,717	1,127,170
	Short planks	91,360	1,827,200
	Cooperage	...	3,355
	Planed wood	...	56
	Various	...	...
Other native species.	Aspen	6,539	130,740
	Birch	18,287	731,480
	Cooperage ...	1,263	44,205
	Others, squared or rough ..	8,189	131,024
	Others, sawn or planed ...	116	4,408
	Total Timber ...	3,315,389	89,010,380
	(II)—*Firewood.*		
Firewood ..	Pine or spruce	309,526	928,578
	Others	285,079	1,140,316
	Total Firewood ...	594,605	2,068 894
	GRAND TOTAL EXPORTS ...	3,909,994	91,079,274
	IMPORTS.		
	Various	...	771,984

TABLE NO. XXXVI.

RUSSIA.

Exports of Common Woods in 1897.

Class of material.	Value in roubles.
(I)—*Timber.*	
Rough ... Oak	317,601
Rough ... Pine	7,740,380
Rough ... Spruce	2,220,706
Rough ... Various	640,064
Poles	357,971
Pieces ... Squared (rafters, ties, &c.)	5,970,808
Pieces ... Sawn (planks, &c.)	29,570,658
Laths and shingles	93,902
Posts	536,602
Walnut wood...	227,396
Various produce	6,411,325
Total Timber ...	54,087,413
Value in Francs ...	144,233,100
(II)—*Firewood.*	
Oak	23,152
Pine	313,038
Spruce	127,922
Birch	37,899
Various	238,225
Brushwood	6,162
Total Firewood ...	752,398
Value in Francs ...	2,006,395
GRAND TOTAL ...	54,839,811
Value in Francs ...	146,239,495

RUSSIA.

TABLE No. XXXVI *(a)*.

Exporting Frontiers and Importing Countries.

	Value in roubles.
Exports according to Frontiers.	
White Sea Frontier	7,518,617
Baltic Frontier	28,104,650
German do.	16,820,959
Austro-Hungarian Frontier	534,711
Roumanian Frontier	43
Black Sea do.	1,269,766
Sea of Azov do.	12
Finland do.	52,425
Asiatic do.	538,628
Total ...	54,839,811
Exports according to Countries importing them.	
Belgium 2,865,630	
England 21,948,262	47,848,859
Germany 19,334,335	
France 3,700,632	
Other countries	6,990,952
Total ...	54,839,811

TABLE No. XXXVII.

RUSSIA.

Imports of Common Woods in 1897.

Class of material.	Value in roubles.
Rough timber, firewood, faggots, brushwood	2,765,459
Squared pieces, over 2 inches thick	205,573
Planks, &c., from ¼ inch to 2 inches thick	1,607,481
Total ...	4,578,513
Value in Francs ...	12,207,368

TABLE No. XXXVIII.

ROUMANIA.

Imports and Exports of Common Woods from 1894 *to* 1898.

Year.	Material.	Units.	Import. Amount.	Import. Value in francs.	Export. Amount.	Export. Value in francs.
			(I)—Timber.			
1894...	Fir logs ...	Cub. metre.	26,928	394,470	21,080	316,200
1895...			14 860	297,200	14,255	285,100
1896...			64,824	1,296,480	57,734	1,154,680
1897...			5,345	106,903	89,162	1,783 240
1898...			1,861	37,220	50,695	1,013,900
	Average ...	...	22,638	426,455	46 585	910,624
1894...	Timber for building and carpentry.	Tonne	1,401	140,101	33,957	3,395,695
1895...			1,320	132,046	39,340	3,933,966
1896...			862	68,990	59 535	4,762.768
1897...			560	44 808	50,689	4,055,118
1898...			1,247	99,754	39,378	3,150,200
	Average ...	...	1,078	97,140	44,580	3,859,549
1894...	Oak cooperage	Tonne	541	54,116	6,327	632.677
1895...			418	41,768	796	79,622
1896...			339	33,912	9,194	919,370
1897...			701	70,061	780	79,998
1898...			492	49,198	1	86
	Average ...	...	498	49,811	3,420	342,351
	Timber, mean average totals	Cub. metre ...	26 638	573,406	46,585	5,112,524
		Tonne ...	1,576		48,000	
			(II)—Firewood.			
1894...	Firewood ...	Tonne	13,350	200,255	5,638	84,584
1895...			9,031	180.618	9,104	182,071
1896...			9,370	187,418	14,585	291,705
1897...			8,941	178,838	12,031	240,622
1898...			10,602	202,049	19,513	390,270
	Average ...	...	10,259	189,835	12,174	237,850
			(III)—Charcoal.			
1894...	Charcoal ...	...	2,056	164,449	...	...
1895...			949	94,929	5	476
1896...			1,458	116,617	...	...
1897...			1,228	98,206	101	10,128
1898...			476	38,050	22	1,787
	Average ...	...	1,233	102,450	25	2,478
			Total of the mean values.			
	Timber ...	...	...	573,406	...	5,112,524
	Firewood ...	...	...	189,835	...	237,850
	Charcoal ...	...	...	102,450	...	2,478
	GRAND TOTAL...		...	865,691	...	5,352,582

TABLE No. XXXIX.

UNITED STATES.

Imports of Common Timbers from 1st July 1897 to 30th June 1898.

Class of material.	Units.	Gross Imports.		Re-exported.		Net Imports.	
		Amount.	Value in dollars.	Amount.	Value in dollars.	Amount.	Value in dollars.
Logs and round pieces	1,000 feet board-measure.	275,547	2,430,089	...	...	275,547	2,430,089
Building timber, squared fully or partly, with axe or saw.	do.	139,601	39,534	27,365	3,928	112,236	35,606
Sawyers' work (scantlings, boards) ...	do.	353,215	3,509,818	26,185	442,659	327,030	3,067,159
Shingles	per 1,000	435,421	760,984	1,523	1,523	433,898	759,461
Other sawn pieces	...	...	796,843	...	1,062	...	795,781
All other unwrought woods	...	...	2,304,766	...	184,113	...	2,120,653
Totals ...	...	...	9,842,034	...	633,285	...	9,208,749
Value in Francs ...	...	...	51,006,341	...	3,282,000	...	47,724,341

TABLE No. XL.

UNITED STATES.

Exports of Common Timbers from 1st July 1897 to 30th June 1898.

Class of material.		Units.	Amount.	Value in dollars.
Unmanufactured wood for carpentry, &c.	Sawn ...	1,000 feet, board-measure.	338,575	3438,578
	Chopped ...	cub. feet.	5,489,714	1,128,893
	Logs, &c ...	,,	...	3,189,820
Sawn timber ...	Planks and scantlings.	1,000 feet, board-measure.	790,659	12,080,318
	Match boards	do.	35,610	387,671
Shingles		per 1,000	50,524	101,040
Planks for boxes		...	...	486,860
Others		...	...	557,895
Staves for barrels		per each	54,142,759	3,559,750
Headers		...	...	227,328
Various timbers		...	...	3,256,880
Total ...		...	...	28,415,033
Value in Francs ...		...	...	147,260,909

TABLE No. XLI.

CANADA.

Exports of Common Woods from 1st July 1897 to 30th June 1898.

Class of material.	Units.	Amount.	Value in dollars.
(I)—*Timber.*			
Lime or white woods ...	1,000 feet, board-measure.	1,209	37,044
Hickory	do.	16	437
Bends and straight pieces ...	each	35,742	14,175
Wood for laths	cord	350	700
Cedar billets fit for shingles ...	do.	903	645
Logs of Elm	1,000 feet, board-measure.	8,483	53,784
Logs of Hemlock	"	1,121	4,030
Logs of Oak	"	120	2,517
Logs of Pine	"	186,049	1,616,671
Logs of Spruce	"	5,526	33,885
Logs of Various	"	9,342	89,430
Sawyers' Work—			
Battens	...	...	20,350
Pine scantlings	per 100	78,786	3,885,448
Other "	"	292,743	7,918,366
Short pieces, scantlings ...	"	22,224	641,068
Laths	per 1,000	334,971	343,378
Fencing	"	2,855	14,851
Posts and poles	"	1,779	18,052
Planks, &c.	1,000 feet, board-measure.	515,277	5,625,391
Rafters	"	573	5,229
Small sawn stuff	"	31,011	241,544
Staves (standard)	per 1,000	7,328	33,412
" various	...	...	368,171
Other sawn wood	...	...	257,603
Carried over ...	...	...	21,225,681

TABLE No. XLI—(*continued.*)

Class of material.	Units.	Amounts.	Value in dollars.
Brought over ...	...	...	21,225,681
Sawyers' Work—			
Wood for matches	...	...	15,892
Masts and spars	each	677	2,448
Piles	...	...	135 154
Hop poles	...	...	665
Hoops	...	...	1.180
Telegraph posts	...	...	20,759
Other ,, ...	...	...	13,522
Posts of cedar, tamarack, &c. ...	...	...	23,415
Shingles...	per 1,000	565,839	994,438
Bundles of pine or cedar shingles	cord	243	656
Sleepers	each	701,81[illegible]	101,191
Bundles of cooperage ...	cord	9,077	20,811
Boards for boxes	each	924,882	101,787
Other boards	...	...	18,768
Squared Timber—			
Ash	Tonne	3,042	34,290
Birch	,,	16,205	143,623
Elm	,,	16,009	222,5[illegible]9
Maple	,,	19[illegible]	2,09[illegible]
Oak	,,	33,841	740,502
Red pine	,,	5,834	62,011
White pine	,,	101,533	1,764,074
Other species	,,	1,508	39,955
Wood for pulp	...	...	912,041
Other woods	...	...	87,323
Total value, Timber ...	...	...	[illegible]6,684,813
Value in Francs ...	...	...	138,294,043
(II)—*Firewood.*			
Firewood	Cord.	79,972	140,897
Value in Francs ...	...	...	730,199
Total value of Exports in Francs...	...	...	139,024,242

TABLE No. XLII.

CANADA.

Imports of Common Woods from 1st July 1897 to 30th June 1898.

Class of material.	Units.	Amount.	Value in dollars.
(I)—*Timber.*			
Hickory logs	...	...	1,470
Fencing posts and sleepers ...	...	...	68,233
Unworked logs and building timber	...	...	136,918
Sawyers' and building timber. Cherry, chestnut, &c.	1,000 feet, board-measure	7,212	227,280
Oak	,,	24,863	484,782
Pitch-pine ...	,,	16 813	295,748
Red wood ...	,,	6	190
Walnut	,,	2,322	56,049
Sycamore ...	,,	42	1,782
White ash ...	,,	413	12,783
Boat building timbers	...	...	548
Rough-dressed sawyers' or building timber	...	...	462,363
Sawn or split planks and scantlings	1,000 feet, board-measure.	32,652	384,767
Pine and spruce planks ...	,,	238	1,455
Laths	per 1,000	6,819	8,450
Poles and rails	...	...	56
Shingles	per 1,000	13,864	19,772
Cooperage	,,	1,035	27,440
Total ...	...	...	2,190,089
Value in Francs ...	...	...	11,350,136
(II)—*Firewood.*			
Firewood	cord	10,783	21,861
Value in Francs ...	...	...	113,295
Total value of Imports in Francs ...	...	...	11,463,431

TABLE No. XLIII.

BRITISH INDIA.

Imports and Exports of Common Timbers for the year ending 31st March 1899.

Class of material.	Cubic tons.	Value in rupees.
IMPORTS.		
Teak	7,795	581,272
Other woods...	15,301	728,437
Total Imports ...	23,096	1,309,709
Re-exports to be deducted ...	369	32,784
Net Imports...	22,727	1,276,925
Volume in cubic metres ...	25,727	...
Value in Francs ...	...	2,145,234
EXPORTS.		
Teak	77,376	9,548,025
Other woods...	2,270	151,048
Total Exports ...	75,106	9,396,957
Volume in cubic metres ...	85,020	...
Value in Francs ...	...	15,846,888

NOTE.—The cubic ton is = 40 cubic feet or 1·132 cubic metres.
The rupee is taken as 16 pence or 1·68 francs.

TABLE No. XLIV.

CHINA.

Imports and Exports of Common Woods in 1898.

Class of material.	Value in Haïkwan taels.
(I)—IMPORTS.	
(*a*)—*Timber.*	
Total Imports	966,637
Re-exports to be deducted	2,082
Net Imports ...	964,555
Value in Francs ...	3,626,729
(*b*)—*Firewood.*	
Total Imports...	379,405
Re-exports to be deducted	1,682
Net Imports ...	377,723
Value in Francs ...	1,420,238
(II)—EXPORTS.	
Nil.	

TABLE No. XLV.

JAPAN.

Imports and Exports of Common Woods in 1898.

Class of material.	Value in yen.
(I)—IMPORTS.	
Building timber and planks	500,182
Re-exports to be deducted	10,622
Net Imports ...	489,560
Value in Francs ...	1,250,826
(II)—EXPORTS.	
Building timber and planks	356,079
Value in Francs ...	909,782

TABLE No. XLVI.

CAPE OF GOOD HOPE.

Imports and Exports of Common Timbers in 1898.

Class of material.	Units.	Amount.	Value in £ sterling.
(I.—IMPORTS.			
In the rough	cub. ft.	3,658,834	210,047
Cooperage	each	201,495	5,035
Planed wood	cub. ft.	1,810,927	131,556
	Total ..		346,638
	Value in Francs ...		8,742,210
(II)—EXPORTS.			
(Including re-exports).			
In the rough	cub. ft.	87,209	6,052
Planed wood	"	3,988	572
	Total ...		6,624
	Value in Francs ..		167,057

TABLE No. XLVII.

ARGENTINA.

Imports and Exports of Common Woods in 1898.

Class of material.	Units.	Amount.	Value in pesos (oro).
(I)—IMPORTS.			
Cooperage and small stuff ...	...	...	129,706
Un or half-wrought woods ...	cub. metre.	23,497	244,561
Walnut, thin boards	,,	435,581	52,268
,, planks	cub. metre.	1,418	79,516
Cedar	,,	16,271	162,726
White pine	,,	74,709	1,039,745
Spruce	,,	111,702	1,517,296
Resin pine	,,	127,843	1,760,231
Oak, in thin boards	sq. metre.	28,023	3,361
,, planks	cub. metre.	623	17,465
Ceiling laths	kilogram.	282,523	91,517
Hoops	...	...	46,317
Various articles	package.	5,023	165,737
	Total	...	5,310,446
	Value in Francs	..	26,552,230
(II—EXPORTS.			
Cedar	...	...	7,168
Sleepers	each.	10,000	15,000
Various woods	...	..	29,122
Posts	each.	177,708	64,530
Billets of quebracho	tonne.	188,260	1,882,604
	Total	...	1,998,424
	Value in Francs	...	9,992,120

II.-CORRESPONDENCE.

Two Burmese Aromatic Woods.

My attention has lately been drawn to the aromatic wood which is used as a cosmetic and perfume by Burmese ladies.* While working in Burma many years ago, I knew it as *Kalamet* or *Taungkalamet*, and when in 1868 Sulpiz Kurz commenced his studies in Burma, which resulted in his excellent Forest Flora, I drew his special attention to this wood. In Volume II, 207, he called the tree *Cordia fragrantissima*. This tree I had found (male flowers and leaves) in May 1859 near Oubo village on my way across the hills between the Kayma Pyu Chaung, a tributary of the Salween, and the Thaukyegat, a feeder of the Sitang river. The ticket is marked by me *Kawoh*, which probably is the Karen name of the tree. I also collected it (leaves only) in January 1862 in the Paunglin forests of Pegu. On both sheets the specimens are (in Kurz' handwriting) called *Cordia fragrantissima*. I also have a piece of the wood from Burma marked No. 89, and (on the ticket) 271.† This piece is strongly aromatic, and has the peculiar structure of *Cordia*, broad medullary rays, consisting of 3 to 6 rows of cells, and very conspicuous on a radial section, giving the wood a beautifully mottled appearance; a small number of mostly isolated large vessels, 0·2 mm. diam., and numerous crossbars of wood-parenchyma connecting the medullary rays. It has a distinct brown very hard heartwood, resembling that of *C. Macleodii* and *C. Rothii*, of which I have excellent specimens from different localities. From these however it differs by its strong aromatic smell. The heartwood of *Cordia Macleodii* is also scented, but very slightly.

There is, however, another aromatic wood in Burma, different in scent and in anatomical structure. Of this I lately received a small piece from a Burmese gentleman residing in London, who informed me that it came from Tavoy and Mergui, and was known as *Kalamet* and as *Taungdangyi*. In structure and in scent it resembles sandal wood. The scent, however, is stronger and more pleasant. The medullary rays are fine, consisting of one or two rows of cells, the rays are uniform, numerous and equidistant, and the vessels are small, only 0·05 mm. diam. The tree evidently is closely allied to *Santalum album*, but it certainly is not the same species. The medullary rays, which in sandal wood are always short, are much longer in the Burmese wood, and the vessels are not solitary, as in the Indian wood, but often in radial lines of 2—5.

* The ordinary cosmetic used by Burmese ladies is made from the bark of a tree called *Thanatka* in Burmese. This in Judson's Dictionary (Stevenson's Edition, p. 1112) is said to be *Murraya paniculata*, but it is probable that the bark of *Limonia acidissima* is also used under the same name.—Hon. Ed.

† This specimen is from the collection of 1884-5 made for the Indian and Colonial Exhibition. The number 271 refers to the page in Gamble's *Manual of Indian Timbers* on which the wood is described.—Hon. Ed.

The colour also is different, dark olive brown—contrasting strongly with the white sapwood. Of the same wood I have received two pieces from Burma marked No. 89 *Cordia fragrantissima*,* and on the ticket of the smaller piece is printed 271. Thus these two different aromatic woods were sent to me under the same name. Many years ago I was struck by the difference, and wrote about it to Mr. Oliver, then Conservator of Forests in Upper Burma. In 1889 Mr Oliver kindly sent me a piece of the same wood, marked "*Kalamet*, Mergui." He had evidently recognized its similarity to sandal wood, for in the excellent list of Burmese names of trees, compiled by him and printed in 1895 at the Burma Government Press, it is stated: "*Kalamet* (Tenasserim), *Santalum* sp."

On page 322 of Gamble's *Indian Timbers* a wood is mentioned, B. 1950, sent from Tavoy under the name of *Kalamet* "possibly another species of *Santalum*," which may perhaps be the same wood as that here described.

My object in writing these lines is to induce some of my younger friends in Burma to send me specimens in flowers or fruit of the Tavoy and Mergui *Kalamet*, together with authentic samples of the wood, and full notes regarding the places where the tree is found, its mode of growth and other particulars, so as to enable me to include it in "*Indian Trees*." I expect to be back at Kew in the autumn, and should be thankful if the specimens could be sent to Kew.

I may take this opportunity to mention that in reply to several of the questions submitted by me at different times to the readers of the *Indian Forester*, I have received most welcome and most useful communications, but that I am still waiting for information regarding the doubtful *Burmese Bamboos*, which formed the subject of an article communicated by me to the *Indian Forester* in 1900. There will still be time to send me notes and specimens, provided they reach Kew, say, in May 1902.

Bonn, July 1901. D. BRANDIS.

Proportionate Fellings in Selection Areas.

After consulting the "dim past," the "vivid present," and the "hopeful future," it is humiliating to have to confess that I have

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* This is another case of error due to collectors relying on native names for identification. Kurz gives *Kalahmet* as the Burmese name for *Cordia fragrantissima*, in mistake apparently for *Taung-Kalamet*. In 1884 when the specimens in question were being collected, *Kalamet* was sent from the Tenasserim circle labelled *C. fragrantissima*. As this was obviously wrong, the specimens were set aside and fresh ones asked for. These were duly received and exhibited, but by some mischance when packing the specimens, the rejected pieces, which had been prepared for exhibition before the mistake was discovered, were also included in the collection; hence the confusion.

From notes made in Mergui in 1889, it appears that *Kalamet* is reported to occur near the Siamese frontier at the source of the Theingon Chaung, a feeder of the Tenasserim river Further information will be found on page 80 of the British Burma Forest Administration Report for 1875-6.—HON. ED.

not derived much sustenance from the able contribution of "O. C.' in our July number. The method of proportionate fellings possesses the "ancient flavour" of the "obsolete makeshifts by means of which the Indian Forester was at one time compelled to check the carelessness of ignorant subordinates, to control the revenue-hunting Divisional Officer, and to prevent mechanically the too rapid uncovering of the soil." But what "O. C." would have us do is not clearly stated. On page 339, however, Dr. Schlich writes, "The Forester must construct for himself the law never to cut, at any one time, more than a certain proportion of the growing stock." Again, and in italics, "*this is the calculation which passes through the brain of the Forester, whether he be conscious of it or not,*" and as this last remark refers to coppice with standards, Dr. Schlich adds, "It is exactly the same thing in a selection forest." I did not have the privilege of knowing either Captain Wood or his Working Plan, but if he asserted, as no doubt he did, that we were only utilizing one-third of our actual yield, I can quite believe that he did his utmost to remedy the defect. In fact, I gathered from an inspection of some of his old workings the impression that he had helped himself uncommonly liberally. An irreverent young officer, who also has seen these fellings, has suggested to me that I have reversed cause and effect, and that in reality Captain Wood made his fellings first and justified them afterwards. Be that as it may, we have unfortunately revenue-hunting Conservators as well as revenue-hunting Divisional Officers, so that a "mechanical" check to the uncovering of the soil is by no means as undesirable as some would have us believe. It seems to me that we have still, and shall long possess, a considerable proportion of "ignorant subordinates," not to mention the lazy and untrustworthy ones who let the contractors do their work for them.

It seems to me that the vast proportion of Indian forests *are* "in a bad way" and are certainly *not* "in proper order;" but I fail to see how the method of proportionate fellings excludes "the individual attention each stem should receive." On the contrary, cutting, say, one out of three, the forester examines his three trees and cuts the one that ought sylviculturally to come out. If he finds that all three should be kept for local and exceptional reasons, he passes on, and cuts his dropped tree as soon as he finds an extra one suitable. The necessary loss of revenue and the violation of natural laws I am quite unable to perceive, and as for prompt natural regeneration, I am not one of those who cannot see a few seedlings under a fine growing tree without at once grabbing an axe.

When "O. C." says that "we have for the last 25 years and more been accustomed to remove, subject to the check of proportionate fellings," I do not quite follow him. The working plan referred to, to the best of my belief, takes stock of the whole forest by enumeration, and prescribes cutting so much annually. This is

in a way a proportionate felling, but it is by no means the kind of proportionate felling that is now under discussion and which can dispense with any preliminary enumerations at all. It is this "commercial" maturity that is the curse of our administration and the ruin of our forests. I have seen only too frequently trees commercially mature, or overmature, marked by trained Rangers under trained Divisional Officers, and felled without mercy, while the heavy grass, the poor and sparse seedlings, the soil, everything that could speak to a sylviculturist, were crying aloud for respite and cover. This has little to do with proportionate fellings, but it shows how the "commercial maturity," which is "O. C.'s" touchstone, leads to downright bad sylviculture, and how slavery to the budget induces sinning against the light.

As to the full utilisation of the actual yield, there can be no doubt that the removal of unsound stems (where they can be spared) is the crux of the matter. These stems whenever their preservation is not required, should be got rid of at any cost on the first opportunity. Till they are gone the soil is not in full production, and *the actual yield cannot justly be taken out in good timber.* Unfortunately and frequently the worst trees are all we have left to protect the soil.

F. GLEADOW.

The Indian Forest Act.

I regret to state that I still fail to see the propriety of R.S Hole's reasoning, ingenious though it be.

I do not "persist in reading only the first paragraph of Section 67;" and I have no "theory" that is not open to good and sufficient reason. This is not yet forthcoming. R. S. Hole says "it is no less certainly true that when a forest officer, having decided a case by ordering the payment of compensation *only* under Section 67 (1) (*a*), realises this sum of compensation, he is then *compelled*, by the provision of Section 67 (2) to release any property that may have been seized as liable to confiscation: *without realizing the value thereof.*" I regret that Mr. Hole's "no less certainly true" proposition is in my eyes based on an illegal procedure from the beginning. Section 67 (1) (*a*) does not allow an officer to accept a sum as compensation for the offence and for property too, but "for the offence" only. If there is *no property attached*, then Section 67 (1) (*a*) will suffice. But if property has been attached, a grave legal step has been taken which the law will hardly ignore in silence. Here comes in Section 67 (1) (*b*) "*when any property has been seized*," &c.

Again, I am sorry to have to find fault with R. S. Hole's next proposition. He says, "the words *the property, if any, seized shall be released*, become superfluous." Not in the least. Section (67) (1) (*b*) *enables the Forest officer to release* the attached property,

but does not compel him to do so, and does not even hint that he *ought* to do so. Section 67 (2) is quite a different affair. It *enables the accused to claim the property* along with his discharge.

I do not follow R. S. Hole in his supposition that everything relating to compounded offences should properly be found in Section 67, consequently his remarks on that score do not appeal to me. Mr. Hole might as well argue that Section 82, for instance, does not exist, because he would have incorporated it in Section 81. There is no lack of similar precedents.

It will thus, I hope, be clear that Mr. Hole's own contentions cannot be maintained. His reference to Baden-Powell, however, calls for more respect. I find myself obliged to differ (in part) from one whom we must all respect as a master. But he certainly did not write the quotation in question in the expectation that Mr. Hole would require it, for he says (top of next page, 440) "this power . . . . are ample safeguards against any abuse of the powers given by this Chapter." Now this "chapter" *includes compounding under Section* 67, and Section 67 comprises the *only other abuse* of power in the chapter that could possibly invoke the use of Section 60; consequently Baden-Powell cannot be said to deny the applicability of Section 60 to compounded offences.

Where I differ from Baden-Powell is in the view that the principal object of Section 60 is not the checking of Section 67. He says, "This was hardly intended, because the subordinate's superiors will interfere." I venture to think that it *was* intended. A guard who *has authority* to arrest and seize needs no sanction from his superiors. He arrests and seizes and then makes two reports. Before a report reaches his superior officer (in many or most cases), the local magistrate being nearer has the case on his file, and any interference by the Forest Officer should take the form of (*a*) compounding, or (*b*) withdrawing the case; rather than that of dealing *administratively* with what is strictly a matter of *law*. No doubt such things are often done, but I doubt if Baden-Powell would have sanctioned them if the case had been put in this light free of other complications. Besides, if a Commissioner (being a 1st Class Magistrate) needs Section 60 to stop a case over the D. F.O.'s head, why should the D. F. O. not equally need it to stop a case over the guard's head?

F. GLEADOW.

With regard to F. G.'s remarks concerning Section 67 of the Indian Forest Act in your May issue, I would draw attention to Notification No. 301 (as amended), dated 28th February 1880, page 21 of Ch. I of the "N.-W. P. and Oudh Forest Manual," which in Rule 2 authorises Divisional Officers, under Section 60, to direct the release of property seized under Section 52. This will doubtless override Section 67.

H. H.

The Assam Forest Report for 1899-1900.

Having read with great astonishment the review of the Report on Forest Administration in Assam during 1899-1900 in your issue of May 1900, I feel reluctantly compelled to take exception to several of the remarks made by your reviewer therein.

In para. 4 your reviewer remarks, "Much* demarcation remains to be done." I conclude that no sane forest officer would require natural boundaries "such as rivers and well marked hill ranges" to be artificially demarcated; and as regards the total length (1,152 miles) of artificial boundaries, this whole length is recorded as having been demarcated and cleared with the exception of four miles, and these four miles were a portion of the boundary line of some recent additions to the reserves. It is therefore impossible to understand what your reviewer means by the above remark.

Your reviewer continues: "Far too much importance is being paid to the inspection of reserve boundaries by Divisional Officers." On this point I quite agree with him, but in justice to the Divisional Officers of Assam, he should at least have stated why this is the case. Rule 15, Section XXII of the "Assam Forest Manual," lays down that the Divisional Officer "will also inspect *all* boundaries of reserves in his Division annually," and it is not to be wondered at that Divisional Officers make some attempt to carry out this impossible feat. Your reviewer next takes special exception to the action of the Divisional Officer of Kamrup in having inspected 270 miles of his demarcated boundary. As I was in charge of the Kamrup Division from the 24th January 1899 to the 24th June 1900, I will now explain why I made such special efforts to inspect a great portion of the boundary lines of my district. A reference to the Administration Report of 1898-99 will show that the Divisional Officer in that year was only able to inspect 17 per cent. of the total length of 397 miles of boundary line. I may state that I was called upon by the Conservator to explain why I had not inspected more. I explained that this was a physical impossibility, and my explanation was accepted. I next year, therefore, made special efforts to inspect as much boundary line as possible.†

Your reviewer then continues: "Probably the Divisional Officer would have been much more usefully employed inside his reserves." He does not suggest what he should have done there. I certainly did all there was to be done inside my reserves, including, among other things, the opening up of 25 miles of

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* This was a mistake for which we must apologize. The passage should read "Little demarcation remains to be done, but far too much," &c.—HON. ED.

† Mr. Doxat is in error in thinking that any reflection was intended on him personally. His own explanation gives force to the reviewer's remarks. If a Divisional Officer is condemned to spend the whole of each camping season inspecting the outer boundaries of his reserves, when is he to find time to explore the interior, lay out roads and develope the forests generally?—HON. ED.

inspection paths. Owing to the impenetrable nature of the forest growth and the steepness of the low hills, which form a large portion of the Kamrup reserves, it is impossible for the Divisional Officer to spend much time aimlessly roaming about his reserves with any advantage to himself or benefit to the Department, and in many cases the only way in which he can obtain any idea of what his forests consist of is by proceeding along the boundary line.

Your reviewer next states, "Certainly, he might have been better occupied than in drawing up a return showing in detail what he had done in this direction." In Assam a special form has to be submitted to the Conservator every month showing in detail the length of boundary line cleared and inspected by the Divisional Officer. The Divisional Officer has therefore no choice in the matter.

I must now draw your attention to para. 6 of the review. Your reviewer here only quotes the first part of the paragraph in the report relating to the working plans of the Kamrup and Nowgong districts, and has ignored the very good reasons given for postponing the working plans for these divisions, namely, that no correct topographical and boundary maps of these districts are available. The Kamrup district at any rate consists chiefly of dense forest growth on low steep hills, with numerous swamps intervening, and the country is so impenetrable either on foot or on elephant that without decent topographical maps of the forests the compilation of even the simplest form of working plan would be impossible. In the Nowgong district, I believe, the conditions are very similar.

Your reviewer continues, "Even if the plan says nothing is to be done, it is most necessary to have it, otherwise a new Divisional Officer appears, and differing from his predecessor, immediately commences to cut." What he would cut is not stated, but I can assure your reviewer that the Divisional Officers in Assam are not likely to cut anything they cannot sell, and as the cost of extraction is so great that it would not pay to cut any trees except those of a considerable size, and as, moreover, it has already been ordered that no sal or other first class tree under 4½ feet in girth* is to be felled, I cannot but agree with the Conservator of Assam that there is no urgent need for working plans in the above two divisions.

Finally, when your reviewer solemnly propounds the axiom that "if the plan says he is not to cut nor to do anything else, he cannot very well go far wrong," I am astounded. I cannot imagine that a working plan that laid down that the Divisional Officer was neither to cut nor to do anything else would be of much use, however welcome it might be to the Divisional Officer concerned.

SILCHAR, ASSAM: 14*th May* 1901.

W. A. R. DOXAT,
Dy. Conser. of Forests.

* This can hardly be considered a sufficient safeguard. --HON. ED.

IV.—REVIEWS.

Forest Administration in Madras during 1899-1900.

The Madras Report has reached us rather earlier than usual this year, but it is still difficult to understand why it should take some twelve months to compile and issue the Forest Report in the Madras Presidency when it can be done in one-half that time in other parts of India. The report loses much of its value by being out of date.

The report was compiled by Mr. A W. Peet, the senior Conservator, and evidence is not wanting that the difficulties and troubles of forest settlement are at last drawing to a close, and officers are beginning to give more time and attention to the systematic treatment and improvement of the forests.

The absence of working-plans has long been a reproach to Madras, but the visit during the year of the Inspector-General of Forests appears to have acted as a spur, and the appointment of three Special Working-Plans Officers has already borne fruit in the production of plans for 219 square miles of forest, apart from plans which are in course of preparation for another 768 square miles. Up to the end of the year plans were either sanctioned or were in hand for 2,536 square miles, but there is ample work for the Working Plans Officers for several years to come, as the total area of reserved forest in the Presidency amounts to some 19,600 square miles. Of course Divisional Forest Officers may be able to assist in some divisions, but in very few, judging from the figures given in Form 44 of the Report. For instance, what spare time can the Divisional Officer of Salem district have for the preparation of working plans. He is in charge of 1,453 square miles of forest, scattered over a division of 7,529 square miles in extent. His receipts are Rs.3,19,034 and his expenditure is Rs.1,68,702. Of his revenue no less than Rs.1,32,332 were obtained from timber and fuel worked departmentally, and most Forest Officers have some idea of the amount of work that means for the Divisional Officer. Figures such as those mean a vast amount of office work and far too much of the actual forestry left in the hands of subordinates.

During the year the department as a whole had a surplus of 6·25 lakhs of rupees or 27 per cent. of the total collections. This being so, there is no evident reason why some of the surplus revenue might not be advantageously utilised in lessening the size of the divisional charges and making them more in consonance with those of other parts of India. Until this is done, the forests of the Madras Presidency will not meet with the attention they ought to have.

Up to date maps have been prepared for 9,760 square miles of forest, or rather less than one-half the total area to be mapped. Unless the Survey of India considerably increase their outturn,

the want of maps must hinder the preparation of working plans, and must in fact hamper all forest work throughout the Presidency.

Fire protection, in spite of the unfavourable season, was only slightly less successful than in the previous year, and of a total forest area of some 19,600 square miles, fire protection was attempted over an area of 5,126 square miles, of which 94·5 per cent. escaped fire as compared with 96·3 per cent. during the previous year. The average cost of protection per square mile was Rs.7-0-6.

In the Nellore district mica mining in the reserved forests appears to be becoming an important matter. No less than 48 mines have been sanctioned, and 28 of these are at present being worked. The royalty received during the year amounted to Rs.49,168. Graphite is also worked on a small scale in the Godaveri district, and licenses have been taken out in several other districts for exploring the forests for coal, plumbago, &c.

The elephant-catching operations, which are conducted in the southern part of the Presidency, were very successful. Twenty-five elephants were captured by the pit system, and as far as can be learnt from the report, none were lost or injured in capturing, although during the year nine of the elephants belonging to the department died, chiefly owing to the drought. The largest number were captured in North Malabar, which comprises the Wynaad, where it might be worth while to introduce the khedda system.

The Government resolution on the report is of considerable length, and sums up as follows:

"Satisfactory progress was made in settlement work: and "also in the preparation of working plans: steady attention "was paid to meeting the requirements of the people and "reconciling their wants with the restrictions necessarily im-"posed by effective conservancy: while a considerable revenue "was realised in excess of expenditure. All these circumstances "testify to the general good management and work of the "department. His Excellency the Governor in Council has much "pleasure in congratulating all concerned on the successful results "of the year."

Forest Administration in Burma during 1899-1900.

The Upper Burma Circles were re-arranged during 1899, and are now known as the Northern and Southern Circles. A new division, called the Mandalay Depôt Division, was created, but the proposed Myitkina Division had to remain in abeyance for lack of officers. On this question the Burma Government makes the following remarks:—"The necessity, in the interests of the forests and of the revenue, of an increased staff of officers of both the Imperial and Provincial Service has been frequently brought to

the notice of the Government of India. Proposals for increasing the subordinate executive staff are under consideration, and will shortly be laid before the Government of India."

The area of reserved forests at the close of the year was 17,153 square miles, or 1,484 square miles more than in the previous year. The reserves are distributed as follows:—

Pegu	Circle	... 4,499 sq. miles,	or 27%	of the estimated forest area.		
Tenasserim	,,	... 4,236	,,	,, 12%	,,	,,
Northern	,,	... 4,284	,,	,, 22%	,,	,,
Southern	,,	... 4,134	,,	,, 22%	,,	,,

Most of the leases inherited from the King of Burma have expired or are about to expire, and we learn that "negotiations with the chief timber firms continued in regard to the new purchase contracts for teak exploitation, which supersede the old leases. Conditions of offer were drawn up on lines sketched by the Government of India and were communicated to the principal timber firms engaged in the forests. The offers covered all the forests worked under expiring leases, the Pyinmana forests alone being excepted. Contracts for additional forests in the Katha division were also added. The Pyinmana forest has been finally closed to purchase contractors, extraction under the departmental contract system being substituted. The conditions of offer were in every case accepted."

The Burma Forest Survey party completed the survey on the 4-inch scale of 161 square miles in the Pegu Circle, 353 square miles in the Tenasserim Circle, and 194 square miles in the Southern Circle, besides a very considerable amount of triangulation and traverse work.

The rate of progress with working plans is said not to keep pace with that of the surveys and still less with the reservation of new forests, but we understand that measures are under consideration for accelerating the outturn of work. The following shows the state of progress at the close of the year:—

Circle.	Reserves for which working plans had been completed at the close of the year.	Reserves for which working plans are in hand.	Reserves for which working plans have still to be made.
	Sq. miles	Sq. Miles.	Sq. Miles.
Pegu Circle	1,023	...	3,476
Tenasserim ,, ...	738	440	3,058
Northern ,, ...	37	...	4,247
Southern ,, ...	74	601	3,459
Total ...	1,872	1,041	14,210

The total number of forest offences was 2,383, a very small figure for a forest area of some 90,000 square miles, and of these 661 were taken into Court, 1,560 compounded and 162 undetected. There were altogether 51 cases of injury to forests by fire, of which a large proportion, 33, were undetected. Of other cases the most serious was one of illicit super-marking by employés of the Bombay Burma Trading Corporation in the Mu division for which a heavy fine was imposed on conviction.

Fire protection is reported to have been conspicuously successful in all circles. The results were as follows :—

Circle.	Area protected.	Failures.	Actually protected.	Cost.
	Sq. miles.	Sq. miles.	Sq. miles.	Rs.
Pegu Circle	838	171	667	35,384
Tenasserim ,, ...	1,182	13	1,169	29,800
Northern ,, ...	1,205	69	1,136	19,408
Southern ,, ...	584	84	500	18,636
Total ...	3,809	337	3,472	1,03,228

The area over which protection was attempted was thus a little over 22 per cent. of the total area of reserves. There were increases of 327 square miles in the Pegu Circle, 537 square miles in the Tenasserim Circle and 29 square miles in the Southern Circle, while the Northern Circle shows a decrease of 239 square miles, which seems however to have been justified. The area successfully protected was 1,027 square miles in excess of that of the previous year, the increase being in all circles. We quote the following from the report of the Conservator, Northern Circle :—

"The success of fire conservancy depends on the adoption of a suitable scheme of work and a steady adherence thereto, and even then success will, as elsewhere, be attained only gradually. On the one hand we have the advantages of a short dry season and of, in the majority of cases, a light undergrowth, which renders the control of fires more easy ; on the other we have the drawbacks of a scanty and unwilling population and of a weak staff, unaccustomed to the work and intolerant of the hardships involved. Both of these drawbacks will in the process of time be lessened, but in the meantime we must proceed warily, and yearly increase our protected area, but not attempt more than we can reasonably expect to carry out successfully. The protection of isolated blocks should not at this time be taken in hand. From divisional centres, where, too, our fellings will be in progress, fire conservancy should gradually but with certainty extend over the reserves, and at the same time a systematic opening up of roads and construction of rest-houses should proceed. It must be recognized

that, for the next few seasons at least, the presence of a gazetted officer of the department will be absolutely necessary at the head-quarters of this system of protection during the dry season; on him will rest the responsibility of training the forest staff and securing the goodwill and assistance of the people; without such supervision it cannot be expected that any proper system of protection can be brought into working order, and insistence on this point is all the more desirable as the fellings of the year, which require constant supervision, will be proceeding in the protected area. The ideas of individuals may vary as regards the effects of fire conservancy on the forest and on the people, and it may be years before the expression of adverse criticism ceases; in the meantime we are happily in the position that, the policy of protection having been adopted, officers of all departments concerned will loyally carry it out, whilst in future the ability of the Forest Officer will be to a great extent gauged by the result of his efforts in this branch, the most elementary, of his professional duties."

In the Pegu Circle 437 acres were planted with teak and 280 acres with cutch *(acacia catechu)* on the taungya system. Other sowings increased the area in which artificial reproduction was attempted to 861 acres. In the Tenasserim Circle 423 acres of taungya were planted, and in the Southern Circle 84 acres of taungya and 59 acres of other plantations. The total expenditure on sowing and planting in all circles was Rs.57,236, which included thinnings and cleanings as well as the general maintenance of the older plantations. The report does not give the total area of plantations at the close of the year, but it appears to have reached the respectable figure of 100 square miles, as follows:—

		Regular plantations.	Taungya plantations.	Cultural operations.	Total.
		Acres.	Acres.	Acres.	Acres.
Pegu	Circle ...	2,745	34,552	4,998	42,295
Tenasserim	,, ...	791	20,127	65	20,983
Northern	,, ...	316		...	316
Southern	,, ...	687		...	687
	Total ...	59,248		5,063	64,311

A Hevea rubber plantation, to cost Rs.2,10,000, has been sanctioned in the South Tenasserim Division.

Improvement fellings in the interests of teak, consisting principally of climber cutting, were carried out to a considerable extent in all circles. The Lieutenant-Governor agrees with the Conservator, Pegu Circle, in thinking that the small cost of the operations in Lower Burma suggests a lack of thoroughness, and that the work should be more extensively and thoroughly done.

We have, however, considerable doubts as to the advisability of extensive improvement fellings, as generally understood, in forests with bamboo undergrowth, except at times when the latter flowers. The higher cost of the operation in Upper Burma seems to have been due to the felling of *ficus* attacked trees in some of the reserves.

Girdling of teak trees to supply the market was undertaken to the following extent:—

		Trees.
Pegu	Circle	12 702
Tenasserim	,, ...	6,032
Northern	,, ...	3,495
Southern	,, ...	4,667
	Total	26,896.

The outturn of timber and fuel amounted to:—

		C. ft.
Teak	... ...	13,740,706
Reserved	woods	1 069,910
Unreserved	,, ...	24,874,537
	Total ...	39,685,184

of which 3,145,715 cubic feet, nearly all teak, were extracted by Government agency. Mortality among elephants accompanying an outbreak of anthrax in the Pegu Circle, led to a falling off in the quantity of teak brought out by Government. The revenue from departmental timber operations was Rs.31,34,027 and the expenditure Rs.9,48,961, showing a net profit of over Rs.36 a ton. The extraction of teak by the chief timber contracting firms was 185,389 tons, yielding a revenue of Rs.28,87,308 or less than Rs.11 per ton, so that the difference in profit in favour of departmental operations is something like Rs.25 per ton.

The total forest revenue for the whole province was Rs.79,87,298 and the expenditure Rs.26,97,010, leaving a surplus of Rs.52,90,288 or Rs.6,28,560 less than in the previous year.

The revenue was contributed under the following heads:—

	Rs.
Timber	68,12,319
Other produce	5,54,918
Drift	2,17,006
Duty on foreign timber	3,12,883
Miscellaneous	90,172
	79 87.298

The expenditure directly incurred on account of the formation, production and improvement of the forests was Rs.4,27,884, but only Rs.53,902 were spent on communications and buildings.

A forest school for Burma was opened at Tharrawaddy in August 1899 under the management of Mr. E. M. Buchanan, Extra Deputy Conservator of Forests. "Very shortly after it was opened it was found that a single instructor was unable to deal with two classes. A trained Ranger had accordingly to be deputed to the school and will remain there. The experience of one year's

working showed that the provisional rules, which were sanctioned when the school was started, needed considerable modification. The sanction of the Government of India was asked and has been obtained to such modifications as the Lieutenant-Governor considered were called for by the special needs of the province. Among other changes, the course of instruction is extended from eighteen months to two years, and the school is thrown open to Rangers and Deputy Rangers, instead of limiting the training to Foresters and Forest guards of the subordinate executive Forest service."

Among other items of interest may be noticed the introduction of a Bill to consolidate and amend the Forest Law of Burma, and the commencement on a small scale of the botanical exploration of the Tenasserim Circle. We should have thought that it would have been more to the purpose to have started this work in Upper Burma, the Lower Burma forests having already been very fully explored by the late S. Kurz.

VI.—EXTRACTS, NOTES AND QUERIES.

Teak Industry of Siam.

One of the principal industries of Siam is the teak timber business, says Consul-General Hamilton King of Bangkok. Teak is the most valuable timber for shipbuilding in the world. It does not yield to the influences of moisture and drought; it is not liable to the attack of borers and other insects; it does not split or sprawl; and, while it is a strong, durable wood, it is easy to work and very light in the water. As a beautiful, dark-coloured wood susceptible of a very high degree of finish, it will continue to be in demand wherever fine finishing timber is needed in shipbuilding, and because of its peculiar qualities that resist the influences of iron when brought in close contact therewith, there is no substitute for it yet discovered as the backing for armour plates in vessels of war.

Because of the attention given at this time to our navy and merchant marine, information on this subject should be of interest in the United States.

The area of the earth's surface in which valuable teak forests are found is not extensive, being restricted to Burma, Siam, and Cochin China. Some teak has been found in Java, but it is not of a superior quality, and as yet the forests of Cochin China and a part of Siam are inaccessible. The limit of their area and the increasing demands now made upon these forests, because of the rapid growth of shipping throughout the world, is presenting a a problem which the British Government has attempted to solve by planting new forests; but many of these attempts have proved failures, and at best it takes from sixty to eighty years to grow a tree large enough for superior timber.

There are but three ports in the world from which teak is exported; Rangoon, Moulmein and Bangkok. Of these, Rangoon stands first and Bangkok and Moulmein rank about equal in the amount exported by each.

The term "teak forest" is a misnomer; for the teak trees do not form a forest as the term is understood in America, but generally are rather found in clumps, or perchance as individual trees in forests and jungle among other timber. This wood grows upon the mountain sides and in high, broken country, and is segregated to the extent of one tree for every ten or one hundred trees of other kinds throughout the forest in which it is found. It is much more expensive to work such timber out to the streams than it is to work the forests of America, where the trees grow nearer together and roads are constructed by which the entire product can be removed.

It is this heavy timber thus scattered that renders the use of the elephant in the teak forests imperative, for teams of any kind would be prevented from doing the work by the dense jungle. This great beast, accustomed to make his way through the undergrowth, is strong enough alone to handle the logs and work them to the stream. But elephants are expensive and at the same time are singularly delicate animals. On an average, an elephant will work only five hours a day, five days in the week and seven months in the year. And even at this, he must be handled with the greatest care, and the owner is fortunate who escapes with not more than five per cent. loss per annum by death.

Siam furnishes about one-fourth of the teak of the world, and the quality of the teak timber found here probably ranges with the best. It is customary for trade reports to rate it second to Burma teak; but all these reports come from British sources, and British control the teak interests of Burma. The British Admiralty contracts have for many years been placed in Burma, and that department is proverbially slow in accepting a change. Again, greater experience there may have resulted in greater care in manufacturing the product for the market. Be that as it may, the streams that bear the Burmese and the Siamese teak to the seas, pierce the same regions and find their product in the same forests.

The teak forests of Siam are situated in the upper provinces at a distance of several hundreds of miles from the capital, Bangkok, with which they are brought into communication by the river Chowphya, commonly called the Menam, and its tributaries. In these forests, which are leased for terms of years to the up-country traders, the trees are first "girdled"—that is to say, at the proper season of the year the bark and sap are cut through all round the trunk close to the ground, in order to make the wood lighter and better for land and water transport before it is carried away, and to prevent what is known in America as sap rot. This is rendered unnecessary in countries where the cold of

winter drives the sap out of the trees and thus prepares them for the lumberman through nature's own process. This operation must be completed at least two years before the trees are cut. The trees are then felled at the proper time and made ready for transport. They are afterwards hauled by means of elephants to the creek or small stream which is nearest to them. These several operations, girdling, felling, and transporting to the creek, require a period of about three or four years; but it is after the butts reach the creek side that the most formidable causes of delay begin to operate. Even if the season should be favourable and the brooks full of water, the logs float at a slow pace down them, and have to be worked forward with the aid of elephants by the process called "ounging" until they reach the larger streams. Here, their progress is impeded by blocks and obstacles of all kinds, and the assistance of elephants is still needed. The transport of a number of logs, after arriving at the larger streams, to the rapids, about 150 miles, requires on an average four months in a good season, and thence downward to Bangkok seven to ten weeks. Under the most favourable circumstances they may reach Bangkok in six months from the time of arriving at the main streams, or three and a-half years from the time of being girdled in the forest.

Unfortunately, it is by no means in every year that there is enough water in the creeks to float the logs at all, and still less certain is it that they will be floated as far as the deep stream before the floods subside. Out of ten years there will not usually be more than two or three when there are full floods, and three or four when there are floods of average height and duration. The other three or four or even five years will be "dry" years, and will only permit of a very small quantity of wood being brought out of the forests.

Thus, taking one thing with another and allowing for the average delay caused by more or less dry seasons, it appears that from the time when money begins to be expended upon a teak tree until it arrives in Bangkok and can be exported, a period of from three and one-half to seven years, or even more must elapse, during the whole of which money continues to be expended on the tree, either in working it or watching it, while no returns can be had. Besides the actual expenses of felling and transporting by land and by water, there is the royalty to be paid to the lessor of the forest and the Government royalties payable on the main river. It is also necessary to keep a considerable staff of watchers to guard against the continual pilfering of logs and against fires.

From the foregoing it will be easily conjectured that a very large capital is needed for persons engaging in the up-country teak trade, and the capitalists who embark in this business must be content to see their money locked up for a long time before profits can come in. If a bad year, *i.e.*, a

dry season, should occur, no profit can, for the time being, be expected ; and if this should be followed by second bad season, it will be impossible either to make any profit or even to pay the interest on the capital expended. Hence it happens that in contracting loans in this business and making arrangements with the lessees of forests, a long period of years is included in the compact, so as to allow of the very gradual repayment of the sums advanced. In many cases, no interest is paid upon such loans for several years, while the wood is being worked down to Bangkok, and then, out of the ultimate proceeds of sale, are paid at length arrears of interests, which reach sometimes an almost incredibly large sum. If a season is good, the trader pays the interest readily and willingly; if it is bad, he is obliged to hold it over, much against his will, for the rate of interest is heavy in Siam, and, in the case of many *traders* who are "men of straw," exorbitant.

As it is with the lessees and head contractors, so it is with the sub-contractors and foresters. These latter invariably obtain advances from the lessees and repay them in kind, with interest in good seasons. It is an unheard of thing for these people to pay interest in money; and a lessee who attempted to enforce such payment would not only fail to obtain it, but also forfeit his chance of obtaining contractors in the future. On the contrary, when the interest on loans to sub-contractors is unpaid owing to dry seasons, it is necessary to advance them fresh capital in order that they may be able in a better year to deliver the wood which they owe.

The logs when felled and before being transported are stamped with the owner's hammer mark. Having reached the creeks and having been floated down river past the rapids, they are made up into rafts which are despatched *en route* to Bangkok in charge of raftsmen who understand the business and generally work for a single employer, between whom and themselves there is mutual confidence. The task of these men as well as of those who work the logs down to the making up stations, is one of great responsibility. They have to contend with the great difficulties of navigation and to guard against the machinations of timber thieves who infest the water courses. Occasionally, notwithstanding the utmost vigilance, a raft will break up; and then an immense amount of energy is required to collect the logs and save them from plunder. One of the most important advantages of an up-country teak trader is that of being always able to command the services of able and trustworthy rafters, and one of the most serious injuries which anyone can inflict upon a lessee is to destroy or impair the confidence of the rafters in his credit and projects.

The teak trader must also find and keep reliable and well-paid agents at the principal towns on the river where the rafts are made up, and at the station where the duties are levied. He

must, during his visits to Bangkok and to places within his districts, intrust his valuable elephants and other movable property to the charge of employés who, if not punctually paid, are apt to levant with the animals or other things and sell them at more or less ridiculous prices for their own benefit.

In short, the teak trader of the forest must have at his command a very large reserve of capital, to be employed during bad years in keeping up the huge staff which is absolutely necessary for successfully carrying on his business.

The cost of working teak in Siam has been greatly enhanced during the last ten years. The royalties to the Government have increased 200 per cent., the price of elephants has increased over 100 per cent., and the cost of labour to work the forests has advanced over 200 per cent.; and to this increase has been further added a heavy difference in exchange which works to the disadvantage of the producer.

The limited area of the forests from which the supply for the future must come, the restrictive measures now being imposed by the Government on those working concessions already granted and the refusal to grant new concessions, and the increasing demand year by year, together with abovementioned advance in cost of production, argue a material rise in the prices of teak in the near future. Notwithstanding all this, prices are ranging comparatively low just now, because of large purchases having been made in anticipation of this expected advance, and because the past season has been phenomenally favourable for bringing teak down to the market.

Again, the teak market of the future promises to be more steady than it has been in the past, because of the elimination of the small traders from the business. There were many of these in the earlier days, but they have been gradually crowded out by the circumstances already mentioned in the report. These small traders, being unable to hold their product for any length of time, were obliged to sell when their rafts came to the local market for whatever prices they could realize; and on account of the large number of these men in the trade, this often caused a decided fluctuation in the market.

Beyond the head waters of the Menam, in Northern Siam, and on the other side of the divide which forms the water head that separates the waters of the Menam and the Mekong rivers, are large tracts of virgin teak forests of splendid quality. The Mekong penetrates this region 2,500 miles from its mouth; but its rapids and waterfalls render rafting impossible, and must prove destructive to individual logs in their journey to the sea. Thus shut off from approach from the north and inaccessible from the south because of the mountain range, these valuable forests will probably remain undeveloped for years to come—buried treasure for the future of Siam.—*Scientific American Supplement.*

The Expansion of Coniferous Forests.

In the monthly record of the April 1901 Number of the Geographical Journal, there is a review of a study, on "The Woods of the Thuringer Wald," by Luise Gerbing in the "Mitteilungen des Vereins für Erdkunde zu Halle" for 1900, in which is remarked:—"The most salient fact brought out by the study is that of the rapid extension of coniferous, at the expense of deciduous forests—an extension which promises to continue in the future, though at present it has hardly effected a radical transformation in the conditions in the Thuringer Wald.

The above is equally applicable to the coniferous forests of Kashmere, as there would appear to be but little doubt that these species are gradually filling up areas which were formerly blanks and are making their presence felt slowly where deciduous trees have been the principal species. Blue Pine (*Pinus excelsa*), being a prolific seed-bearer, is the chief factor in this movement and is closely followed by deodar, but the former generally shows itself first. There is ample proof of this expansion at the edges of the forests, where it will be found that in suitable localities groups of young plants and seedlings exist where there are and have been no mature trees.

It is also noticeable that in this expansion deodar in favourable localities will hold its own against all-comers, including the quick-growing Blue Pine. Whether this gradual extension of conifers at the present day in Kashmere is due only to the prevention of fires (not grazing as there are no rules existing, allowing the Forest Department to check or control it in any way), or whether it shows that these species are of more recent development than deciduous ones, is difficult to say and can only be proved by comparison with other similar forests in other parts; but, judging from the general aspect of coniferous forests in Kashmere, they would appear, many of them, to be comparatively young.

E. Radcliffe,
Divisional Forest Officer, Kashmere.

VII.—TIMBER AND PRODUCE TRADE.

Messrs. Churchill and Sim's Circular.

August 2nd, 1901.

East Indian Teak.—The deliveries for July amount to 905 loads, against 998 loads for July last year, and 8,579 loads for the first seven months, against 6,185 loads in 1900. Prices for converted wood have been well maintained, but the demand for logs

has been very small. Floating cargoes are still not enquired for, and shipments close at hand are practically *nil*.

ROSEWOOD, EAST INDIA.—Shows no improvement.

SATINWOOD, EAST INDIA.—The demand continues dull, and sales are difficult as the stock is too heavy.

EBONY, EAST INDIA.—Is in less demand and prices are weak.

PRICE CURRENT.

Indian Teak, per load	...	...	£10 15*s.* to £16 15*s.*
Rosewood „ ton	...	...	£5 to £9.
Satinwood „ foot superficial		...	5*d.* to 12*d.*
Ebony „ ton	...	...	£12 to £16.

Denny, Mott and Dickson, Limited.

WOOD MARKET REPORT.

London, 2nd August, 1901.

TEAK.—During July the landings in the London Docks consisted of only 62 loads of logs, 96 loads of planks and scantlings, and 42 loads of blocks, or a total of 200 loads, as against 915 loads for the corresponding month of last year. The deliveries into consumption were 506 loads of logs, 346 loads of planks and scantlings, and 11 loads of blocks, together 863 loads, as against 1,008 loads in July, 1900.

The dock stocks at date analyse as follows:—

	7,432	loads of	logs,	as against	9,879	loads at the same date last year.	
	5,308	„	planks,	„	3,971	„	„ „
	58	„	blocks,	„	7	„	„ „
Total	12,798	loads		„	13,857	loads	„ „

The above official figures do not take into account a cargo just in docks from Moulmein, containing as per manifest 880 loads of logs and 32 loads of planks, in all 912 loads. A considerable proportion of the deliveries of logs last month was for the Continent. Without present quotable advance, the prices, particularly of logs, are very firmly maintained, the bulk of the stocks being strongly held; and the prospect for autumn and winter trade appears encouraging, the more especially as chartered and floating sailing vessels, in which the bulk of the log importations arrive, are fewer, and on the average also smaller in burden, than has been the case for many months past; which should further serve to stiffen log prices here as against prices for planks which for the most part arrive by steamers, and in such profusion as to keep the demand, healthy and expansive as it is, waterlogged by the eagerness of a few weak consignees to realize promptly on arrival.

Market Rates of Products.

Tropical Agriculturist, August, 1901.

Cardamoms	...	... per lb.	2*s*. 3*d*. to 2*s*. 4*d*.
Croton seeds	...	... „ cwt.	22*s*. to 30*s*.
Cutch	...	... „ „	23*s*. to 35*s*.
Gum Arabic	...	... „ „	20*s*. to 35*s*.
Do. Kino	...	... „ „	1*s*. 3*d*. to 1*s*. 6*d*.
India-rubber,	Assam	... „ lb.	2*s*. 2*d*. to 2*s*. 9*d*.
Do.	Burma	... „ „	2*s*. to 2*s*. 9*d*.
Myrabolans,	Madras	... „ cwt.	4*s*. 3*d*. to 5*s*. 6*d*.
Do.	Bombay	... „ „	4*s*. 3*d*. to 6*s*.
Do.	Jubbulpore	... „ „	4*s*. 3*d*. to 7*s*. 6*d*.
Do.	Bengal	... „ „	2*s*. 1½*d*. to 2*s*. 6*d*.
Nux Vomica	...	... „ „	5*s*. to 10*s*. 6*d*.
Oil, Lemon-grass	...	... „ lb.	4½*d*.
Orchella wood	...	... „ cwt.	10*s*. to 12*s*. 6*d*.
Sandalwood Logs	...	... „ ton	£20 to £50.
Do. Chips	...	... „ „	£4 to £8.
Sapanwood	...	... „ „	£4 10*s*. to £5 15*s*.
Seedlac	...	... „ cwt.	50*s*. to 55*s*.
Tamarind, Calcutta	...	... „ „	10*s*. to 11*s*.
Do. Madras	...	... „ „	7*s*. 6*d*. to 11*s*.

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A Bonny Forest.*

BY A. SCHAEFFER.

AT an altitude varying from 2,200 to 4,200 feet in the valley of the Fier, on a steep slope overlooking the small town of Thônes, prim Chef-lieu de Canton of the Haute-Savoie, there is a dense wood which, though of the small area of 321 acres, well deserves to be written about.

The property of the town, the wood is streaked with any number of paths of gentle gradient laid out at the instigation of M. l'Inspecteur Guinier, which permit of its being gone over without any feeling of fatigue. An excursion to the Canton du Mont is a perfect promenade for those tourists who are attracted in summer by the freshness of the climate, and who will surely become more numerous still, when the Municipality shall have realised their dream of turning Thônes into a great aerotherapeutic station.

For the Forester the charm of the place is magnified by the interest afforded in studying the wood. But for certain scarped ravines, at the bottom of which torrents roar and remind that one is in the Alps, it would be easy to imagine oneself in the midst of the Jura. As a matter of fact, the walks lead through plantation-like high forests of Spruce and of Silver Fir, sometimes complete and regular, sometimes judiciously thinned out by selection fellings, which would not be out of place in the classic regions of Pontarlier and Morteau.

A few figures may best describe the vigour of the wood. A recent enumeration established the fact that the Canton du Mont contains 42,962 tons of Spruce and Silver Fir, or approximately 140 tons to the acre if deduction is made for ravines and a small compartment stocked with beech. In 1884 this same wood only contained 38,597 tons, and the growing stock has therefore

* Translated by H. from the *Revue des Eaux et Forêts*, No. 12, 15 Juin 1901.

increased by 3,365 tons, which added to 5,199 tons exploited, gives a production of 8,564 tons in 16 years, say 535 tons a year or 85 cubic feet per acre a year. During the same period the volume of the old trees of, say, 18 inches in diameter, which in 1885 did not exceed that of the trees of medium size, has now so increased that it is, in regard to their volume, as 37 : 23. The normal state has about been reached, and it can be said that at the commencement of the 20th century the wood is in full production.

This result is the more remarkable because in 1840 the Canton du Mont had so deteriorated in consequence of ill-considered fellings, that it was seriously proposed to make the best of the almost denuded slope by turning it into a goat-run. To-day this lost pasturage for goats is worth some £40,000 sterling, and 60 years have sufficed to accumulate this heap of wealth.

Nature has been ably seconded, it must be admitted, by the wisdom and thrifty tendency of the administration of the town of Thônes, who have pushed their self-denial to the very limit of not taking a single cubic foot out of the 'Reserve' set aside during the rotation which has just been completed. But it would be quite wrong not to applaud to the echo the enlightened competency of the foresters who have managed the wood, and thanks to whom this prodigious growth of wood and of capital value has been obtained.

Numerous agents have succeeded one another, both at the head of the charge of Annecy and at the district of Thônes. They had not all had the same way of looking at things in point of view of organisation; some favoured the selection method, while others were for a full high forest; but one and all steered clear of any exaggerated view, as well as of any hard-and-fast dogmatism. Those who practised selection fellings have carried them out prudently, and not feared to thin the regular thickets which they came across; while those who have directed the regeneration fellings have never gone as far as the final cutting. The consequences of this freedom of action, intelligently applied, and carried out under cover of the selection method, have been of the happiest. The beautiful appearance and the almost uniform richness of the compartments in Canton du Mont superabundantly prove it.

A visit to the wood will convince the most sceptical of all the good that can be done by applying a method so elastic. Thinings, seed-fellings, extractions, everything comes under the modern selection method. Of astounding plasticity, this method of treatment bends and lends itself to growing stocks of great diversity; the cultural instinct is above all, and in conforming to it one is sure to do well.

An editorial footnote explains that it is not the modern selection method, but the regular method which has been described such as it has been applied in the neighbourhood of Pontarlier and of Morteau for half a century. Be that as it may,

the results are most remarkable for forests at a considerable elevation in the mountains of Europe.

Malaria.

In recent years it has been discovered that malarial fever is caused by a parasite which undergoes two alternating generations, one within the human body and the other within the body of certain species of mosquito.

Dr. Laveran first detected, in November 1880, the presence of peculiar bodies, both pigmented and non-pigmented, in the blood of malarial patients.

The idea that mosquitoes were the source of malarial infection arose from analogy with what Dr. Manson had already observed in the case of filariasis.

The valuable investigations made by Major Ross in 1897 confirmed the mosquito-malaria theory; and the knowledge then acquired has been extended by the researches of Professor Angelo Celli, Director of the Institute of Hygiene, University of Rome, and by the labours of the Italian Society for the Study of Malaria, and of the Liverpool School of Medicine.

Forest officers in India, and more especially those who are fated to live and work in malarious localities, will read with great interest Professor Celli's "Malaria," translated from the second Italian edition by Dr. J. J. Eyre (Longmans, Green & Co.).

The malarial parasite belongs to the class, *Protozoa*; Order, *Sporozoa*; and has been provisionally placed in Sub-order *Hæmosporidia*.

The dimorphism or alternating generation consists of—

1. An asexual cycle completed within the body of man.
2. A sexual cycle completed within the body of the mosquito.

In the first cycle the parasite commences as a sporozoite, gymnospore or amœbula, consisting of a cell containing protoplasm with a nucleus and nucleolus. This attacks and destroys the red corpuscles of the blood. The febrile stage corresponds to the development of these cells, which, after producing within themselves a large number of amœbulæ, burst and allow these bodies to escape. Each amœbula then attaches itself to a red corpuscle, and in course of development produces other amœbulæ as before.

In the second cycle other sporozoites or amœbulæ develop into larger bodies, which are called 'gametes.' The gametes are either male (spermoid) or female (ovoid). When the mosquito has sucked the blood of a malarial person, the gametes pass into the middle intestine of the insect and there unite, the spermoid entering the ovoid and forming a zygote. This produces within itself an enormous number of fusiform bodies, about 10,000; and when the zygote bursts these bodies (amœbulæ) accumulate about the salivary glands of the mosquito and are then ready to enter

the human body through the punctures made in the skin by the insect, and to re-commence the first cycle.

Some febrile diseases of birds, dogs, horses and other animals are also caused by hæmosporidial parasities, which pass during the second cycle through the bodies of certain species of mosquito, but which are innocuous to man.

The mosquito, the definitive host of the malarial parasite of man, belongs to the Order, *Culicidæ*, which has three genera: *Culex*, *Anopheles*, and *Aëdes* (the last mentioned not found in Italy), and of these *Anopheles* is the only genus that harbours the malarial parasite of man.

In *Culex*, the innocuous genus associated with *Anopheles* in malarious localities, the palpi are very much shorter than the probocis; the larvæ have the breathing tube in the tail, and assume an oblique position, head downward, when they come to the surface of water to breathe; the eggs also are laid in groups of 100 to 200 or more in clear or muddy water.

In *Anopheles*, the palpi are as long as the proboscis; the larvæ have breathing tubes in the back, and assume a horizontal position when they come to the surface of water to breathe; and the eggs are laid in groups of 5 to 20 in clear water.

The particular species (and this refers more especially to those of Southern Europe) that harbour the malarial parasite of man, are:—

1. *A. claviger* vel *maculipennis*. Each wing with four black spots arranged in the form of a capital T.
2. *A. bifurcatus*. The wings without spots.
3. *A. superpictus*. Four black spots arranged in a line along the anterior or external edge of the wings, with intermediate spots of a yellow colour.
4. *A. pseudopictus*. The same as No. 3, but the four black spots not so distinctly marked.

The eggs of the malarial mosquito in Italy are laid from April to September, the period of hibernation extending from November to March.

The eggs are laid in still or slowly-moving fresh water, and take 30 days to become perfect insects, and these after 20 days begin to lay. The larvæ live in water, feeding on vegetable matter, and coming to the surface to breathe. The perfect insect lives entirely in the air, and feeds on vegetable juices and blood. It lives and hibernates either in houses (*A. claviger*) or in trees (*A. bifurcatus*).

The measures proposed by Professor Celli to combat the disease are, chiefly:—

1. Isolation of infected patients.
2. Use of disinfectants against
   (*a*) the parasite in man;
   (*b*) the malarial mosquito.

3. External protection of the human body.
4. Removal of local predisposing causes.

1. *Isolation.*—As an infected person in a malarious locality may either infect other persons through the agency of mosquitoes, or be himself re-infected during treatment, it is necessary to isolate him by removing him to a non-malarious locality until a microscopic examination of his blood shows that he is completely free from the disease.

2. *Disinfectants.*—Remedies found to be efficacious when given internally, were: quinine sulphate, potassium bromide and iodide, arsenic, antipyrin, methylene blue, phenocoll and euchinin; and by subcutaneous injection, carbolic acid; the best results accruing from euchinin, methylene blue, and quinine.

Quinine, in sufficiently large doses, kills the protoplasm of the parasites, and causes their expulsion from the red corpuscles.

The best time to administer the drug is immediately after an attack during the sweating stage; but it may be given with advantage just before an attack, as it then has the good effect of preventing or reducing the formation of the "gametes," on which after their formation it has no influence.

The larvæ and nymphæ may be destroyed by adding to the water in which they live the following substances in order of efficacy, *viz.*, saturated sulphurous water, permanganate of potash, saturated solution of salt, chrysanthemum powder, larvicide aniline dye, saturated solution of tobacco leaves, petroleum, ammonia, oil, etc.

The vegetable disinfectants which, with the addition of those already noted, were tried with a certain measure of success, were saturated solution of Valerian root, of Quassia amara, Solanum nigrum, and of Daphne Gnidium.

To destroy the mosquitoes the following odours, fumes and gases were successfully tried, and are given in their order of efficacy: *odours*—oil of turpentine, iodoform, menthol, nutmeg, camphor, garlic, pepper, naphthalin, onion; *fumes*, tobacco, pyrethrum powder, larvicide, eucalyptus leaves, quassia, wild mint, pitch, rosemary, camomile flowers, salvia, common wood; *gases*—sulphur dioxide, hydrogen sulphide, ammonia, and common gas.

3. *External protection.*—Stout clothing is recommended to resist the attacks of the mosquitoes, and to prevent chills. Effective local applications to the exposed parts of the body are: pomade of valerianic acid; and soaps containing extracts of tobacco or of turpentine.

4. *Removal of predisposing causes:*—The following measures, which have been tried with complete success in the Roman Campagna and other parts of Italy, are recommended; disforestation of the locality, as trees shelter the insects; thorough surface and sub-soil drainage; deposition of ordinary earth or of alluvium to raise the ground level; erection of suitable houses;

fitting of doors and windows with wire-gauze screens; use of mosquito nets; supply of information to those living in malarious localities as to the cause of the disease and the best measures to be taken for its prevention.

The majority of forest officers are exposed to the danger of contracting malarial fever. In the light of the knowledge we now possess, they should be able to take measures, on behalf of themselves and of their subordinates, to render forest stations in the heart of malarious localities comparatively healthy, and to reduce the ravages of what is admitted to be one of the most fatal scourges of this country.

R. L. HEINIG,
ANDAMANS. *Dy. Conservator of Forests.*

Attacks on the Forest Department in Algiers.

THE following translation of the greater part of an article by "G. L." in *La Dépêche Algérienne* cannot fail to be interesting to Indian foresters on account of the remarkable similarity between the two countries in several of the matters touched upon :—

"Most people think, or pretend to think, that the French Forest Department in Algiers is ruining and despoiling the native; that it jealously shuts up immense areas on which there is not a sign of forest; that it forbids the native to make either charcoal or pitch; that it refuses to allow him the wood needful for his huts; that it starves his flocks and herds, and thereby causes disturbances among people who must either revolt or die.

Such legendary beliefs would vanish before the least enquiry of a serious and honest nature. But they are so rooted in the public mind, and calumny has been so shouted abroad and whispered in secret, that whenever any disturbance occurs among the natives it becomes a matter of course to saddle the Forest Department with the responsibility. It is the old story,—throw enough mud and some will stick.

The Algerian forests were demarcated by *senatus consultus*. The old boundaries were carefully looked to. The new ones were made in part at least without any participation of forest officers. All culturable lands are carefully excluded, so much so that whenever the Administration wants to build a guard's house, it has to purchase a suitable site from the owner or from the Jama.

The multitude of boundary marks erected to exclude trifling areas makes the maps look like lace work. In fact, the respect for private rights has been carried to extremes. What then is the spoliation of which the natives are the victims? Is it spoliation to bring under management the forests which the Mussalman law itself maintains to be State property? The rights of use have been respected everywhere, as can be verified by reference to the State documents sanctioning the demarcation.

The natives are allowed rights to timber, to firewood, to grazing for their cattle, horses, asses, mules, sheep. Goats alone are excluded. But let those who raise their voices against the suppression of browsing come forward and show how the forests can possibly continue to exist if browsing is allowed. The Administration has suppressed no native customs, and has regulated them so far only as is necessary to ensure that the forests are not speedily destroyed. The object most earnestly sought by the higher Administration in Algeria has always been to find some method of treating the forests without interfering in the least with native habits. It would be much more to the point to find the means of gradually weaning the people from their destructive practices which continually menace the very existence of the forest;—practices which the special service cannot check without incurring charges of intolerance and barbarity.

After all, there are conditions under which a forest can continue to exist, and conditions under which it *cannot*. Man cannot lay down the laws of vegetation as he pleases, and he will never be able to breed goats and to grow timber on the same land. It is very easy to denounce alleged acts of intolerance, to maintain a careful silence as to the public calamity that is only held off by the Forest Department, and to abstain from offering any remedy. The interests of the natives are always to the front; those of the forest are kept in the background. It will certainly be seen before long how sorry a jape it is to imagine that facts can be made subject to theories, and to submit the immutable laws of vegetation to the abuses of a barbarous and out-of-date civilisation. Such ideas will disappear along with their promulgators. Unfortunately the forests are disappearing the faster of the two, and by the time the error is recognised, it will be too late. In this country, scorched up by the burning sun, it will require hundreds of millions of francs, and centuries of time, before the Administration will be able to repair the devastations of natives who are looked upon now, with no reason at all, as interesting victims rather than as the common culprits they really are. *Yet in the near future, when the very existence of the colony will be threatened through the destruction of the forests, no doubt the Administration will be severely blamed for not having preserved them.* Yet the savageness of the attacks proves that the Department has placed duty before all other considerations. It obstructs far too many greedy hands who expect to escape denunciation, in season and especially out of season, as in the present case of the trouble at Margueritte. Every unprejudiced mind must admit that the trouble was purely due to religious fanaticism. The prisoners were made to wear the Arab costume and to pronounce the *kalama;* the murdered victims were made to face towards Mecca; and the instigators themselves claimed that their action was due to orders and revelations from on High. Nevertheless the newspapers contain nothing but stories of the exactions of the Department, of

the prohibitions of making charcoal, of legendary and prehistoric trees sold to Italians and Spaniards in spite of Arab protests, and such like disagreeables devoid alike of sense and foundation. The campaign has its objects. There may be a desire to remove certain responsibilities from shoulders for which they are becoming too heavy, and to put the burden on to the scapegoat's back. But the public will not be blinded, and will continue to believe that the trouble at Margueritte had nothing whatever to do with the Forest Department."

II.—CORRESPONDENCE.

Destruction of Game in the Central Provinces.

THE fact that big game is being rapidly shot out is one I take for granted no one will care to dispute. The best means of preserving and, if possible, of increasing the present stock is, however, a matter open to discussion, and one which must enlist the sympathy of all true sportsmen.

In reading through LONG TOM'S letter in which he discusses the question generally, I must say I was disappointed at the lack of any definite proposals, unless it be that guns should either be entirely withheld from the native, or granted as at present, no "satisfactory compromise" being feasible. With this I can hardly agree; surely half a loaf is better than no bread, and if it is impossible to withdraw all guns still if even half or less were withdrawn, less game would be shot. LONG TOM'S statement that traps make very little difference to the head of game, and that it does not matter whether these are prohibited or not is contrary to my experience both in Europe and out here, which is that traps can aid very materially in reducing the head of game in a district, and in support of this view I refer LONG TOM to certain parts of Mandla. Guns are, however, without doubt the chief means by which game is killed, and the point at issue practically resolves itself into the best means of reducing the present number of guns, and having done so, of controlling those that remain.

Gunners can be broadly separated into two classes:—

1. Europeans who are exempted from the Arms Act and can obtain permits to shoot in Government forests.

2. Natives who carry guns and who are not granted permits for reserved forests; these can be further sub-divided into:—

(*a*) Natives with licenses to carry a gun.

(*b*) Natives with illicit guns.

(*c*) Natives exempted from the Arms Act.

The European permit-holder is usually a good sportsman. He gets a permit to shoot in a block or part of a block for periods ranging from 15 days to several months; for this he pays the wages of a forest guard during the period the permit holds goods; he

has also the use of the forest guard, the permit is therefore practically free of charge.

The number of big game-shooters has increased so rapidly of late, that in some districts there is hardly an unlet forest from October till July. It will be seen, therefore, that forests are never at rest, and the sportsman being usually in search of a trophy of that class of game which especially requires protection, that is large stags to breed from, is the class which gets most shot. Occasionally also a "man with a gun" gets a jungle and slaughters all he can; with this sort of person no one has any sympathy; but it often happens that a good sportsman will shoot some animal, say a cow-bison, by mistake, or be tempted to kill another barasinga, although only having leave to kill one, trusting either that no one will know, or that his friendship with the Divisional Forest Officer will make it all right. Personally I have no sympathy with this class of sportsman, and think he should be made to pay for both his offences even the one "committed by mistake" just as much as a boy who throws a stone at a sparrow and breaks a window has to pay for it; but I know there is frequently great reluctance on the part of Divisional Forest Officers to take notice of such an offence, especially if he is at all friendly with the offender. The offender, moreover, if asked to pay up makes a personal matter of it, and the Divisional Forest Officer gets roundly abused behind his back. The result is, in most cases, nothing is done, and permit-holders, judging from past experience, don't mind breaking rules on the next occasion. Since Divisional Forest Officers will not carry out the law in this respect, rules should be made fixing the sum a permit-holder has to pay for shooting a hind by mistake or a stag in excess, or an immature stag; in this way it could not be made a personal matter, as the Divisional Forest Officer would have no option in the matter. If this were the case, I am confident less "hinds and extra stags" would be shot.

Another point, not regarding the rules themselves but the way in which they are carried out, is the system of giving short leases of forests. It is well known in Europe, and the same applies here, that a short lease means a skinned ground. A sportsman has perhaps three different jungles for a month each in the year; he knows that at any rate he can't be back again for a twelve month to any of them; and he knows, too, that another man has got it next month, so he makes the most of it. It is a common thing for a man to go out on the 28th of the month, to "jolly well shoot all I can," because somebody else has it next month. It would be far better if he had the same jungle for three months instead of three different ones for a month each. Whenever possible, make the lease as long, and in some cases I know jungles could be let yearly, in which case the holder has a permanent interest in the game, which feeling, I regret to say, is at present sadly lacking in most C. P. gunners.

At present I believe I am right in saying there is no district in the C. P. in which any attempt has been made to determine the

stock of game in hand, nor is there any record kept of how much has been shot. Without this knowledge adequate game conservancy is impossible, nor are the factors difficult to obtain; local men can generally furnish the former pretty accurately; the latter should be furnished by the permit-holder. I would insist on each permit-holder, on expiry of his lease, filling in and signing a form stating what he had killed, wounded, and seen. In this way an accurate knowledge of what had been killed up to date would be on record; and, moreover, I fancy the measure would lead to fewer "extra stags" being shot and "mistakes" being made, as the sportsman would have the "form" before him. There would be no chance of not being found out, and of course the "butcher" would either have to sign a false document or give himself away. Possessing the above factors, the Divisional Forest Officer should at once close for that year any forest in which a certain proportion of the stock has been shot. (In Germany and Austria, where the management of deer is understood better than in any other countries in the world, this proportion runs about $\frac{1}{7}$th.)

Another excellent means of preserving game is the creation of sanctuaries; these should be large, central, well watered and should be kept closed for five or six years. Smaller sanctuaries should be made in each large block of forest. Wherever a block is being much shot over, one portion of it should be closed, so that even when game is hunted it can get some place to lie up in.

It is the desire of most forest officers that all sportsmen should have fair and legitimate sport, provided the supply of game will stand it, and I have known many instances of Forest Divisional officers putting themselves out to no small degree in order to obtain *shikar* for perfect strangers; only in very few instances does a sportsman fail to get a jungle, but if the number of big game shooters goes on increasing as it is at present, the day will soon come when, for the sake of the game alone many passes will have to be refused. I need hardly say these remarks and the whole question of the preserving game from the permit-holder apply more especially to districts with large stations in them, such as Jubbulpore, Saugor and not to districts more remote in which the number of sportsmen is limited.

Before passing on to the 2nd class of gunner, I give a short *résume* of the measures whereby game might be protected against the class of gunner just under discussion:—

1. Divisional Forest Officers to insist on a strict observance of the rules. In order to help Divisional Forest Officers to do this, a rule to be made fixing the penalty to paid for a hind, immature or extra stag, whether shot by mistake or not.

2. Longer leases to be given if possible.

3. Determine the approximate stock of game in each block or detached area.

4. Determine what has been shot in each block.

} Close the forest accordingly.

5. Create sanctuaries.
6. Issue fewer permits.

The question of preserving game against native gunners is a matter of much greater difficulty than the one I have just discussed. Excellent rules can be framed, it is true, but the difficulty is in enforcing them, and of course there is "no good barking unless one can bite."

1.—The Licensed Native Gunner.

There is no doubt that in dealing with this matter concerted action should be taken by the District Officers. The issuing of gun licenses is a matter which chiefly concerns the Deputy Commissioner, the control of the guns is in the hands of the District, Superintendent of Police and the responsibility of guarding the forests from poaching rests with the Divisional Forest Officer. The Deputy Commissioner in issuing licenses for guns, as Long Tom points out, does so sparingly or not according as he is a sportsman or not. The gun license is given to enable some local *shikari* to carry a gun, ostensibly for the protection of crops; but in my opinion in almost every instance this privilege is abused, and I have frequently known the "crop protector" 20 miles from the crops and hanging round a good game jungle, which conduct on his part I take to be suspicious. Another class of man who gets a gun is the native malguzar; As a rule, he does not do much damage himself, but he frequently lends out his gun to some village *badmash*, who does the damage for him. In both cases, therefore, the privilege is abused. The cry about damage to crops is merely a pretext to obtain a gun for *shikar* purposes. In every district with which I am acquainted the number of guns is excessive. If Deputy Commissioners, therefore, in issuing licenses would only remember this and cut down the numbers granted, much good would ensue without any appreciable increase in the damage to crops.

Passing on to the question of control, I believe I am correct in stating that all the police have to do is to check the license and the gun, after which the "crop protector" can go where he likes, which he does, and he can go right up to the edge of a reserve which, if an opportunity occurs or if he is friendly with the forest guard, he has no scruples about entering. Now since the gun license has been issued to protect crops, it is surely reasonable to insist on the gun never leaving the village arable land, and that at any time when called on to do so by any police or forest officer, the village crop protector should have to produce his gun somewhere in the village area. If this rule were made it would prevent wandering in search of game.

The question of poaching in reserves is a very difficult one to deal with, partly because the areas are large and the forest guards few, and partly because the forest guards themselves have no interest in the game, and as likely as not are in with the "crop

protector" if he gets a kill. There is also an erroneous but widespread idea amongst forest guards, that they are not responsible for the game in the forest in the same way as they are for the timber. I have also met Divisional Forest Officers who do not take any action even if there are unmistakable signs of poaching having gone on. The game is of course just as much the property of Government as the trees are, and a great deal more might be done by Divisional Forest Officers than is at present the case in impressing this on forest subordinates, at the same time I would advocate any signs of poaching having gone on, such as *machans* over water, etc., being treated just as severely as I would signs of illicit fellings.

I will now pass on to the man who has a gun without a license, a far more common person than is generally supposed. Of course he has no scruples about shooting in a Government forest; in fact, prefers it as it holds more game and is more remote, as if he is caught in the reserve or out of it, he is still up a tree for possessing the gun. This class of "sportsman" is usually under the protection of the forest guard or local police, who get their share of any animal killed, and it is pretty well known in the neighbourhood that he has a gun. A stranger would only find out by making enquiries. Here I can only suggest visiting with punishment forest guards and police within whose neighbourhood the gun was and rewarding the person who showed the criminal up.

I now come to the class whose name is "legion," namely, those persons exempted from the Arms Act. These people are perhaps the worst offenders of all. I don't happen to know exactly who all the persons are who are thus allowed to carry arms, but the most prominent are certainly in the Forest, Police, and Post Office departments. Why should two-penny half-penny subordinates be allowed to carry guns? The reason given I believe is some myth about their work taking them amongst dangerous animals. This is pure rubbish. A native meeting a tiger would be far more likely to escape if he left it alone than if he fired off an ounce of lead and 2 drams of powder into it. Where a man-eater is about, by all means let every one carry a gun; but elsewhere I would do away with all these guns amongst the Forest and Postal subordinates up to officials who draw not less than Rs.50 a month. Regarding the Police, the matter is different, and I have not yet thought out a plan whereby the Police, who must have their rifles, can be prevented from shooting even in Government forests.

A summary of measures that might be taken against the second class of gunner comes briefly therefore to the following:—

1. Issue fewer permits to crop protectors.
2. Crop protectors' guns not to leave village areas.
3. Divisional Forest Officers to do more in the way of encouraging subordinates to protect game, punishing forest guards who permit poaching.

4. Forest and Postal Department subordinates not to be exempted from the Arms Act unless they draw Rs.50 per mensem or more.

SOLID LEAD.

Destruction of Game.

IT is gratifying to see that the subject has been opened in the *Indian Forester*. Forest officers are too often looked upon by the general public as jealously guarding the game in their forests and regarding the reserved forests as their own preserves. We can discuss this question between overselves without fear of awakening any jealousy or calling each other hard names.

My experience deals chiefly with Bengal and Assam. I quite agree with LONG TOM that licensed guns are not, as a rule, used primarily for the preservation of crops. There may be exceptions where elephants and pigs are plentiful and habitually raid the crops ; but as a rule, guns are used essentially for killing game. In the Bengal Duars a large quantity of meat of game is sold at the bazars in the tea gardens ; the game is not killed in the course of watching over the crops. In many cases licenses are issued to persons to protect crops where there is no destructive game at all ! Licenses appear to have been issued without any consideration of the merits of each case, and it is a difficult matter to withdraw a license once it has been granted.

My object in writing is not so much to indicate the manner in which ordinary game is destroyed as to expose the slaughter of special animals inhabiting the Sub-Himalayan tract of Bengal and Assam. I refer principally to the rhinoceros, buffalo and gaur. Every year a shooting party from a neighbouring native state, well equipped with elephants, and with permission to enter the reserved forests, is responsible for much needless slaughter. The game is driven by elephants to guns posted on the runs, and everything, regardless of size, age or trophy, ruthlessly shot. Many animals escape wounded, to suffer from fly-blown wounds or die a lingering death in some remote haunt. The effect of these annual invasions is very noticeable in the sad deterioration of the number of animals, and also in the alertness of the game, which it is now very difficult to approach on an elephant. Here is a case where the native *sh kari* cannot be blamed ; his weapon is worthless on these ponderous animals.

In addition to the unfair manner in which these shoots are conducted, the risks incurred in admitting a large party with one or two hundred followers into the reserved forests during the most anxious part of the fire season, is another injustice. Work is unhinged, the establishment has to watch over the movements of the party and followers in addition to carrying on its own work. It is not therefore surprising that the visits of the party almost invariably coincide with our bad fire seasons. My readers will

ask why the matter has not been represented. Protest after protest has been made and the question referred to in annual reports, but without the slightest success. Sport must be provided for the wealthy globe-trotters and others, the forests must endure the risks and the game be submitted to pitiless slaughter.

If any one has seen the recent publication, entitled "Wild Sports of Burma and Assam" by Colonel Pollok and W. S. Thom, he need only refer to the photograph at page 467 to confirm my statement. The picture is of the record bag made by the party referred to in the spring of 1899. The animals were not shot inside the reserved forests, at the same time the photo is typical of the butchery of animals which occurs regardless of age or sex.

The local sportsman, who endeavours to maintain a good head of game and to shoot purely for sport, views the advent of the party with horror. No consideration is given to the man who spends the best years of his life in remote forests and with sport as his only amusement; everything must give way to the wealthy and titled, who, accustomed to having everything arranged for them, know little or nothing of the game they pursue and seek to destroy. It is sufficient for such persons that they can boast of bagging an animal; they are birds of passage and do not give a thought to the resident sportsman. Such is my tale of woe; will any one suggest a remedy?

DRYAD.

Checks with Possibility by Area.

I AM thoroughly glad to find myself indirectly supported by so earnest a forester as A. G. Hobart Hampden, whose proposal (page 342) to *mark in reserve the necessary number of stems* in each class, comes to much the same thing as my proposal to introduce frankly the *method of storied forest*. This method is essentially and principally based on the *reservation of a proper number of stems in each class*. Hence, A. G. H H. has arrived at much the same result by a separate road. I may here take the opportunity of wandering from the subject in order to express my total inability to see on what grounds Mr. Leete says (page 368) that "storeyed forest is but a slight modification of that proposed under the name of 'Selection' for Kheri." If "Kheri Selection" is really "Storeys," let us call things by their most correct names, and credit each method with its proper due. The reservation of stems in proportion to the average cover of a stem of each class is the proper and distinguishing badge of "Storeys."

To return. I am also relieved to find myself not the only Cassandra, the only *vox clamantis in deserto* pessimist. When O. C. tells us that Captain Wood was distinguished for his moderation, and that we now know all about sal (he may, I don't), it requires some boldness to be publicly a pessimist. Hence I welcome A. G. H. H.'s query—"Where shall we get our revenue during the next rotation?" I can supply a modest contribution towards

the answer. The "next rotation" is already upon us, and the revenue will be supplied by reducing the exploitable size from 7ft. to 6ft. and from 6ft. to 5ft. At any rate, that is what some particularly dear but predaceous friends of mine purpose doing. Of course I admit their superior knowledge and wisdom, but nevertheless can hardly help wringing my hands and wailing in the privacy of my chamber. The misfortune about the past so-called improvement fellings has been twofold. They were not made with any definite aim in view, as it was not laid down whether the permanent method to follow would be selection or any other. They were not made with strict adherence to the sylvicultural principles involved, or in other words, the desire for revenue induced the felling of many a fine tree that had a long and prosperous career before it, and caused the retention of many rotten stems that would have cost money to cut. No wonder that A. G. H. H. and myself look with great suspicion upon any repetition of this kind of sylviculture. It is pretty certain that if a felling is ordained, the average forest officer will make it, whether there is anything to fell or not. Fellings of scattered trees over grass have been justified to me on the ground that there was really a sufficient number of seedlings in the grass, though I could not see any. That was simply ointment for a sore and uneasy conscience. Even though the grass had contained many seedlings, they could certainly not be considered *established* and fit to uncover. It would be curious if a regeneration fit to uncover could hide itself from the careful seeker. An operation such as the above can be nothing but disastrous.

Seeing then how the average Divisional Officer is torn between his sylviculture and his revenue, and how all officers understand revenue and but few care for sylviculture, it is evident that the only way to prevent disastrous operations is that indicated by A. G. H. H., *viz.*, to make officers responsible for the preservation, rather than the felling, of trees. Any fool can fell a tree and get more credit and advancement if he fells two. What is wanted is something that will compel him to keep trees.

I have not at present time to develop a full reply to G. A. F., but the above may indicate the first consideration to which I would draw attention. It is this. The Indian forests are frequently in the condition of more or less "ruined forests." The method of proportionate fellings finds its proper and simplest application in the case of *complete and uniform crops such as the regeneration fellings under the uniform system.* There it can be worked as a perfect operation, at once sylviculturally and financially correct, without any previous enumeration. In a probably overcut selection forest of this country it is not in its proper place, and the soundest basis to work it on would be that of *reservation implied if not prescribed.* But some kind of an estimate of the existing stock would be necessary as a basis. Such a slight estimate as could be formed by a careful man, walking through the forest and

viewing it as best he might, would even suffice for a start. He would thus argue, "If I cut 1 spruce out of 3 and 1 fir out of 6, that will leave me about 5 large spruce and 15 large firs to every 10 acres." The steps leading up to this are omitted, but he concludes to carry it out and does so in x years at the rate of $\frac{1}{x}$th of the forest per year. At the end of this felling cycle he has obtained much more accurate estimates of the stock at no special cost, and is in a position to do still better. Of course his acceptance of 5 large spruce and 15 firs per 10 acres, depends entirely on his *sylvicultural* knowledge, and assumes that these trees, together with the smaller ones, constitute the best possible crop that can be obtained under the conditions. Different cases with financial complications would fill the *Indian Forester*.

There seems to be some confusion of ideas on these subjects. The discussion has concerned (1) the possibility by number of trees, (2) the limitation of regeneration fellings by area, (3) proportionate fellings. In a selection forest is found the possibility by number of trees with an area-limit, but not properly "proportionate fellings." In some selection forests there is an attempted possibility by volume and a paper rotation, which is perhaps a convenient fiction or generalisation, but not a very solid fact. In a uniform forest there is a limit of area in which proportionate fellings may advantageously replace the usual fellings by volume.

F. GLEADOW.

The Forest Motto.

SIR,—The words "meliora speramus" may be considered to refer to better sylviculture and departmental work, but I hold that to many, and especially officials outside the Department, the principal impression derived from them is that of a reference to grievances. Their adoption, therefore, as the motto of a Department which has pretensions to self-respect, is strongly objectionable.

The main body of the Department is not, I believe, in favour of them, and certainly never expressed any opinion in that regard. At the same time, their adoption as a motto representing their special attitude by a few,—with no alternative for the many,—and their consequent use by some of the latter who are in want of something better, undoubtedly creates the impression among the general public and other Departments that the Forest Department, as a whole, approves of them.

If we are to have a departmental motto (and it is evident that such is required), I would propose that some serious consideration should be given to it at a general meeting of forest officers such as takes place in Dehra once a year.

R. C. MILWARD.

Dated 21st August 1901.

[WE quite agree with our Correspondent, but why have a motto at all?—HON. ED.]

Germination of Teak Seed.

As teak is rather a valuable timber in this part of the country, I have been trying to grow it with least cost. The first difficulty that stood in the way was germination, which sometimes took twelve months. In the June of 1898 I first succeeded in rearing teak seedlings within a week from the time the teak seeds were sown. The seeds used this time were one year old, and the time of sowing was the month of May. Fresh seeds have been tried since then, and finding them to answer equally well, I beg to inform you of the result. If any of your readers wish to give it a trial, a trench a foot deep, 5 or less feet long and 2 to 3 feet broad, should be dug before the end of January. The soil excavated should be put out of the trench and allowed to heaten. In the latter half of April the excavated soil, freed from stones and roots of grasses and other weeds, is to be returned into the trench and a bed, rising nearly at least 6 to 10 inches above the level of the surrounding ground, is to be prepared. On this bed the ripe seed collected is to be sown in lines and allowed to be exposed to the sun. In the beginning of June the seed should be covered with a thin layer of earth, and within a week from the first down-pour of rain, seedlings will be found covering the beds. If no seedlings be seen, the intruding grasses and other weeds should be picked up, and with a little more rain the seedlings will come out. Seedlings grown in this way can be transplanted with success. The soil where I have made my experiments is reddish brown, and the annual rainfall nearly 24 inches.

D. N. DAMALE,
Forest Ranger.

Karad (District Satara), 11th August 1901.

V.—SHIKAR AND TRAVEL.

Stray Leaves from the Diary of a Sportsman-Naturalist.

A POACHER'S LUCK.

ON a gloomy morning, in the month of July a train was dragging its tortuous way, with much noise and little speed, across the rain-sodden plains of Central India. In a first class compartment another man and myself lay at ease on the seats. My companion, just landed from the Old Country and South Africa, was on his way to rejoin his regiment, stationed in the part of the country to which I was bound. I had just left the "Summer Capital" and the mighty Himalayas, and we growled in concert at the mugginess and unpleasant climate of the plains. The conversation turned, as it so often does between men in India, on shooting, and I questioned my companion as to the sport to be

obtained in the —— hills in the neighbourhood of his station, they being my present destination.

"The ——forest you mean?" was the reply. "That part of India is played out. Nothing to be shot there. The recent drought finished off what we had left. The —th, you know, are a sporting lot, and we have some keen *shikaris* amongst us."

"Lively this," I thought. "Not much chance for me, a stranger in the land who," as I only intended to stay for a few days in those parts, "would be looked on as a poacher to boot." My companion, L—— by name, told me a great deal about the successes they had had *in times past*, but assured me it was "no go" now, unless a *black buck* head would suit me, and that would in all probability be but a *small one!!*

On arriving at our destination I wished L—— good-bye, promising to look him up on my way back, and next evening found me ensconced in a bungalow in the —— forest, which clothes the ——hills. There I met R——, and almost his first words finally settled my hopes of sport. In reply to a question he repeated almost the identical words made use of by L——.

"Shooting? None! Shot over too much, and the drought carried off what was left!" This was a clencher.

The next morning broke a good average gloomy monsoon day; but the showers were light, and we started out early on a tour of inspection, returning to breakfast at about 11 o'clock. I had spent the last four days in hard travelling in tonga, train, and saddle, and confess I was looking forward to a lounge and a book after the particular meal was over.

Dame Fortune had arranged otherwise however.

During the latter part of our walk the clouds had come low down and half a gale of wind was blowing them in blinding showers across the hills as we got into the bungalow. This increased during breakfast, and when an orderly came to the door and reported that a man had come in and stated that a tiger had killed his buffalo early that morning at a spot about six miles away, the news was not received with very great enthusiasm. I suggested that he be told to wait till breakfast had put more heart into us, and that meanwhile men might be sent off to build a *machan* over the kill. The weather was worse after breakfast, but when the villager had told his story I knew that in spite of the assurances I had received about there being no game, &c., I intended going, though I did not want to turn out a bit. R—— from the first had made no pretence of either wanting or intending to go. As he remarked, the weather was vile, not fit for a dog to be out in, even whilst on the move, much less so for a man sitting in a *machan* in a wet jungle.

However, I collected together the remnants of my rapidly-diminishing energy, and changing into jungle kit, hurriedly started so as to get wet through at once. This done, it was not worth while going back, and forward was the word.

I rode two miles and tramped the rest up over the wet mole-hills (for so they appeared to me after the giant Himalayas, but I believe they call them '*mountains*' in these parts) until I reached the kill, and a more depressing show I have rarely assisted at. The tiger had killed in the open on the top of a small grassy plateau, which was quite treeless. The ground sloped suddenly and steeply on the western edge of this plateau, and the carcase of the dead buffalo (out of which only a few pounds of flesh of the hindquarter and the tail had disappeared) had been dragged by my men down the slope a short way through the jungle, leaving a marked trail where the bushes had been cut to allow of this being done. I have said a dark, wet, thick shrubby jungle clothed the side of the steep slope. In a small space some yards down at the end of the trail above alluded to I could see the spot where the carcase lay, the jungle having been cut so as to leave a small clearing just round it. Up above in a tree full of wet creepers some 35 feet from the ground I saw my quarters for the next three hours or so, and overhead the lowering clouds, whilst a strong wind blew the driving rain across my face. The prospect was most enlivening, especially as that same hour last week would keep obtruding itself uncalled on my memory, and I pictured a fire and the low lounge in front of it in a cosy drawing-room in the far away hills. At that moment I thought that if there was one fool and semi-crazed idiot in the world that one went by the cognomen which I had received in my younger and wiser days.

Having inspected the defunct buffalo from a respectable distance, for obvious reasons, I climbed up into the *machan*, covered myself up in my mackintosh, and sent the men, all but the orderly, away. Hardly had they disappeared when a blinding shower came on, and I had plenty of time to meditate on the dogma that all men are fools, but *some* bigger ones than others; my meditations being interrupted now and then by squalls of wind and rain, which necessitated frantic clutches to the nearest branch to prevent myself being blown down the khud below, into closer proximity with that buffalo than a fastidious man like myself would care to be.

The time crawled on with leaden wings. Visions of hot tea and buns in the aforesaid cosy drawing-room flitted across my brain, weary with abusing its owner; and the buffalo carcase, on which my eyes had been fixed so intently and for so long, began to assume fantastic shapes to my dazed vision and to lift the legs I had thought so stiff and stark. I could almost, I thought, see it wink an eye. Tail it had none: the tiger could a tale unfold about that (its not mine, so don't got angry!): or I should have thought it was wagging it at me in derision. Suddenly, from absolute lethargy and inertness, my body assumed a tense rigidity, the tension of the muscles being almost painful, so tightly were they braced. Without a sound, without the movement of a branch or crackling of a twig, a fine royal tiger had stepped out

into the small clearing round the buffalo with all the lightness and grace of a kitten, carrying its head held high in regal fashion. One lordly glance up the track by which the carcase had been dragged down was all he vouchsafed, and then stepping half round the buffalo he picked it up in his powerful jaws as easily as a kitten would pick up a ball of yarn, carried it just out of the clearing into the jungle alongside, and squatting down (I could guess this), began to crunch up the carcase. To describe my own feelings were impossible. From the seventh heaven of hope and delightful anticipation of bagging my *first tiger* I was reduced in a moment to the abject and black depths of despair. Do you understand what had happened? The space cut round the dead buffalo was only just sufficient to enable me to see it clearly, and I had understood that the carcase had been tied down to stakes in the ground. It had not been so tied, and the tiger by moving it out of the clearing had taken it and himself out of my range of vision. I turned round to the man Bishu with me, and my pantomimic actions and expression of face must have convinced him once and for all—provided he had ever heard of the much-vexed question—of the correctness of the Darwinian theory of descent and of our still very close relationship to the apes of the woods. Was it two minutes or was it thirty that black despair held sway? I know not; and then a ray, a tiny, feeble, faint ray of light, fair as the evening star, burst through the gloom that oppressed me.

Luckily the wind was still blowing, although not in the terrific gusts I had experienced an hour or so before, and the *machan* had steadied down and was no longer like the deck of a ship in a gale. The noise of the rustling branches was still sufficient however to drown any sounds I made in getting free of my mackintosh and standing up in the *machan*. By moving to the extreme righthand edge, clinging on by a small branch and leaning well over I perceived, after a time, to my infinite delight, the tiger's left ear showing snowy white against the surrounding foliage, and soon after for a short moment the left half of the crown of his head as he moved it in his crunching operations. He was apparently squatting on the ground with the hind quarters of the buffalo between his forepaws, feeding just as a cat would. This I conjectured, but although I watched for nearly half-an-hour, not an inch did the beast budge from its recumbent position. It became evident that I should have to fire at what I could see, or make a chance shot at where I thought the tiger's body was. I soon determined that if I had to fire at him in his present position I would take the head shot and risk it. The minutes went by, and I suddenly became aware that the light was failing; in addition to this serious point I could stand the irksomeness of my present position no longer. I have said that to see the tiger at all I had to cling to a small branch and lean right out of the *machan*, standing at its extreme right edge. There was no

parapet of any kind, and the drop below was about 45 feet, as the ground sloped steeply, so that the position was not an enviable one. Even the slight support accorded me by the branch was unavailable when I wanted to fire, as I should require both hands were I to succeed in hitting the mark presented. The only way to negotiate the difficulty was to make the orderly hold me round the waist, as I could not hold on to the branch, and my pantomime signals were most energetic as to the consequences to himself should he let go and send me below. If he held tight, all would be well with me. If he let go, well I did not care to think about the consequences. I didn't like it, not a bit, as it was depending on a native more, much more than I had ever done before. But what could I do? There was my first tiger below me, and ordinary commonsense and prudence were relegated to the background. With one final glare at the wretched Bishu, resulting in a frantic and almost too energetic tightening of the clasp round my legs, I leant right out of the *machan* and, waiting till a movement showed me the left ear and almost half the portion of the head nearest to it, I took as long a breath as my extremely irksome position permitted, wondered where I should be in a second or two, and fired. The shot was followed by a clutch that pulled me backwards into the middle of the *machan*, and I found myself gracefully reposing on the head and shoulders of my companion, but luckily still erect and with my rifle, of which the left barrel was still ready for further operations, in safety. I gathered that the clutch was only the result of the great tension to which the man's nerves were strung. The report loosened them, and luckily for me in a backward direction. Had it been forward I should have had a poor time of it, the conditions below being an unknown quantity. I confess I was jumpy myself, but I had listened as carefully as the circumstances would permit after the shot, and save for one sound, as of something falling in the grass, I had heard nothing. No growl! No crash! Had I killed the beast outright! It seemed almost impossible that such a piece of luck should be mine after the half hour or more of anxiety I had gone through. Or, dreadful thought, was it a clean miss? I turned to Bishu and enquired what he thought. His answer sent my hopes to zero. He thought he had heard the beast spring away. As I was sitting on his head at the moment, and he himself was in as big a fright as was possible, I might have spared myself the blow which this reply gave me. I was too excited however to think rationally just then. I told him to get half down the tree and see if he could see anything. He did so, and presently came back and reported that he thought he saw the jungle waving about near the buffalo. As a wind was blowing and every tree was dripping, the jungle most certainly was on the move; but from other causes than the death throes of a wounded tiger. Nevertheless his words were golden to me then—sweeter far than pearls dropping from the cherry lips of the fairest of the wilful sex—

and of about equal value! I then bethought me of standing up in the *machan* and endeavouring to get a little higher than the position I had fired from. It was just possible to raise myself a little and yet see through the branches the place which had been occupied by the tiger's head, and there—surely a sight for the gods!—was a little patch of pure white with two or three black streaks across it. 'Twas all I could see, but I knew it was my first tiger lying on its back! I got down, called up Bishu who had again gone part of the way down the tree, and sent him up to see what I had seen, whilst I myself did a little quiet *pas seul* on my *machan* floor to work off some of the superabundant spirits. The question now to be faced was, what was to be done? It was no good firing at what I could not see, and I had no intention of spoiling the skin by trying aimless shots at what I was convinced was a dead tiger. I had fired at the head and I felt that the bullet, by some marvellous luck, had gone truly home. After considering a bit we called out to the men who were some way off in the open above, and, as soon as they were near enough, explained the position to them. They sent down a few bushel-loads of stones, sticks and mud, &c., to wake up the brute if he was only stunned or wounded, and I then got down and, with the Rajput Forest Ranger, armed with a prehistoric implement he called a rifle, we marched up to the tiger and found him lying on his back, as dead as mutton, with a bullet-hole just beneath his right ear. Death had been instantaneous! We stood round, and the requiem of the dead monarch was shouted by a babel of voices, all explaining how much they had helped in the deed of death, the refrain, which came in at intervals when want of breath stopped the chief perfomers, consisting of a chorus of grunts and wah! wah!! wah! wah's!!

It was now nearly dark, and leaving instructions that the beast was to be brought straight in, I turned away and for the first time for nearly an hour became aware of the fact that I was wet, cold, hungry, and stiff and tired. The rain was coming down as if it meant to continue, and I had six weary miles to get over.

We got up out of that jungle and started best pace for home. Before a mile had been covered it was pitch dark, and the dense mist came down on the hills like a thick white pall, the shroud of the dead lord of the jungle. Two miles or more were got over in safety, and I was beginning to think that in a short time we should drop down on to the cart-road where all would be plain sailing, when Bishu, who was leading at a good round pace, faltered in his stride, went on, hesitated again, took a few more steps forward, and then came to a dead stop and volunteered the information that we were on the wrong road. My castles began to fall, but I was in too good a frame of mind to allow them to crumble quite to pieces, and I tramped for twenty weary minutes behind the orderly, while he tried various directions in search of the road. I

only kept my eyes or rather attention fixed in the direction we had come from, and this I nearly lost, as it was terribly dark and the thick mist made it impossible to see the ground even at one's feet at all plainly. The rain was steadily falling and the wind blew pitilessly through my bones, for we were apparently on the summit of an open down with small scrub jungle here and there in patches; at least I gathered this to be the position of affairs by running into the said patches at intervals. I began to have visions of a night passed on the ——hills in a thin khaki shooting suit with no food or drink (there was plenty of the latter its true, but my vitiated taste required, I fear, something stronger), and even my tiger began to recede slightly from its prominent position in my thoughts as my imagination pictured only too vividly the beauties of the situation.

At length the man seemed completely at fault, and I suggested that we should go back to the place where we had first lost the way, if we could find it, on which point I had grave doubts, and make a cast round there. This we proceeded to do. On the way we came upon a dark-looking line running at right angles to the direction in which we were moving, and Bishu, after kneeling down and examining it, pronounced it to be our path. Heaven only knows how he knew, but he turned sharp to the right and trotted on. I followed fearing every moment to see him check again. He held steadily on, however, and proved correct as soon as we came to a slightly broader track full of sharp-cornered trap-rock stones which, from its vile nature, I had marked down on the way up in the afternoon. Bad indeed was the walk down that path, which wound in zig-zag fashion down the hill to the cart-road below, and throwing dignity to the winds I, in many places, took to the methods of my ancestors and went on all fours. One can't be too particular in the dark, and its better to save one's shins and lose a little dignity than to try and save the latter and end by grievously hurting both. The weary two and a-half mile tramp along the cart-road I do not remember much about. The lights of the bungalow brought me back to the world, and tired, wet and muddy I stamped in, subsided into a long chair and laughed at R——'s incredulous "Nonsense, what? Well, I'm.....! What?" as I assured him I had bagged (within 24 hours of my arrival in the 'no shikar' country) my tiger, my first tiger.

I sent the skin into L—— next day with a note worded much as follows:—"Dear L——,Herewith a tiger-skin. Will you look after it for me till I turn up. Shot the brute yesterday..... Understood you to say there was no shooting in the—— hills, and that it was a poor country. I find it excellent."

His reply was perhaps more emphatic than polite, although extremely pithy. It consisted of—

"Dear P—, *Well, I'm d.....d!*"

THE VAGRANT.

Through Eastern Europe.

FINDING one summer that my leave was available at an earlier date than I expected, and it not being convenient to arrive in England on the date on which the first steamer from Rangoon would arrive there, I decided to travel leisurely home through Eastern Europe. S., whom I met in Rangoon and whose love of travelling had not been diminished by over a year's continual touring in Upper Burma, also made up his mind to accompany me.

Leaving Rangoon by the P. Henderson's S. S. "Arrakan" on May 20th, we had a very comfortable run of 20 days to Ismailia, touching at Perim *en route*. Perim, it may be remarked, is not quite such a barren place as it seems when viewed from a passing vessel: there are several herbs, chiefly rock plants and stone crop, sufficient to support a herd of twelve wild gazelle, which, of course, are not allowed to be shot or hustled in any way.

We left the "Arrakan" with some regret; in the light monsoon weather we experienced she proved herself a remarkably steady boat, while the food, though nominally second class, was extremely good and quite equal to that supplied in the first saloon on many ships.

On landing at Ismailia we found we had only 10 minutes in which to pass through the Customs and take the train to Cairo and Alexandria. Cook's agent, a very smart man, arranged everything for us in the minimum of time, and had it not been for him we should have undoubtedly missed the train and had to spend the night in Ismailia, not a very interesting place.

From Ismailia S. and another man V., who was travelling a part of the way with us, went on to Alexandria, while I left for Cairo to rejoin them two days later.

In Egypt, especially in the slack season, it is unnecessary to travel first class, except in the express trains between Cairo and Alexandria, on which there being no third class carriages, the second are apt to be inconveniently crowded. The country in the irrigated parts of Lower Egypt and in the towns reminds one very much of the N.-W. Provinces and the Punjab, the only broad difference being that in Egypt, of course, all the natives are Mussalmans, and that in the towns there is a larger European quarter.

The hotels in Cairo are magnificent and so are the prices; but in the off season when a hotel with 150 rooms may only contain five visitors, it will be found that the manager will make very considerable reductions from the printed tariff.

Drinks, afternoon tea, and extras of all kinds are, however, extremely expensive, and are better taken in one of the numerous cafes which abound.

Having business in Cairo I was unable to visit the pyramids, and only had time to drive through the bazaars and pay a short visit to the El Azhar mosque. This mosque is said to be the central university of Islam, and to be attended by over 10,000 students

who occupy the cloisters on each side of the large central court. I should say there were roughly 3,000 there at the time of my visiting. The cloisters and colonades are low and narrow, and the material used is a common grey stone, while the mosque proper consists of about 5 not very large bays, each crowned by a squat dome. The El Azhar mosque is said not to be the finest in Cairo, but there is nothing which in the least approaches the Jamma Musjid at Delhi in size or magnificence or the smaller mosques both there and in Agra for perfection of design and beauty of detail.

I enquired at the mosque for Indian students, but was told there were very few, and was then taken to see a Mussalman trader from Cabul, who knew Northern India well. He was very pleased to see me, and offered tea and sweetmeats. In conversation with him I found he had rather a poor opinion of the Arab and Syrian students, saying that for piety of living and knowledge of the Quran, beyond mere parrot repetition, the schools of India were far superior. This man told me that he arranged to look after and board Indian students on their first arrival from India.

On the journey from Cairo to Alexandria our train broke down owing to a flawed excentric rod having snapped suddenly. A travelling inspector told me that the details of these engines (American) were often of bad material and hastily put together, so that they were constantly breaking down. This is the same reputation that American engines have earned in Burmah, and also as I learned from a chief engineer on the Roumanian railways in that country too. It is refreshing to learn in these days that for excellence of detail and carefulness of finish, English locomotives are still pre-eminent.

Although we arrived in Cairo and Alexandria in June, the heat was by no means great and oppressive, but we were fortunate in not experiencing the hot winds from the desert. It would be impertinent to attempt to criticise the administration of Egypt after three days' residence, but to a casual traveller everything seemed quite equal to the most advanced provinces in India, while in the public offices, where I found everyone most obliging, a most business-like air prevailed.

For Indian travellers intending to spend a few days in Egypt on their way home and wishing to see something of the country, it would be preferable to spend a longer time in Cairo, neglecting Alexandria, which presents no particular points of interest, resembling very much any other seaport town in the Mediterranean. Those, however, who do not care about sightseeing and are merely waiting for a steamer to take them on, should go during the summer to Ramleh, a charming seaside suburb, which is almost entirely European, and where there is an excellent hotel, the San Stefano. From Alexandria we journeyed by the "Alkahrieh" of the Khedivial Mail S. S. Co., *viâ* the Piræus and Smyrna, to Constantinople. Although not quite so clean as a ship commanded by an

Englishman, she was a most comfortable and fast passenger boat, of over 2,000 tons, with a speed of 15 to 16 knots, and providing an excellent table.

Owing to the existence of a few cases of plague in Egypt we were quarantined for two days at Delos. The medical inspection by the quarantine authorities on shore was rather a farce, for the passengers merely passed along in Indian file and bowed to the doctor. After returning to the ship we were confined there for two days, not being allowed even to hire a boat and sail in the harbour for fear that we might land on the nearly desert shores of the island. There is an ancient torso said to be of Apollo at the quarantine station, which, in truly P. W. D. fashion, has just been covered with a fresh coat of whitewash. We were lucky in experiencing only two days' quarantine, for it often happens that when there is plague in Egypt, it is imposed for ten days: travellers should enquire about this before leaving Egypt.

From Delos we had a run of 8 hours to the Piræus, where our steamer stopped for three hours; this was just sufficient to pay a hasty visit to the Acropolis at Athens, passing the remains of Hadrian's temple, the tomb of Lysicrates, Socrates' prison, the tomb of the famous Venetian Doge Daudolo and the baths of Theseus *en route*. All these ancient monuments lie close together, and one would prefer to spend at least one complete day in Athens; still if this is not possible the excursion to the Acropolis certainly repays the trouble and expense: although the buildings on the Acropolis, with the exception of the Propylæa, are much ruined, there is yet much beautiful detail left, especially a door in the cell of the Erectheum, in the Ionic style, which was a gem of classical beauty. Leaving the Piræus at 6 P.M. we arrived at Smyrna about noon the next day. To one just arrived from the East, the town appeared very bright and clean; many, if not most of the European houses, even the small ones, being built of pure white marble. The bazaar is well worth a visit. Fruit of all kinds are both good and cheap: cherries, apricots, peaches, figs and grapes being abundant at the time of our visit. In Smyrna, as elsewhere in Asia Minor, there are large numbers of Germans, and it was not surprising that there was also a large *café* on the sea front, where most excellent beer can be obtained at reasonable prices. We had no time to visit the Church of St. John, one of the seven primitive churches, or the Cave of the Seven Sleepers. Here again, as at Athens, we were pressed for time, and it being extremely hot, the seductions of the Bier-keller proved superior to the more spiritual attractions of mere sightseeing.

Leaving Smyrna at 5 in the afternoon we arrived at Constantinople at 4 the next afternoon. Here we engaged a guide, whose services we found invaluable. Constantinople is a dear place, and the cost of living and sightseeing during a period less than a week cannot be set down at less than £2 per day. The cheapest method of living is to bargain for one's room at a hotel and to eat

most of one's meals outside, for though hotel-keepers make great reductions for those who live *en pension*, yet the price of extras, especially wine and beer, remains very high. I will not attempt to describe the general aspect of Constantinople with the neighbouring towns of Pera, Galata and (on the Asiatic side) Scutari. Suffice it to say that it is one of the few places we have seen that have far surpassed our expectations, and that it is well worth a visit. We saw all the regulation sights, and were present at the weekly visit by the Sultan from his palace to the Selamlik. The line of route is strongly guarded by 10,000 soldiers, and ordinary visitors must stay outside these. Accommodation in outbuildings on the line of route can only be obtained if one is personally known to some member of an embassy, who can vouch for the visitor's credentials. Formerly the difficulties in the way were not so great, but since the assassination of the King of Italy far more stringent precautions have been taken than formerly against the admittance of strangers.

Drawn up in review order, the troops that we saw seemed a fine lot of men, well clothed and fed, and well armed and drilled. The education of the officers seems, however, to be a weak point, the training that they receive during youth in the harem vitiating their energy and intelligence, while numerous general officers either themselves, or the sons of palace favourites are under thirty.

For travelling in Turkey, as also in the Balkan States of Bulgaria, Servia and Roumania, passports are absolutely necessary, travellers unprovided with them not being allowed to leave the ship. Further, before crossing the frontier they must be visèd by a consul of the country which it is desired to visit and sometimes by the British consul also. Thus, in order to visit Turkey from Egypt passports should be visèd by the English consul at Alexandria, who will arrange to provide the traveller with a Turkish passport, without which one cannot enter Turkey.

V. had left us at the Piræus as he wished to arrive here quickly, travelling by train to Patras, whence steamers run nearly every day in about 6 hours to Brindisi. For those who, like ourselves, had travelled from Burmah in a ship that does not touch at any continental port, and dislike the long and wearisome voyage round by Gibraltar and the Bay of Biscay, the route *viâ* Alexandria, Piræus, Athens, Patras and Brindisi or Trieste offers considerable attractions over the hackneyed journey from Port Said to Brindisi direct. The additional cost is not greater than a pound or so, and the extra time occupied from two to three days, according to whether the journey is performed by the fast P. & O. boats from Port Said to Brindisi or not.

From Constantinople there are two routes to England: one by train the whole way to Calais *viâ* Sophia and Belgrade, the other by Constanza (a Roumanian port) and Bucharest. As we wished to travel on the Danube between Giurgevo and Belgrade, we chose the latter route. The first part of the journey was performed in

a Roumanian vessel, a fine ship of over 2,000 tons, built in Italy, with a speed of over 16 knots. The cabins are large and well fitted, while the table is excellent—when the weather permits one to be present, which appears to be the case but rarely. At Constanza we experienced great difficulty in passing through the customs, the officers being much exercised by the presence of a few well worn packs of cards which we had used on the "Arrakan." The head of the office was much annoyed when we suggested that the difficulty might be solved by taking them on board and giving them to the steward. Finally, as a great concession and after an hour's talking, he returned us a pack each, tearing up a third, although we assured him we had no suspicion of ulterior motives on his part. We remained on board at Constanza till 5 in the morning, taking the ordinary train at 5-30 to Bucharest, as we desired to cross the Danube bridge by daylight. One of the engineers of the railway, whom we met in the train, a most agreeable and well-informed man, told us that the bridge was over one kilometre long in four big bays and a few smaller ones. The bays are composed of overhead bowstring girders, 80 feet above ordinary highwater level. The bridge is both longer and higher above the water than the proposed bridge across the Irrawaddy at Sagaing; it was built in France at a cost of 5,000,000 francs. The approaches on both sides are rather low, which detracts from the appearance of the bridge, which is otherwise a very fine structure. Along the railway cuttings we noticed *Robinia pseudacacia* had been planted and was growing luxuriantly.

Bucharest is a fair-sized town of over a quarter of a million inhabitants, and was the first European town we had yet come across. Even in the town however, the peasants, both men and women, wear their national costume, the men's consisting of a long white coat and trousers with a leather waistcoat or broad belt. The coats of the men and the bodices of the women were frequently handsomely embroidered with what I believe is called Russian embroidery. One of the most interesting features of our journey has been the numerous varieties of costume worn by men and women alike. In Orsova, the first Hungarian town met with when travelling up the Danube, all the women were dressed like the typical fancy dress ball beggar maiden, with numerous strings of coloured string and ribbons depending from their belts.

Bucharest, which may perhaps be compared with Brussels not to its disadvantage, we found a pleasant and comparatively cheap place. We met with much politeness and civility in Bucharest, which so far, except in Egypt, we had been strangers to. I believe this to be due to the desire of the Roumanians to exalt the credit of their capital, but their enemies attribute it to the fact of a commercial crisis having exhausted all the ready money of the country and a corresponding eagerness to handle that of the stranger. However this may be, we were sorry that

the time at our disposal did not allow us to make a longer stay than one day in Bucharest, and we left it with regret. Gypsies, as dark as natives of Northern India but far less handsome, were met everywhere. Their bands are said to discourse excellent music, but the evening that we spent there being rainy, none of the open air bands were to be heard, and we did not hear a really good band until we arrived in Belgrade a few days later.

We left Belgrade by train for Giurgevo, arriving there after a run of three hours. It may be mentioned that the railways in Roumania are very comfortable, and that for short journeys by day the second class carriages are quite good.

Giurgevo lies opposite the town and old fortress of Rustchuk, which was dismantled in 1877 and has since remained so according to the provisions of the Berlin Congress.

We ourselves alighted at Giurgevo and drove to the landing stage on the Danube some three miles away, thinking it a waste of time to cross over to Rustchuk and join the Danube steamer there, which subsequently crosses the river to Giurgevo again. It is probable, however, that it is both cheaper and quicker to travel direct from Bucharest to Rustchuk by rail and ferry steamer, thus avoiding a long and expensive drive over muddy roads through a country of no particular interest.

From Constantinople there is a shorter and cheaper route to Rustchuk *viâ* Austrian Lloyd's steamer to Varna, and thence by the Bulgarian State Railway to Rustchuk. Although shorter the journey takes longer owing to neither steamer nor train being express, but each stopping at every station *en route*. By this route Bucharest, which is well worth a visit, is not passed through.

At Giurgevo landing stage we had little time to wait for the steamer which arrived about 8 P. M.

We were much disappointed with our ship, which was very badly appointed and not nearly so comfortable as nine-tenths of the Irrawaddy Flotilla Company's steamers. To begin with she was of small size and by no means clean; the cabins were small and afforded little space for baggage; there were no bathrooms; while the food was poor and expensive and the waiters uncivil and inattentive. The line we travelled by was a German or Austrian one. The boats of the Hungarian company are said to be far superior, and from what we saw of the Hungarians afterwards it is probable that they are much better found and the accommodation more comfortable. It should be borne in mind that unlike river steamers in Burma, nearly all baggage has to be weighed and paid for at very high rates. Thus even in fine weather travelling is not more comfortable than in a well-appointed corridor train, which nearly all the fast trains are in Germany and to the eastwards. In short, the tourist who wishes to travel by Danube steamer should so arrange matters that he does not have to spend a night on board.

Between Giurgevo and Sistova the banks of the river are flat and marshy, bordered with willows, especially on the left bank or Roumanian side: on the right bank in Bulgaria the country is bare and almost devoid of vegetation, even when there are a few low undulating hills to break the monotony.

We passed Sistova at night, but it is said to be an extremely picturesque town. The Russians crossed the river here in 1877.

Passing Kalapat and Widdin, where the remains of the field works constructed during the Crimean and Russo-Turkish war are still to be seen, afterwards Radujevac, the boundary between Bulgaria and Servia, we arrived on the early morning of the second day at the entrance of the iron gates, at the end of the great Roumanian plain.

The following description* is taken from the steamer company's handbook:—

"The iron gates are an obstruction to the flow of the stream, "the chief one being formed by a long rocky bank, the Prigada bank "1,000 metres (over 1,000 yards) long, while the river contracts "to a breadth of between a 1,000 to 600 metres. The Prigada "bank is no single continuous mass, but a medley of thousands of "isolated reefs and banks, of rugged crags and sharp rock needles "which fill up the whole bed. Between each particular reef the "water is often very deep, but sometimes so shallow that no vessel "can pass; the fairway too is often only 3—12 fathoms deep. The "velocity of the current is enormous, and on that account owing to "the many obstructions in the channel the passage is a dangerous "one. Now owing to the regulation of this and also of the upper "cataracts (the whole extending for a mile and a-half), the obstruc-"tions in the stream are avoided and a new channel for ships has "been made passable."

This channel is the iron gates canal. It is constructed on the right bank of the river, and was opened in 1896 by the Emperor of Austria and the Kings of Roumania and Servia. At the time of our visit the Danube was very high, so that the canal was full of water which ran like a mill race, our steamer, which was usually capable of making 12 knots an hour against the current, being only able to move at a walking pace. Of course the depth of the canal is only sufficient to admit of steamers little larger than the one by which we were travelling, and as one has so frequent occasion to notice in Burma, the speed falls off at once when passing the shallow water though the engines may be going full speed ahead.

From the lower end of the iron gates the mountains close in upon the river and do not retreat for some miles above Orsova, which is situated at the head of the canal and is the first Hungarian frontier station on the Danube. We waited here two hours while we went through the custom house and our passports were

* Remembering that the order is down stream.

inspected and passed. This delay enabled us to stroll round the town and breakfast on excellent fruit and coffee at a cafe instead of in the very indifferent restaurant on the steamer. The chief points of interest hitherto between Giurgevo and Orsova had been watching the passengers of different nationalities, Roumanians, Turks, Bulgars and Servians, most of whom were wearing their picturesque if often rather dirty national costumes, which for both men and women were more often of an Oriental pattern than of European cut.

Between Orsova and Belgrade—a 16 hours' run—lies the grandest and most magnificent scenery on the Danube. A mile or so above Orsova the mountains, which are well covered with coniferous forest, rise precipitously from the river to a height of 5 or 6 thousand feet, while the breadth of the stream in the Kajan Pass diminishes to 150 yards, the corresponding depth being over 200 feet. Our guide-book, with a touch of anti-climax, says :— "Here the Danube has a depth of 74 metres; right and left "rocks tower aloft to an enormous height and present the most "picturesque scene that river scenery can offer. In this portion of its course the Danube for natural beauty is incomparable."

With the exception of the word picturesque—for whatever else, it is certainly not that but rather grimly magnificent—this description may very well be true, though neither of us have seen the upper defiles of the Irrawaddy, which are said to be very fine. On either side of the Kajan Pass there is a road with galleries cut through the solid rock : that on the right bank and now impassable in places was built by the Emperor Trajan; the other on the left is a modern carriage road constructed at the close of the 18th century and named the Szechenyi Strasse, after one of the greatest of Hungarian patriots.

For those with not much time to spare, the journey between Orsova and Belgrade is the only part of the Danube worth paying any attention to. The train can be taken from Bucharest to Orsova and at Belgrade again a main line with express trains takes one on to Buda Pest. As already mentioned, the journey between Orsova and Belgrade is performed by daylight, so that there is no need to sleep on board.

In Orsova there were many shops and pedlars of fresh caviare, a delicacy we had never tasted before.

Fresh caviare is to the ordinary black caviare imported to the East in tins as whitebait to imperfectly salted *gnapi* (fish paste); some that we bought changing of its own accord by mere lapse of time from one variety to the other.

Belgrade, with the Hungarian town of Semlin on the opposite bank, is brilliantly lit throughout by electric light, and the view while entering at night is truly picturesque. At Belgrade we stayed at the Grand Hotel, which was replete with every comfort except baths. However, there are excellent and cheap Turkish baths in the town, which are most refreshing after a long hot and

dusty railway journey. Belgrade we found a peaceful and restful place after the other towns we had passed through. The fortress on the top of a flat hill overlooking the junction of the Save and Theiss with the Danube, was a most charming place with shady walks and benches, while a small restaurant affords excellent wine for a very small price. The sentries allowed us to wander all over the place without question or opposition. Belgrade is a comparatively cheap place. It is well provided like every other continental town with electric tramways, and since the streets are broad, the traffic limited, and there is no Board of Trade to impose grandmotherly restrictions, the speed within the town varies from 8 to 16 miles an hour; sometimes exceeding 20 miles an hour in the country. There is an excellent park a few miles outside the town (reached by train in 25 minutes) with fine trees and shady walks, with one or two good restaurants hard by.

We wandered into the conservatories, which were tended by convicts, to one of whom, as there were no warders about, we gave a few cigarettes. The casualness of their occupation was truly Oriental; it is probable, however, that they were good conduct men, nearing the termination of their sentences.

In the garden attached to the restaurant we heard for the first time first class music played by a band of gypsies. Many of their pieces were thoroughly Oriental in melody, feeling and execution, though with the exception of an instrument resembling the Burmese piano, they used the ordinary orchestral string instruments. It would be interesting to have some Burmese music performed on modern instruments; much of it would then resemble gypsy music. Like other Orientals, the gypsies usually play without written music, and occasionally, I believe, improvise.

We left Belgrade in the early morning, and after the usual tiresome formalities at the frontier town of Semlin (where passports are again necessary) we arrived soon after mid-day at Buda Pest.

I will not attempt to describe Buda Pest, except to say that for those in search of amusement of all kinds it is the most lively and best run town that I have yet visited.

The means of locomotion are abundant and far cleaner and faster than the 2*d.* tube, trams, and 1*d.* steamers in London.

In fact no one need ever walk for more than half a mile before meeting a swift electric train which will take him wherever he wishes to go. The Hungarians seem a most businesslike nation, and while as a rule courteous and obliging, do not waste time and indulge in that tiresome excess of courtesy so often met with in Austria. We were both delighted with Pest, and if we had not been anxious to arrive in England would stay there for 10 days.

From Buda Pest we travelled *via* Vienna, Dresden and Berlin to London, breaking our journey for a day at each place. This is really the cheapest route from Pest to London, and during July is

not crowded, so that there is always plenty of sleeping accommodation at night.

The Berlin zoological gardens are well worth a visit, being vastly better and more scientifically arranged than ours in Regents Park. The big game particularly, from Africa, being specially well represented, while one can have an excellent dinner there and listen to two first class bands, which play alternately without ceasing throughout the late afternoon and evening.

As regards the languages, French is useful in Egypt and Turkey, also to a certain extent in Bucharest; afterwards German is the only language (except perhaps Russian in the Balkan States) of any use until the frontiers of France, the chances being that where French is spoken English will be spoken too. A knowledge of Italian will be found advantageous in Roumania, their language being closer to it than any other of the Romance languages. With regard to expense, except when guides are engaged the cost is no more than travelling in England.

25th July 1901. A. P. G.

VI.-EXTRACTS NOTES AND QUERIES.

Note on the cultivation of Elettaria Cardamomum.

Soil.—The soil ought to be richly loamy, free, capable of holding a sufficient quantity of moisture and containing a good percentage of leaf mould. A rocky soil is very detrimental to its well-being.

Climate.—This exercises a great influence on the cardamom plant. A heavy or a light monsoon brings about a bad crop. Continued drought from February to May does not affect the plants much, but the yield will be small. February rains do immense good. A moderate and well-distributed rain is what the plant likes and produces a good yield. Fire, it need not be added, kills the bulbs outright.

Aspect.—This should be such as the direct rays of the sun do not strike the ground of the cardamom garden. Northern and western are the most beneficial; but a north-eastern or a south-western does not do great harm. The ground should not be exposed to the effect of strong winds.

Altitude.—This ranges between 1,800 feet to 5,000 feet. Those growing on and above 2,000 feet thrive best. Watt (Dic. of Eco. Pro., Vol. III, p. 228) gives the altitude to be 2,500 feet to 5,000 feet; but I have known rich gardens growing below an altitude of 2,300 feet.

Cultivation.—The two chief modes of cultivation are by bulbs and by seeds. To start a plantation, the ground should be first cleared of all undergrowth, and big trees of different species felled here and there to admit sufficient light and air. The seed is then sown broadcast. If the ground is slightly prepared

preparatory to sowing, better results are sure to accrue. After the first monsoon the plants attain a height of 2 or 3 feet. Weeding is absolutely necessary in the first and second years; and in the third and succeeding years till the plants bear fruit this operation may well be dispensed with. Fruits begin to appear in the third year; but profuse and profitable seeding commences in the fourth or fifth year. Weeding is necessary in all the subsequent years, and a neglect of the operation surely leads to deplorable results.

In the propagation by bulbs pits of about one foot deep and 18 inches wide are dug in beds slightly raised above the surrounding ground; and into these the bulbs are transplanted. Here, as before, the ground must be cleared of all undergrowth and the canopy slightly opened out to admit sufficient light. Fruiting in this case is sure and profuse in the third year. Here, as in the other case, weeding is indispensable.

A garden which had been yielding good results, but which had been, through carelessness and neglect, left uncared for, has been known to be treated in the following method with excellent results:—

In summer the undergrowth is cleared and big trees are felled at random to admit light and air. In the succeeding autumn young plants come up in numbers in places exposed to light and especially on either side of the fallen stems. Natives assign this not to the clearing of undergrowth and the admission of light, but to the so-called 'shaking of mother earth' caused by the fall of gigantic trees. Whatever it might be due to, the results are satisfactory. Great care should be taken in this case as elsewhere, not to open out the leaf canopy too much, as by doing so the young cardamom plants may be overtopped and choked up by the profuse appearance of injurious growth.

Yield.—According to Watt (Dic. of Eco. Pro.) 28lbs. per acre in Bombay Presidency seems to be the highest on record. But instances are not wanting in Southern India of gardens yielding 5 thulams, *i.e.*, 100lb per acre. This might be an exceptional example, but $1\frac{1}{4}$ and $1\frac{1}{2}$ thulams, *i.e.*, 30 and 25lbs., per acre are very common. At any rate, the yield would surely justify the outlay of a small sum for the culture of cardamoms; and it is curious to see that productive lands are allowed to remain fallow and that those Governments which have every facility for cardamom culture are apathetic towards that industry.

THANIPADOM:
20th June, 1901.

K. G. MENON,
Cochin Forest Service.

"Fire Lines in Pine Forest in Prussia."

PINE forests are in all probability the most easily set on fire, and this is specially true of those growing on sandy soil. Such forests form the chief stand of the district at Chorin, a little

village near Eberswalde in Prussia. The pines (*Pinus sylvestris*) are growing in clear stand on a sandy soil, presumably the delta formation of the under ice-streams of the glacier that once covered the region. The stand is especially endangered by the main line of railroad from Berlin to Stettin; but despite these conditions, there have been very few serious forest fires in it. That there have not been more is due solely to the excellent system of fire lines which cut up the stand into small sections and successfully prevent the spreading of any fire that may start.

Adjoining the line of the railway, and running parallel to it, is the main fire line. This is a strip about thirty-five feet wide, on which a number of trees are kept as "spark catchers." The trees used for this purpose are of various genera: birch, beech, pine, &c.; but the forester in charge gives the pine the preference, as it is evergreen and consequently of greater service in the early spring when the danger from fire is greatest. The trees are kept clear of branches for at least two to three feet from the ground, and the ground-covering is of grass or some low-growing green herb. All dry material and all weeds are carefully removed. These precautions are taken to prevent the fire from making rapid headway. Back of the strip just described is a shallow ditch some four feet in width, which runs parallel to the track. This ditch is very carefully freed of all growth whatever, and from two to three times in the course of the spring and summer the earth is loosened, so that the fresh broken soil is always exposed. The strip and ditch together form the regular form of fire line along railroads, and are excellent in preventing large fires. Suppose that a spark alights in the ground-covering and this takes fire, there are no dry lower branches nor any weed growth which can furnish fuel to the fire, so that it runs but slowly. If the fire is not discovered and put out, it finally reaches the ditch, and there, not having previously attained any size, it is unable to get across, and therefore burns itself out.

In those localities which are most endangered by the trains, a further system of fire lines is employed. This extra protective belt occurs back of the beforementioned ditch. A section of the normal stand is divided by four-foot ditches similar to the first, into squares with a side of about thirty feet. The area embraced within these squares is kept free from all such things as fallen branches, dry grass, and the like. The ditches are swept clear of all pine needles and other easily inflammable stuff, and the ground is kept bare by hoeing. This extra protective belt prevents the spread of any fire which starts within the ordinary fire line beside the railway, and is only a necessity in especially exposed localities where sparks are liable to be blown beyond the ordinary lines.

In the interior of the stand still another protective system is employed. This consists of a series of roads which intersect the stand, forming a sequence of squares the sides of which are about

seventy yards. These roads are twenty feet in width; are ploughed up each spring, and are then sown down with ceradella, a low growing Spanish plant belonging to the pea family (*Leguminosæ*) and similar in habit to the common vetch (*Vicia sativa*). Ceradella is a very close grower and seems to thrive on all soils and to keep fresh and green in the worst droughts. Consequently it is eminently fitted for the prevention of the spread of ground fires. Such roads planted with ceradella serve to check intra-stand fires before they obtain great headway, and in case a fire has got beyond control they give the fire-fighters a point from which contra-fires can be started.

Such is the complete system of fire lines in use in the district, and by means of them a stand very exposed to danger from fire has escaped all large fires for a long period of years. The railroad bears a large part of the expense of the formation of the primary fire line as well as its entire cost of maintenance, the secondary belt and the fire roads are paid for by the Department of Forestry.

For many of the details contained in the foregoing, I have to thank Herr Forstmeister Dr. Kienitz, who has charge of the district, and who very kindly accompanied me through his interesting revier.—*The Forester.*

Logging in the Redwood Forests of California.

AMONG the many natural wonders of Western America are the forests of giant trees which cover the lower slopes of the rocky mountains, the Sierra Nevada and the Cascade Mountains, and the coast ranges which reach from the Columbia River down through Western Oregon and California. To a traveller from the Eastern States there is no feature of the country lying between the Pacific Ocean and the Rocky Mountain range which creates so strong an impression as the size and character of the forest timber. The oak, the maple, the elm, and a dozen other varieties which are familiar to residents in the country east of the Alleghenies, cease to form a feature of the landscape, and as the train climbs the eastern slopes of "the Great Divide," the traveller catches his first glimpse of the giant trees of the West, the rounded and gentle outline of the densely-massed foliage of Eastern trees being replaced by the tall and sentinel-like forms of the Redwood of California and the pine and fir of Oregon and Washington. The finest specimens are to be found in the large groves, where the trees are closely massed, their huge trunks, from 10 to 25 and even 30 feet thick at the butt, rising perfectly plumb and without a limb for from 100 to 150 feet to the first branches, many of which are thick enough to form a massive tree in themselves. The largest specimens of California trees are found in the famous groves at Mariposa and Calaveras, where specimens of the *Sequoia gigantea* with a diameter of 30 feet at

the butt were not uncommon when the grove was first discovered, while the height of these truly wonderful trees was frequently over 300 feet, and is even estimated to have been in some cases as great as 400 feet. The two most celebrated varieties of the big trees of the West are the Douglas fir found in the immense forests which abound in Washington and Oregon, and the Redwood trees of California. The Douglas fir is the western counterpart of the Southern pine. Like it, it is admirably suited, by virtue of its great bending strength, for bridge and roof work, and all classes of framed structures, and the Douglas fir of Oregon is likely ever to remain the favourite wood for use in the racing spars of yachts of the larger class. The Redwood trees of California, on the other hand, not only furnish a timber which affords wonderful resistance to deterioration when exposed to the weather, but is possessed of an exceedingly fine and beautiful grain and colour, which makes it a choice wood for the interior decoration of houses. It is very largely used for this purpose in the West, and has become increasingly popular of late years in the East.

A general idea of the enormous amount of timber contained in a tree, measuring like this 16½ feet at the butt, may be gathered from the following dimensions:—

The total length	300 feet.
Length from butt to first limb	150 „
Diameter at butt	16½ „
Average diameter of logs	12 „
Full contents of logs in board measure ...	166·125 „
Weight of logs estimated at 4½ pound per foot, board measure	273 tons.

Bark on the tree, 6 inches in thickness. The number of days from the time the choppers commenced until the tree was made up into logs ready for transportation, was four and three-quarters. As the largest logs were split in the woods before transportation, it took nine logging cars to haul the logs to the mill. After communication with a belt of timber has been established, these noble trees, the lives of many of which are measured by the thousand years, begin to fall beneath the axe and crosscut saw. One cannot but feel on sentimental grounds the deepest regret that these stately and monumental specimens of tree life should be so ruthlessly swept away, and the pity of it all is only partly mitigated when we remember that the timber thus cut up is turned to a thousand valuable commercial uses. In felling the trees a cut about half-way through is made on the side of the tree towards which it is to fall, and the tree is then sawn through from the opposite side. This is in the case of trees of only moderate dimensions; in the cases of the larger trees the crosscut saw is used more freely. The falling of a 250-foot tree is a thrilling sight, never to be forgotten. The first warning is given by the crackling of the fibres, as the saw cuts away the small remaining

wood that keeps the tree up. The top of the tree is then seen to move slowly across the clouds as the giant bends slowly to its fall.

With an angry "swish" and increasing momentum it describes a giant quarter circle to the ground, the blow of its 200 to 300 tons of weight making the earth tremble as from an earthquake shock. The logs are of unusual size, the majority of them running from 5 to 16 feet in diameter. For convenience of handling all of the logs over a certain diameter are blasted into sections with powder before they are shipped down to the mills. The logs are hauled to a logging railroad by means of a portable engine which, for convenience of transportation, is bolted to a sled. When it is desired to move this sled, the wire cable is run through a pulley which is attached to a convenient tree or stump, and brought back and fastened to the sled. By winding in the cable the engine is drawn to the desired position. When the logs are to be moved, the sled is chained to a tree, and the hauling is accomplished by running a steel rope through as many steel pulleys as may be required. The logs are hauled to the railroad over chutes formed of two parallel lines of logs or poles laid on the ground and freely greased with tallow. They are taken down by the railroad to the saw-mill and worked up into merchantable lumber.—*Scientific American Supplement.*

Extract from the Report of the Committee of the Society of Arts on Leather for Bookbinding.

TANNING.

THE vegetable tanning materials now used in the production of leather are very varied, and probably their active principles, the tannins, form a considerable class. Though their chemical constitution is still only partially understood, it is known that they may be divided into two groups, one of which contains the dihydric phenol *catechol*, and the other the trihydric phenol, *pyrogallol*, and these groups are characterised by very considerable practical differences. The catechol tannins, which include quebracho, gambier, larch, hemlock, mimosa, and turwar (*Cassia auriculata*) barks, part readily with water when exposed to the action of light, heat, and acids, becoming converted into red resin-like products. We have found that leathers tanned with these materials, although originally strong and tough, are particularly prone to a sort of red decay, which is much hastened by the presence of acids and the action of light, heat, and gas-fumes, and which totally destroys the tenacity of the leather. After a very large number of experiments, we most unhesitatingly condemn all these catechol tannages for bookbinding and upholstery, however suitable they may be for other purposes.

This brings us to the consideration of the many thousands of skins which come over from India tanned with turwar bark. These are bought on the London markets by the leather dressers, and are usually detannised by scouring, or drumming in an alkaline solution, next treated with sulphuric acid to brighten their colour, and re-tanned in sumach, after which they are finished and are usually sold under the name of "Persian moroccos" or "Persian sheep." For cheap bookbinding purposes this leather has been used most extensively, and in all our numerous investigations no leather has proved so inferior in resistance to decay as the re-tanned Persian. A book bound in Persian morocco or in Persian sheep shows signs of decay in less than twelve months, and from our experiments we are inclined to believe that no book bound in these leathers and exposed in a library on shelves where it could be affected either by the sun's rays or by gas-fumes, could ever be expected to last for more than five to seven years. The leather, as imported, will redden perceptibly with a single day's exposure to sunshine! In visiting numerous libraries we found that more than half the modern bound books which were in a bad state of decay had been bound in Persian or East India-tanned goat and sheep. We cannot emphasise our opinion too strongly on this subject. We should unhesitatingly advise that in all contracts and specifications for bookbinding, the use of East India-tanned goat and sheep, whether re-tanned or not, be absolutely forbidden. Similar objections apply with almost equal force to the use of mimosa, hemlock, or larch, or of quebracho wood or extract, as tannages for bookbinding leathers. Gambier is also objectionable, while oak-bark, valonia, and oakwood extract, which probably contain tannins of both groups, have proved tolerably permanent.

The pyrogallol class of tanning matters, which comprises gallnuts, sumach, myrobalans, and pomegranate rind, has proved to yield leathers much more resistant to decay under library conditions than the catechol tannins, and of all these pure sumach is the tannage we would most strongly recommend for high-class bookbinding. We have tested leathers tanned with every common tanning material as regards resistance to the action of light, heat, gas-fumes and oxidising agents, and none has stood the test so well as pure sumach tannage. It is almost certain that all the early Italian moroccos which have shown such remarkable permanence are of sumach tannage, and the Niger goat skins are either tanned with sumach or some closely allied substance. The sumach which is imported into this country is very frequently mixed with cheaper materials, such as "tamarix" and "pistacia." When one or both of these materials are present in the sumach, the effect makes itself apparent on the finished material by reducing its length of life, as both these adulterants belong to the class of catechol tannins which we have unhesitatingly condemned.

It must be clearly understood that our condemnation of the catechol tannins refers only to leathers expected to withstand the action of light and air for long periods, and protected from weather. In resistance to wet and mechanical wear, many catechol tannins are superior to sumach.

PRESERVATION OF BOOKS.

Much light has been thrown on the influence of various outside conditions existing in libraries on the durability of leather, by a series of very careful experiments made by the Committee. These experiments prove conclusively that the acid-fumes of burnt gas are the most fatal of all the influences to which bindings are ordinarily exposed, producing what has been described as "red decay" on every sort of leather to which they have had access, the effect being most marked on the East India tannages and other leathers made with tannins of the catechol class; and least so upon these with sumach and other tannins, such as myrobalans, which are known to be pyrogallol derivatives, while oak-bark occupies an intermediate position, both practically and chemically. It was shown that 30 days' exposure to the fumes of a very small gas jet rendered East India leather (tanned with turwar bark) perfectly rotten, so that the surface could be scraped off with the finger nail, while on leather tanned with sumach it had comparatively little effect. Similar experiments were made with exposure to sunlight during 30 days of the past summer, and in this case again, the leathers were affected in the same order: turwar, quebracho, larch bark, and gambier being among the worst; and sumach and myrobalans the least affected, while oak-bark as before occupied an intermediate place, being somewhat darkened but comparatively little tendered. It was found that serious effects, very similar to those of light, were produced by exposure during 30 days to air at a temperature not exceeding 110° to 120° Fahr., dry air being apparently slightly the most deleterious.

GENERAL CONCLUSION.

To sum up the experimental work as far as it has gone:—

1. It is shown conclusively that the catechol tannins, which include turwar, quebracho, hemlock, and larch barks, and gambier are unsuitable for bookbinding leathers where durability is expected, and that sumach yields a much more permanent leather, while myrobalans occupy an intermediate place, but nearly approaching sumach. It is unfortunate that *cassia* bark, which is the tanning material employed for East Indian sheep and goat skins, should have proved so unreliable, since these leathers have been largely used in bookbinding without suspicion, and are in other respects a cheap and good article. With regard to sumach leathers themselves, it is possible that some of the darkening noticed may be due to the presence of adulterants, such as pistacia leaves, in the

sumach used, as it is almost impracticable to obtain absolutely pure sumach, and the pistacia tannin is allied to that of the *cassia*.

2. Of all the influences to which books are exposed in libraries, gas-fumes—no doubt because of the sulphuric and sulphurous acid which they contain—are shown to be the most injurious, but light, and especially direct sunlight and hot air, are shown to possess deleterious influences which had scarcely been suspected previously, and the importance of moderate temperature and thorough ventilation of libraries cannot be too much insisted on.—*Journal of the Society of Arts.*

Retired Indian Forest Officers for the Philippines.

Captain George P. Ahern is establishing a system of forest administration for the Reserves in the Philippine Islands, and is anxious to obtain the services of three or four foresters who have had practical experience in India. Such men, I suppose, might possibly be obtained from the retired list.

The Forestry Reserves in the Philippines will be divided into three or four divisions, and a Conservator placed in charge of each division. Such an office would be very similar in its duties to that of Conservator in India, and it is for such positions that men are required. The term of service would be either for two or three years, and the matter of salary will be arranged later by correspondence with the applicants. Information in regard to forest management and system of administration will be gladly furnished upon application to the Forestry Bureau, Manila, P. I.

It might be mentioned that Mr. Ribbentrop, late Inspector-General of Forests in British India, has consented to act as an adviser in the formation of a suitable system of forest management in the Philippine Islands.

Captain Ahern expects to be in India sometime in October, and may possibly go to Dehra Dun.

F. E. OLMSTED,
United States Department of Agriculture,
Bureau of Forestry,
Washington, D.C.

August 29th, 1901.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Wood Circular.

September 4th, 1901.

EAST INDIAN TEAK.—The deliveries in August have only totalled to 942 loads against 1,125 loads for the same month last year, but the deliveries for the eight months are 9,521 loads,

showing still an excess over the 7,310 loads for the same period of 1900. The market has been very stagnant during the month, prices having perhaps drooped a little in consequence. A want of buying power both here and for arrival is the feature of the situation, and there is nothing either in the state of stocks or supplies or in the level of prices to form a sufficient reason for this. A revival of demand from one or two quarters would soon alter matters.

ROSEWOOD, EAST INDIA.—Stocks are more than sufficient, as the demand is very dull.

EBONY, EAST INDIA.—Remains inactive and prices weak.

PRICE CURRENT.

Indian Teak, per load	...	...	£10 to £17.
Rosewood „ ton	...	...	£5 to £9.
Satinwood „ superficial foot		...	5*d.* to 12*d.*
Ebony „ ton	...	...	£9 to £12.

Denny, Mott and Dickson, Limited.

WOOD MARKET REPORT.

London, 2nd September, 1901.

TEAK.—The landings in the London Docks during July consisted of 883 loads of logs and 366 loads of planks and scantlings, or a total of 1,249 loads, as against 389 loads for the corresponding month of last year. The deliveries into consumption were 446 loads of logs and 499 loads of planks, together 945 loads, as against 976 loads in August, 1900.

The Dock stocks at date analyse as follows:—

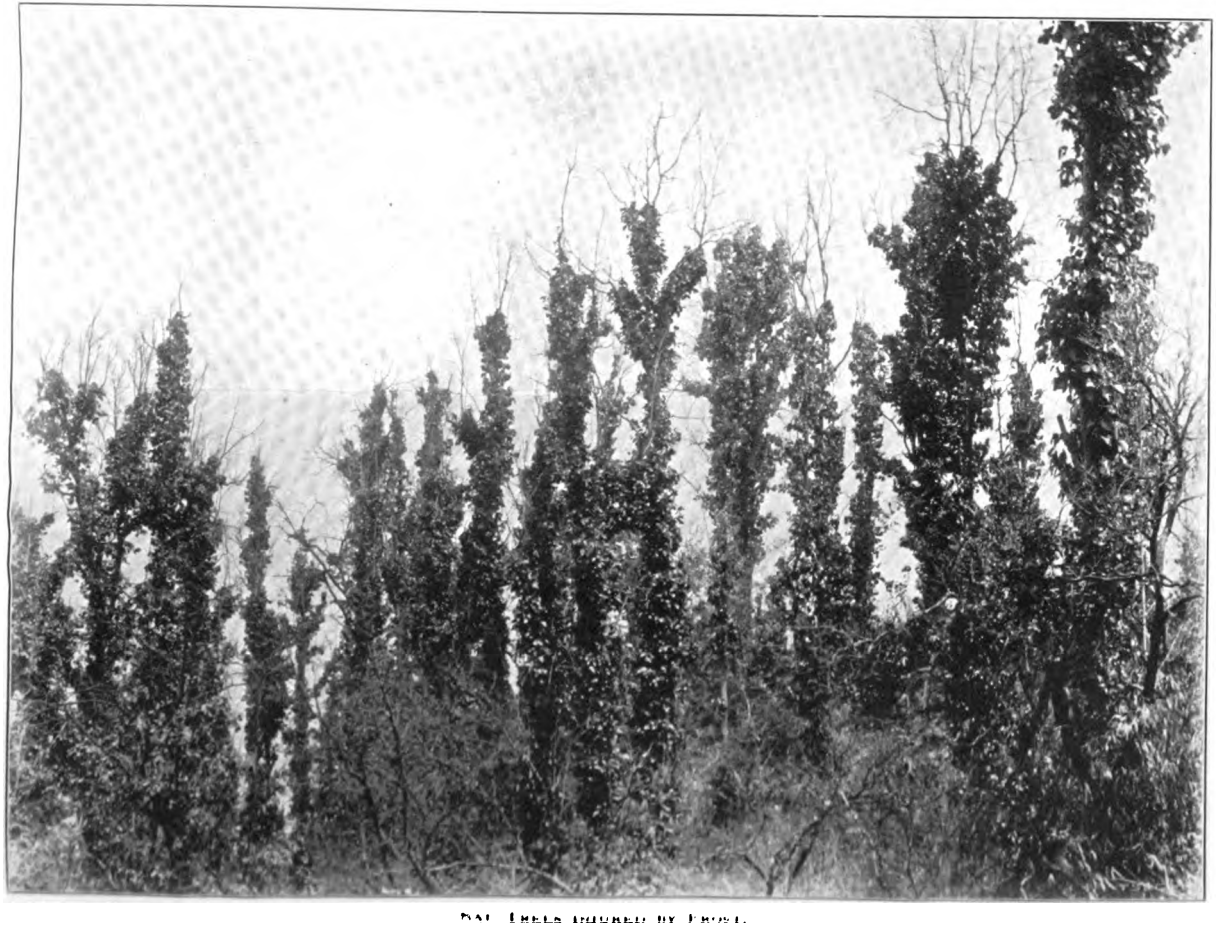
	7,869	loads of	logs as	against	9,383	loads at the same date last year.	
	5,142	„	planks	„	3,880	„	„ „
	90	„	blocks	„	7	„	„ „
Total	13,101	loads		„	13,270	loads	„ „

Excepting a better demand for planks, this market has shared in the general dullness of business. Shippers, however, continue to give practical evidence of their claim that f.o.b. cost and moderate supplies at the shipping ports of European quality do not permit of their forcing forward unsold supplies. The business in the timber trade during August has been carried on under the depressing conditions of a very sluggish demand for consumption, and a writing down of prices which has caused the supply of such demand to be very painful to sellers, and little conducive to fresh stocking even at the present depressed freights and reduced f.o.b. pretensions of soft wood shippers.

Market Rates of Products.

Tropical Agriculturist, 2nd September, 1901.

Cardamom	...	... per lb.	2*s.* 3*d.* to 2*s.* 4*d.*
Croton seeds	...	... ,, cwt.	21*s.* to 22*s.*
Cutch	...	... ,, ,,	23*s.* to 35*s.*
Gum Arabic	...	... ,, ,,	35*s.* to 58*s.*
Do. Kino	...	... ,, ,,	1*s.* 3*d.* to 1*s.* 6*d.*
India-rubber,	Assam	... ,, lb.	2*s.* 2*d.* to 2*s.* 8*d.*
Do.	Burma	... ,, ,,	2*s.* to 2*s.* 8*d.*
Myrobalans,	Madras	... ,, cwt.	5*s.* to 6*s.*
Do.	Bombay	... ,, ,,	4*s.* 3*d.* to 7*s.* 6*d.*
Do.	Jubbulpore	... ,, ,,	5*s.* to 6*s.* 3*d.*
Do.	Calcutta	... ,, ,,	3*s.* 6*d.* to 5*s.*
Nux Vomica	...	... ,, ,,	7*s.* to 10*s.* 6*d.*
Oil, Lemon-grass	...	... ,, lb.	5*d.* to 5½*d.*
Sandalwood Logs	...	... ,, ton	£20 to £50.
Do. Chips	...	... ,, ,,	£4 to £8.
Seedlac	...	... ,, cwt.	50*s.* to 55*s.*
Tamarind, Calcutta	...	... ,, ,,	10*s.* to 11*s.*
Do. Madras	...	... ,, ,,	7*s.* to 10*s.*



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Injury by Frost to Sal Trees.

OUR illustration, reproduced from a negative taken by Mr. W. H. Lovegrove, Deputy Conservator of Forests, shows the effects on sal trees of the extraordinarily severe frost which occurred in the Ganges Division of the N.-W. Provinces between the 10th and 19th January 1900, a few days before the belated winter rains commenced.

We are indebted to Mr. F. B. Dickinson for the following description of the locality in which the photograph was taken :—

"The area which was most affected was the valley of the Dhimhi, the easternmost feeder of the Kohtri, in the Chokam Dun, about a mile to west and north-west of the Chokam rest-house. On both sides of the stream is undulating ground, formed of detritus washed down from the hill range on the north, through which the stream has cut a channel of some 80ft. to 100ft. deep. This undulating ground is grass covered, with patches and strips of sal, and is always subject to frost, the effects of which make themselves felt to a height of over 150ft. above the bed of the stream. The lower patches of forest are attacked nearly every year, and the trees are covered with adventitious branches to within a few yards of the ground and have no proper crowns, looking like enormous bottle-brushes. The younger ones are so constantly killed back, partially or wholly, that there seems no chance of their ever growing up, and it is probable that the older bottle-brush trees, of which there are numbers—50ft. to 60ft. in height—must have grown up under more favourable conditions than now obtain.

The forest naturally improves on the higher ground, and there is some chance here of its encroaching on the grass. Last year's frost was, however, much more severe than usual, and extended its ravages to a higher level, greatly damaging patches which had before seemed out of danger. The area affected extends from the base of the hills all along the stream to its junction with the Kohtri, a distance of 1½ miles, and has an acreage of about 4—500 acres. It is, no doubt, its exceptionally sheltered position, combined with its comparative flatness, which renders it so liable to frost. It is in fact surrounded by hills and spurs on all sides.

The severe frosts of last year were referred to in the Annual Report, para. 97. Frost appears to be more severe in dry winters, judging from my two years' experience of these forests. The

winter of 1899-1900 was an exceptionally dry one, there being very little rain after the end of August until the 19th January, whilst the past winter was a decidedly wet one, and we hardly had any frost at all in the submontane forests."

A similarly severe frost occurred about the same time in the Dehra Dun forests, when it reached levels hitherto quite untouched.

The Preparation of Saltpetre in the Southern Shan States, Burma.

THOUGH not strictly a forest product, saltpetre may be included amongst minor forest produce, and as such its mode of preparation may be of interest.

Limestone caves are fairly numerous in certain parts of the Southern Shan States, especially in the State of Möng Pan, bordering on the Salween. Many of these yield an earth rich in nitrates, a kind of guano in fact, the accumulated dung of bats, swifts, &c.

The potash portion (saltpetre being a nitrate of potassium) is supplied by wood ashes. These wood ashes are obtained by cutting up various trees, mainly species of *Anogeissus* and *Lagerstræmia*, into lengths of about 5 feet, stacking them roughly in the forest and setting them alight.

As the industry is dependent on a constant supply of wood ashes, it can only be carried on during the dry weather, all work ceasing in the rains. The camp is usually on the bank of a stream so as to ensure a plentiful supply of water.

After the guano and ashes have been brought into camp, the former is pounded fine and mixed with wood ashes in the proportion of one basket of guano to two of ashes. The mixture is put into a huge filter made of bamboos and lined with leaves, as shown in the accompanying photograph, and is lightly pressed, after which water is poured in. This percolates through, dissolves out the nitre and drips into a wooden trough. The amount of water poured in depends on the richness of the guano, and so long as the water which drips into the trough is of sufficient strength, determined by taste, more fresh water is added.

The solution thus obtained is then boiled in iron cauldrons until it acquires the right consistency, when it is run through mat filters into bamboo tubes, one foot long and three inches diameter, where it crystallizes. When crystallization is complete, the bamboos are split open and the resulting saltpetre is ready for the market.

The only use to which saltpetre is put is the manufacture of gunpowder; the requisite sulphur for which comes mainly from the Eastern States, though a small amount is also obtained from local sulphur springs.

A considerable quantity of gunpowder is consumed annually in these States in fireworks as well as for firearms, every other Shan being the possessor of a gun of some sort, the Arms Act not yet being enforced.

BAMPON, *15th August*, 1901. W. H. CRADDOCK.

PREPARING SALTPETRE IN THE S. SHAN STATES.

Photo. by W. H. Craddock.

II.—CORRESPONDENCE.

Election of Dr. W. Schlich, C.I.E., to Royal Society.

In England, at a distance from the sphere of action of the *Indian Forester*, we have awaited eagerly some echo of the enthusiasm which we expected would be aroused by the election of our old comrade, Dr. W. Schlich, to a Fellowship of the Royal Society. To myself and to other foresters on the spot the announcement afforded the keenest satisfaction for a reason to which perhaps the attention of the Department in India has not been attracted, and this is, shortly, that this is the first occasion on which research and the study of Forestry as such has been acknowledged as sufficient qualification for admission to a Society whose membership implies very special attainments in the world of Science. Other of our colleagues have ere now been invited to add to their other distinctions these simple letters, so often the sole reward of unselfish labour in the furtherance of special knowledge; we have congratulated them as friends; we have as members of the same Department been brightened by the reflection of their glory. In the present case there would appear, however, to be very special cause for satisfaction, for here is the public recognition of Forestry as a science, the fact that the Forest Officer may now, within the limits of his profession, receive an honour hitherto unattainable therein, and for these reasons it is perhaps due that while congratulating ourselves we should also most heartily congratulate Dr. Schlich, to whom all honour is due as being the first Forester of the Royal Society.

S. E. W.

[We are quite sure that all Forest Officers in India were greatly pleased to hear of the distinction bestowed on Dr. Schlich, and though it seems somewhat late to do so, we take this opportunity of offering him our most sincere congratulations.—Hon. Ed.]

III.—OFFICIAL PAPERS AND INTELLIGENCE.

Rate of growth of Sal in Thinned and Unthinned Areas in the Central Circle of the North-Western Provinces and Oudh.

Communicated by Mr. F. B. Dickinson, *Conservator of Forests.*

The figures given below are the results worked out from girth measurements in sample areas in the submontane forests of the Central Circle for different terms of years, ranging from seven to seventeen years. They are especially interesting from the conclusive way in which they show in every case the largely increased rate of growth in thinned areas as compared with that in unthinned areas.

In most cases it is twice as large in the former as it is in the latter, except in the case of the Andhermajhera plots, where the thinning appears to have been a light one:—

(i) KUMAUN DIVISION.

CLASS.	KHONANI NORTH, 1 ACRE PLOT, THINNED 13 YEARS.			SELANI, 1 ACRE PLOT, UNTHINNED 13 YEARS.			REMARKS.
	No. of trees.	Average increase.	Time required to get through the class.	No. of trees.	Average increase.	Time required to get through the class.	
		Inches.			Inches.		
Sal IV 0—1′ 6″	5	10·69	22	1	4·90	48	2,000′
,, III 1′ 6″—3′	33	6·27	38 } 115	11	1·65	142 } 284	
,, II 3′—4′ 6″	21	4·28	55	32	2·49	94	
,, I 4′ 6″—6′	12	5·27	44	5	2·43	97	
,, IA above 6′	...	...	...	...	...	...	
Total	71	...	159	49	...	381	

	LAKHMANMANDI, 17 YEARS.						
	2 ACRE PLOT, THINNED.			½ ACRE PLOT UNTHINNED.			
		Inches.			Inches.		
Sal IV	11	11·83	27	16	4·29	70	1,100′
,, III	48	12·14	26 } 87	22	8·69	34 } 160	
,, II	43	9·86	34	19	5·04	56	
,, I	7	9·89	34	2	6·62	45	
,, IA	...	...	...	...	...	...	
Total	109	...	121	59	...	205	

Class.	Sanmanthapla 17 years.						
	2 acre plot, thinned			½ acre plot, unthinned.			
		Inches.			Inches.		
Sal IV	3	11·88	28 } 87	16	3·13	98 } 190	1,100′
„ III	46	10·57	29 }	21	5·75	53 }	
„ II	52	10·22	30 }	13	7·99	39 }	
„ I	11	9 88	34	3	8·02	38	
„ IA	...	...	...	1	1·25	245	
Total	...	...	121	54	...	473	

	Aonla Khera South, Compartment 5, unthinned.			Chilla, Compartment 3, unthinned.			
		7 years.			7 years.		7 years.
		Inches.			Inches.		
Sal IV	7	4·67	23 } 52	5	3·51	31 } 78	2,400′—2,800′
„ III	99	3·72	29 }	11	2·31	47 }	
„ II	...	..	...	5	2·77	40	
„ I	...	...	...	2	1·25	88	
„ IA	...	...	...				
Total	106	...	52	23	...	206	

(*ii*) GARHWAL DIVISION.

CLASS.	NORTH PATLI DUN 13 YEARS.						REMARKS.
	2 ACRE PLOT, THINNED.			½ ACRE PLOT, UNTHINNED.			
	No. of trees.	Average increase.	Time required to get through the class.	No. of trees.	Average increase.	Time required to get through the class.	
		Inches.			Inches.		
Sal IV	37	7·56	31 } 81	97	2·75	85 } 141	1,420′
,, III	88	9·39	25 }	52	4·2	56 }	
,, II	29	9·42	25	...	...	...	
,, I	3	9·83	24	2	1·33	176	
,, IA	...	...	...	...	...	...	
Total	157	...	105	151	...	317	

	SOUTH PATLI DUN, 13 YEARS.						
	2 ACRE PLOT, THINNED.			½ ACRE PLOT. UNTHINNED.			
		Inches.			Inches.		
Sal IV	58	12·61	19 } 68	142	5·13	46 } 141	1,300′
,, III	92	7·75	30 }	26	4·07	58 }	
,, II	1	12·58	19	2	6·37	37	
,, I	...	...	...	...	...	...	
,, IA	...	...	...	2	3·37	70	
Total	151	...	68	172	...	211	

Class.	Amtanala 16 years.						
	2 acre plot, thinned.			½ acre plot, unthinned.			
		Inches.			Inches.		
Sal IV	1	9·92	29 } 81	5	4·15	83 } 191	1,800′—1,900′
,, III	11	11·87	25 }	50	5·97	57 }	
,, II	84	10·68	27 }	24	6·71	51 }	
,, I	18	10·11	28	3	14·62	28	
,, IA	...	...	...	...	...		
Total ...	114	...	109	62	...	219	

	Rehar 13 years.						
	2 acre plot thinned.			½ acre plot unthinned.			
		Inches.			Inches.		
Sal IV	17	9·72	24 } 74	24	3·34	70 } 150	1,000′
,, III	81	8·97	26 }	33	5·40	43 }	
,, II	29	9·61	24 }	13	6·39	37 }	
,, I	1	11·58	20	1	4·50	52	
,, IA	...	...	...	...	...	...	
Total ...	128	...	94	71	...	202	

(iii) GANGES DIVISION.

CLASS.	CHAUKHAMB 12 YEARS.						REMARKS.
	2 ACRE PLOT THINNED.			½ ACRE PLOT UNTHINNED.			
	No. of trees.	Average increase in 12 years.	Time required to get through the class.	No. of trees.	Average increase in 12 years.	Time required to get through the class.	
		Inches.			Inches.		
Sal IV	72	6·1	35 } 94	21	2·45	88 } 163	2,000′
,, III	108	7·4	29 }	51	5·29	41 }	
,, II	30	7·15	30 }	18	6·37	34 }	
,, I	5	5·97	36	1	7·05	31	
,, IA	5	5·54	39	1	5·3	41	
Total ...	220	...	169	92	...	235	
	ANDHERMAJHERA 12 YEARS.						
	2 ACRE PLOT THINNED.			½ ACRE PLOT UNTHINNED.			
		Inches.			Inches.		
Sal IV	20	4·23	51 } 116	22	3·01	72 } 145	1,100′
,, III	114	6·02	36 }	48	5·34	41 }	
,, II	28	7·45	29 }	13	6·75	32 }	
,, I	1	5·6	39	1	8·4	25	
,, IA	...	...	...	...	...	...	
Total ...	163		155	84	...	170	

As would naturally be supposed, the difference is most marked in the younger classes before the trees of the future have got away from the ruck, proving the advantage of early thinnings where this is practicable. Unfortunately the cost of carriage to the market makes it impracticable to thin a large portion of these forests at an early age. The working season is short, barely six months, local means of carriage practically nil, so that it has all to be procured at a distance.

Rates of carriage are, therefore, large, and increase as the season advances; thus it does not pay to export cheap, small timber except from the forests in and near the plains. The only way to get over this disability is to construct tramways from the forests to the railways.

Grouping the sample areas into two series in accordance with altitude above sea level, we find that the average number of years required to get through each class, are as follows :—

Class.	For plains forests and those near the plains altitude 1,000′ to 1,400′.		The middle forests above 1800′.	
	Thinned areas.	Unthinned areas.	Thinned areas.	Unthinned. areas.
IV ...	30 years.	74 years.	27 years.	62 years.
III ...	29 „	48 „	30 „	64 „
II ...	27 „	40 „	37 „	55 „
I ...	25 „	40 „	36 „	61 „

These figures are interesting to indicate how the growth falls off in the older classes in the higher forests, but there are not sufficient data at present from which to draw conclusions in regard to the growth in these higher forests. More sample areas are required both in the middle and upper forests up to 3,500′. It has not been possible to calculate the acre increment from the records, because only a portion of the trees are measured in the sample areas, especially in those which are unthinned. This is to be regretted, and I think that in future it will be advisable to record the measurements of all trees in the sample plots. The average height measurement of the trunk capable of yielding timber, and form factors for each class, should be determined in each locality, the results being recorded in the measurement-book. We should then have data to calculate the volume per acre and the increment per acre, and compare the increment in thinned and unthinned forest.

IV.—REVIEWS.

Elephant Catching in Mysore.*

THE Superintendent of Kheddas in Mysore has drawn up an interesting account of elephant-catching operations in Mysore. It would appear that Hyder Ali was the first to make a systematic attempt to capture elephants in herds under something like the Khedda system, but he seems to have completely failed in his endeavour. At that period herds of elephants were exceedingly common in Mysore, all along the Western Ghats, and the damage done by them was very great, so much so that some sixty years ago permission was given to the public to destroy any elephant found damaging crops, and a reward of Rs.25 was given to any one producing the tusks, ears, tail and nails of an elephant.

Under those conditions the destruction of elephants became wholesale, and it was found necessary to withdraw the reward, and the pit system was introduced by the State officials. This system was more or less in vogue from 1878 to 1890, when it was finally abandoned. During those thirteen years 212 elephants were captured in pits, but the report does not state how many animals were killed in the operations.

The noosing system was also utilised to effect the capture of large solitary males. Under this system four or five tame female elephants ridden by their mahouts, who partly conceal themselves as they lie on their elephants' necks, are taken to the forest which the solitary male is known to frequent. Once discovered, the tame elephants take it in turn to closely accompany the male day and night, until he is tired out and drops into a sound sleep, when he is surrounded by the other females, his legs are carefully noosed, and he awakes to find himself a captive. Regular Khedda operations were started in 1867 by Col. J. L. Pearse, but were not successful until 1873, when Mr. Sanderson was instructed to effect the capture of some of the elephant herds which were doing much damage in the Chamrajnagar Taluk. The first drive resulted in the capture of 55 elephants at a cost of Rs.15,500, and the operation resulted in a profit of Rs.30,615. From then onwards Khedda operations took place at frequent intervals with varying success, but with ever-increasing cost. At first the operations were a success financially, but since 1889 they have always resulted in a very heavy loss. From 1889 to 1898 the Khedda operations resulted in a loss of Rs.2,36,563, the reason for which is not very clearly explained in the report. The report contains some interesting information about the feeding of elephants, the writer of the report being of the opinion that the elephants in Mysore do not get nearly enough to eat. The Government allowance of green fodder for an elephant is 400lbs. per day in Bengal, while in Madras it is only 250lbs. The Superintendent

* Report on Khedda Operations in Mysore, by K. Shama Iyengar, Superintendent of Kheddas.

of Kheddas endorses the late Mr. Sanderson's opinion that not less than 800lbs. of fodder should be given per day. If this is correct, the unfortunate elephants under the Madras Government have a very bad time of it. The monthly cost of keep of an elephant in Bengal is put down at Rs.24, while in Madras it is as high as Rs.48, the difference being mainly due to the high price of rice in Madras and to the necessity for giving a larger ration of rice in Madras to make up for the smaller amount of fodder.

Mysore seems to have no indigenous mahouts of its own. A Hindu mahout is a rarity, and the greater proportion of the Musalmans are brought from Chittagong and Dacca, and are the only ones who are of any use.

The disposition and habits of elephants are dealt with at some length. The herds range in number from 10 to 100, and each herd is a family, in which the members are nearly allied to one another. One herd does not intermix with another, but tame male and female elephants appear to find no difficulty in gaining admittance to a herd. They frequent certain localities at different times of the year, and always travel from one part of the country to another by certain well-defined paths—a habit which is taken advantage of in locating the elephant pits.

The age of an elephant is indicated in two ways. As an elephant gets old, the top of the ear which in youth is erect begins to bend over, and does so more and more as the animal grows older. With advancing years the face, ears and end of the trunk get speckled with copper-coloured spots.

The Superintendent is strongly against the view that elephants will not breed in captivity. He thinks that this is due to the segregation of the sexes and to the physical causes of insufficient food and hard work. He also mentions several cases in which he has purposely turned loose tame female elephants in forests frequented by wild ones and the tame animals have generally calved in due course, but he mentions no instance of a tame female breeding with a tame male.

The remarks on diseases of elephants are not of much practical value, the writer apparently believing that in the wild state the animal is not subject to any disease, and that the great mortality among tame elephants is due to sickness induced by underfeeding. He mentions the popular belief that the remains of a dead elephant are very rarely found in the jungles, and the superstition that elephants on the approach of death retire to some inaccessible valley which has never been discovered by human being. There is no doubt that the remains of elephants have been found, and it is no uncommon thing for a Forest Officer in charge of a Division where wild elephants are found, to have three or four pairs of tusks brought in to him in one year. There is every reason to believe that elephants, like all other animals, are subject to disease in their wild state, but are very much more liable in captivity owing to their unnatural surroundings.

Forest Administration during 1899-1900 in Ajmer-Merwara, Baluchistan, Coorg and the Andamans.

AJMER-MERWARA.

THE year was one of severe famine, the average rainfall being only 3½ inches compared with 9 inches in 1898-99 and 20 in 1897-98. It is little wonder, therefore, that the deficit amounted to Rs.6,925, and that operations under the working-plan were greatly restricted. Out of 11,421 acres prescribed for felling, only 781 acres were actually felled. The villagers extensively resorted to cutting and felling wood from their own holdings, and the price of fuel remained so low that fuel from distant working units could not be brought to market and sold at a profit.

There were no fires, as the little grass which grew in the forests was soon removed, and the forests became so clear of undergrowth that no special precautions were necessary.

"The total number of forest offences was 974 as compared with 833 in the previous year. There was a good deal of illicit cutting of green wood in the forests. Other offences were less than usual. The offenders were leniently dealt with. The number of cattle impounded was 4,794 against 6,222 in the previous year. All restrictions on grazing had to be removed in the middle of the year, and the pounds had to be closed in November 1899. There was practically no fodder or grass procurable from January onwards, and the cattle thenceforward remaining in the districts were the few plough, milch and draught cattle which their owners were able to support. The surplus cattle were sent to foreign pastures in the autumn of 1899, and those that remained either died of starvation or were slaughtered for their hides."

The most promising incident during the year was the discovery of asbestos and other minerals in the forest area, which has led to several applications for prospecting and mining licenses.

BALUCHISTAN.

There was no alteration in the area of reserved forests, the total area of which remained at 205 square miles. Additional areas are proposed for reservation, but owing to famine and the failure of grazing in the localities concerned, it was not considered desirable to press the question of extending the State forests.

There were eighteen fires, eight of which were caused by lightning, but in no case was any very serious damage done.

Natural reproduction in the forest areas dependent on rainfall appears to have been nil, and planting operations on irrigated land were less successful than usual. The total area of plantations including nurseries at the close of the year was 35 acres; 3 acres were planted and 4½ acres excluded as failures. Tamarisk cuttings appear to have succeeded better than any other species.

The outturn of timber and fuel was 462,717 cubic feet, and at this rate of consumption it is said that the available supply can

only last a few years, the annual increment of the forests being very small owing to the slow rate of growth of the indigenous species. Under these circumstances the Deputy Conservator proposes to restrict the local output and to import fuel from Sind.

The gross receipts of the year were Rs.16,756, chiefly derived from the royalty levied on timber and fuel removed by purchasers from the unclassed forests. The deficit of Rs.11,509 was the smallest that has occurred since the year 1891-92.

Coorg.

No alteration took place in the area of reserved forests, but 4 square miles were added to the area of *paisari*-protected forests. *Paisaris*, it is explained, "are tracts of land outside the reserved forests, which are not comprised in the revenue-paying or revenue-free area and are not included in *urudves* or *devarakadus*. *Urudves* are village forests set apart by Government for the purpose of providing timber, fuel, grass and leaf manure to the villages to which they are attached. *Devarakadus* are sacred groves forming land, from which no one has a right to derive any profit." The total area under the Forest Department at the close of the year was—reserved forests 238 square miles, protected forests, including the above, 661 square miles; total 899 square miles.

Two working-plans, embracing an area of 30 square miles, received sanction during the year. The preparation of a working-plan for sandal remained in abeyance until the Inspector-General of Forests could visit Coorg and discuss on the spot the future treatment of this species.

There were 106 breaches of Forest Rules against 74 in the preceding year. Fires were very destructive, the season being one of the worst on record. Altogether 34,100 acres, of which 30,300 acres were in South Coorg, were burnt out of 131,000 acres under protection. The cost per acre actually protected was 10·8 pies. Open fire lines have not proved effective in Coorg, and it is proposed to replace them by covered fire lines, by which, we understand, is meant lines carried through the forest on which only the undergrowth is desired. On this subject the Deputy Commissioner has the following remarks:—

"There is reason to believe that the system of long lengths of open fire lines in Coorg have never given satisfaction. In the first place, the time available for clearing with the labour at hand is insufficient. Much of the latter is taken up with the felling and export work which is just then at its busiest. The consequence is that in order to work over the whole length the firing has to be begun too early when much of the growth is too green, and there is no time to work over it a second time. No doubt the unusual ignorance and incapacity of the protective staff is responsible to some extent for the bad results, but not for all. Another point is that year by year the open lines appear to get more choked with the undergrowth, and especially with lantana, which at once

begins to take possession of all clearings in Coorg. Consequently the work is getting annually more difficult and expensive. There is no doubt at all that well cleared lines of 70 feet width will repay the expenditure incurred on them, but it must apparently be recognized that there are conditions of growth and climate in Coorg which will occasionally render such lines futile as barriers in the way of a large fire in a high wind. It was our misfortune last season that the fires appeared to come all at once at the most unfavourable moment. There was no time last year after the receipt of orders to make a commencement with the covered fire lines alluded to in paragraph 4 of the Government of India's Review of the last report. This year the position of three such lines with a total length of 9 miles has been marked out, and it is hoped the results will be satisfactory. If so, the open lines will gradually be replaced by them."

The Deputy Conservator's remarks on natural reproduction are of interest:—

"An extraordinary season has been experienced. Following a light monsoon last year, a long and phenomenally severe drought has been succeeded by an exceptionally heavy south-west rainfall. In South Coorg this has yielded almost double the average rainfall. But for some species, like teak and sandal, which are not tolerant of very much moisture, perhaps the continuous wet weather experienced for weeks on end, without break or cessation, has been more harmful than the heavy fall itself.

"*Teak.*—Last year it was reported that the regeneration of teak was satisfactory. It is a pleasure to report that the scanty monsoon which followed the close of the year exactly suited the species, and the seedlings of the year are everywhere vigorous. Even in those forests which suffered so severely from fire this year new shoots have come up plentifully. Unfortunately the very opposite has to be said of the seedlings of this season. After germinating well the heavy monsoon, which in South Coorg gave almost double the average fall, has rotted almost all the plants. The exceptions being most numerous in Anekad and Attur where, however, teak does not appear to naturally flourish as it does further south.

"*Sandal.*—Owing to the absence of early showers in the sandal tract, and indeed of any rain at all until the middle of June, there was practically no regeneration from seed this year, and what there was has been almost entirely killed by the continuous rains of the present monsoon. The seedling growth of the season may therefore be counted nil. It must further be reported with extreme regret that throughout the lantana country in particular, and in all the *paisaries* in North Coorg, fires have done enormous damage. It is also noticeable that 'spike' has spread in an alarming manner. At present it is confined to the lantana area, and it is remarkable that trees in hedges or surrounded by lantana and brushwood suffer the most, whilst isolated plants are seldom attacked."

Teak does not generally suffer from too much rain, provided it is on well drained land. The "spike" disease is, we understand, being investigated by the Government Mycologist.

Experiments made in regard to the cost of eradicating lantana showed that if carried out by coolies the cost averaged Rs.30 an acre, and the results were imperfect. The Ceylon system of pulling out clumps after rain by means of yoked cattle was but little cheaper and no more satisfactory. The best results were obtained by using elephants accustomed to dragging timber, and the cost by this method was only Rs.10 to Rs.15 an acre.

The gross outturn of timber removed was 356,866 cubic feet or 152,858 cubic feet less than in the previous year, when the sales of timber on waste lands were abnormally great. Sales of sandalwood were the same as in 1898-99, 172 tons; but the average price realised was Rs.400 per ton as against Rs.351.

The financial results were—Receipts Rs.1,56,780, Charges Rs.72,707, Surplus Rs.84,073; the latter being the highest reached since 1893-94.

ANDAMANS.

The work of the Forest Department in the Andamans is shortly described in the following extract from the Government of India Resolution:—

"Forest operations in the Andaman Islands are mainly confined to the extraction of produce, and are limited in extent by the amount of convict labour that can be placed at the disposal of the Department. A large proportion of the available labour is employed in meeting the requirements of the settlement in timber, fuel and gurjan oil, which are considerable, so that only a comparatively small quantity of timber can be extracted for export. A trade has been established in London for Andaman padauk, but the demand is greater than the present supply, and it is believed that koko (*Albizzia Lebbek*) and other Andaman timbers would find a ready sale if they could be placed on the market in sufficient quantities. It is therefore important that advantage should be taken of labour-saving appliances whenever practicable, and experiments in this direction should be persevered with."

The labour-saving appliances alluded to are a tram line, which was extended 150 yards during the year, a timber sledge road, the outlay on which is said to have been out of all proportion to its usefulness, and a wire ropeway which was not a success. Nevertheless the experience gained will prove useful, and as the steep hillsides of the Andaman valleys are said to be well adapted to a system of wire ropeways, this form of extraction is to be persevered in.

There were no breaches of Forest Rules, and fire protection measures are unnecessary owing to the heavy rainfall and absence of herbaceous growth.

Natural reproduction was unfavourable owing to short rainfall; and an area of 5 acres, which was sown with padauk and ironwood,

was for the same reason practically a failure; on the other hand, twenty-nine acres of maritime swamp were successfully re-stocked with mangrove seedlings.

The Department supplied the Settlement with 25,484 tons of firewood and 5,773lbs. of gurjan (*Dipterocarpus*) oil, the latter presumably for lighting. In Burma its use for this purpose almost entirely ceased many years ago owing to the cheapness of kerosine oil.

The quantity of timber extracted was 5,808 tons, of which 2,446 tons were padauk. The average rate per ton realised for padauk squares in Calcutta was Rs.195 or nearly double the price obtained in the previous year. In the London market this timber realised 6*s*. 6*d*. a cubic foot, koko (*Albizzia Lebbek*) and black chuglam (*Terminalia bralata*), 4*s*. 6*d*. each, and taungpeingye (*Artocarpus chaplasha?*) 4*s*. There appears to be a demand for all these species, which the Department is not at present prepared to meet owing to the labour difficulty. "Specimens of choice padauk taken from the junction of bole and main branch and from stumps, including crown of root, were sent to the Paris Exhibition. The branch and root pieces were cut into veneer on arrival at destination, and the latter were much admired, being valued at 9*d*. to 2*s*. per square foot, $\frac{1}{16}$th of an inch thick." Probably many other Indian species could be profitably disposed of if worked up in this way.

The revenue for the year was Rs.2,91,115 and the surplus Rs.1,49,309, the highest but one on record.

V.—SHIKAR AND TRAVEL.

A Night's Watch.

I COULD not persuade the Pakrind tiger to kill any of my "ties up," though six appetizing baits had been for some days fastened in the most likely places it might be expected to pass by. But its beat was a large one, which contained much undisturbed jungle, where apparently, as it had not killed village cattle for some weeks, it was able to obtain as much food as it needed. There was no water inside the jungle, but, roughly speaking, at the four corners of the area, which was 14 miles long by 10 miles wide, water was to be found. At three of the corners there were small nearly dried-up village tanks, and at the fourth, which was in the hills, was a water-hole fed by a small spring (one of those over which a native *shikari* loves to sit and shoot unsuspecting does and fawns as they come to drink on a moonlight night). My only chance of a shot at the tiger seemed to be to sit over this hole; it was a very remote chance certainly, but there were signs that the tiger had been in the neighbourhood some days before, and as I had to leave on the following day, I felt that I could not go away without having tried every means to bring it to bag. In the previous year

I had tried for it, but had not been able to obtain a shot, though it had deigned to kill one of my baits. A month or two before I tried, it had been fired at, and I think slightly wounded, by an officer of a native regiment who had left the wing he was accompanying on their march on relief along the trunk road some 10 miles away to try for the Pakrind tiger. Baits, beats and bullets were therefore not new things to it when I arrived upon the scene, and it was clever enough to steer clear of all three.

The water-hole was, as I have said, in the hills. All around the jungle had been burnt, and there was little covert between it and the thick grass and tree jungle in which the tiger usually lived, but it was approached by numerous gorges and ravines, and was just the place to which game might be expected to come at night.

About 3 o'clock I left my camp, having sent men on before me with a native *charpoy* which they were to fasten up over the water in the most convenient tree, and about 6 o'clock I reached the place. The water was not very abundant, and what there was, was very black and muddy, and looked most uninviting; but I suppose it contained some saline properties, which are always such an attraction to game. Some twenty yards away from the main water-hole there was a little water in a hole in the bed of a ravine; this was much cleaner-looking, but it did not seem to be resorted to by game so much as the mudhole, around which were innumerable tracks varying in size from those of the little four-horned antelope to the large but old imprint of a big bull-buffalo, and some rather more recent marks of bison. There were no quite recent tiger tracks, but bear and leopard had visited the water on the previous night, and I hoped that even if the tiger disappointed me I might get a shot at one of the two latter animals. My *machan*, which was placed on a tree between the two water-holes, needed some additional screening before I considered it quite hidden, and it was nearly dark before I was settled in it. The moon, which did not top the hills behind me until between 8 and 9 o'clock, was just past the full, but though the afternoon and evening had been cloudless, the night was not to be so. It might certainly have been a much darker night than it was, but every now and then a thick black cloud obscured the moon, and the water, fifteen yards away, was not visible. I do not know who my first visitors were. About half an hour before the moon rose I heard some animals at the water lapping. They seemed smallish, and may have been wild dogs, but they made no sound save the lapping, and next morning I could find no tracks to help me to identify them. As soon as the moon rose, and I could see a little, I had dinner, and as I finished I heard the sounds of a leopard about half a mile off in the valley below. A four-horned antelope that had been for some time near the water, but apparently rather nervous about drinking, at last plucked up courage and waded through the mud to drink, and then the sounds of the leopard were repeated nearer and nearer, it

gave its little barking call and scampered off. The leopard evidently did not want to drink, for though I heard it for nearly an hour, now a little nearer, and again a little further off, it never came within a quarter of a mile of me. The next sounds I heard were most weird. An appalling din arose about fifty yards behind me, as if a number of wild cats were fighting, but they never approached the water; at least I never saw them do so, and their identity remains a mystery. I must have dosed off for a few minutes, for I suddenly became aware that there were some big animals walking about nearly underneath me, and cracking the dead burnt branches as they moved. They were evidently buffalo or bison, but which, I could not determine at first; however, the moon for a minute showed out clearly, and I saw that one drinking at the water was a bison. There were six of them, and they must has stayed at least twenty minutes within thirty yards of me; but it was not light enough for me to make out if there was a really good head among them, but they all looked enormous in the dim light, and it was a strange sensation to be so near to a heard of bison for so long a time without their being aware of my presence; had it been lighter, all their movements would have been visible, and the sight would have been still more enjoyable. Before the sound of the bisons' tread had died away, as they went down the valley, two bears came down from the hill behind me to the water. Of course, they squabbled before they reached the water, and it was the sound of their quarrel that put me on the *qui vive*.

Apparently one of the pair had been worsted, for only one came to the water in the ravine to my left. I could easily make out a large black mass, as the bear walked down the ravine side, and aiming at the front part of it I fired, my bullet fortunately penetrated the lungs and broke up these. To make certain, I fired a second shot which broke the spine, and the poor bear's sobs ceased. Perhaps I ought not to have fired at the bear, but two-thirds of the night had passed and no tiger had appeared, so I took what the gods sent me. There was one more visitor to the water before the night was over, and this was a sambhar stag. I could hear its antlers strike against the low branches of the trees as it came up, and could just see its antlers as it drank, but the moon was much obscured, and I but hazily saw what with better luck would have been a magnificent sight. Then the east began to light up as the sun rose behind the hills, and I climbed down from my *machan* and inspected the bear, which proved to be a young male nearly 5 feet long.

And so the Pakrind tiger still remains to be shot.

LONG TOM.

The Genus Shikari Kashmiriensis.

THIS study is only meant for the tyro sportsman in Kashmir; the information may, however, be useful to others as well.

Having arrived at Baramula, you will here engage a *doonga* or mat house-boat for yourself and a cook-boat for your servants. Round about you on your arrival will be observed men all with huge wallets containing books, which in their turn contain letters from Sahibs, dating from the year one to the present day —some genuine, others apparently bazar-made. It is advisable not to give these gentlemen any encouragement, but to dive into the dâk bungalow precipitately, where you will be safe at all events until you poke your head out again. If possible, eschew the boat with babies, or else you may be tempted to commit infanticide later on. As you are in a hurry you want to start and naturally give orders to this effect, but there is no motion, only a lot of whispering at the back of the boat. Then the head of the family arrives and explains that they have no coolies to tow the boat. If you have any sort of a stick-like weapon, threaten him with it and the effect will be instantaneous; off will go the boat. Father, mother, sons, daughters and babies all taking a turn to tow or paddle. This is the custom. You pay for the boat and the crew has to work it. You will reach "Sopore" possibly by the evening, so pick a nice place to moor your boat, or else it will be tied up for you by a ricketty bathing-machine looking place or by the bridge, both equally filthy and evil smelling. The Woolar lake will have to be crossed to-morrow, so give orders to start at 2 A.M. in the morning and you may get off at 6 A.M. You then order your dinner, and whilst in the middle of soup or first course your nose will be assailed by the most awfully awful stink emanating from the back of your boat. You enquire what it is, and you will be informed that it is the family also having its dinner, cooking its food in fish oil; order it out at once and forbid such a thing ever taking place again with the direst of threats. It is also a good plan at this stage to forbid hookah-smoking in your boat for ever and ever, at least as long as you are living in it; this will save another exhibition of temper later on. You then tumble in, after a smoke, hoping to wake up and find yourself halfway across the lake. It is wonderful how the air makes you sleep, and you open your eyes at 8 A.M., wondering where you are. When you've found yourself you peer outside through the mats, and with an objurgation discover the boat to be still in the same old place. You howl for help, and when quieted down a bit you will screw the information out of the head boatman that there has been a "barra typhoon," and that is the reason they have not moved. As you have been asleep you cannot gainsay this argument, but wonder at the stillness of the atmosphere, and after physical persuasion off you start. Crossing the lake on a fine day is lovely, but dangerous in flat-bottomed boats when at all windy. *Dolce far niente*—it is very nice for the traveller to loll in an easychair and enjoy it all, but it's a very tiring performance when the glamour has worn off, and simply awful in wet weather in a *doonga*. On the evening

of the third day you may arrive in Srinagar and will admire the picturesque though smelly Venice of the East. Early next morning all sorts and conditions of men will be found hovering like spectres round about your boat with eager eyes and right hands or wallets ever ready to produce the inevitable books with their chits. This you ascertain from the inside of your boat by squinting through the mats. If you value your life and the safety of your *doonga* do not venture forth, but take a quiet survey. One man short and fat with green putties and a very large note-book; another tall, thin and cadaverous; a third with one eye, and that a blue one, and so on. After having had a good look, enquire from your servant who these men are, and you will be told that they are prospective *shikaris*. The struggle for existence being keen, you send for all their books and go through their chits; if you want to see some fun just mix a few up, and gradually weed out the worst until you have only got, say, the three best. Beware of the man who wears green putties and the man who has been with American millionaires and other globe-trotters. You then send for the three men one by one: your choice being effected, you enquire eagerly from the gentleman where he intends to take you, and let us presume you are only going for black bear, at least for the present. He will inform you, and you tell him to go on ahead to make necessary arrangements, leaving instructions behind where to follow. This being done, he will ask for rupees and a pair of binoculars, give the former sparingly, and if you've got an old pair of the latter, lend them, if not, don't; he will also hint at taking one of your rifles, which gently refuse. When the gentleman has disappeared you will doubtless stay a few days in Srinagar for supplies, &c. At last you leave Srinagar and go as near to the happy hunting ground (having got your permit first, of course) as possible in the boat. You then march with tents to the village. On your arrival a figure comes forward and greets you with a *salaam;* you gasp, Who the devil is this? – is it the villain in an Opera Bouffe with apparently 10 suits of puttoo on, grass shoes and stuck all over with knives like a gigantic pin-cushion, and festooned with leather belts and pouches? You look again, and seeing but one blue eye you recognize your long-lost *shikari*. You enquire for *khabbar* and are informed that bears are swarming in the nullahs at the back, as the mulberries are ripe. It is a curious but noteworthy fact, that unless the *tuts* (mulberries) are ripe, you never get anything. If you want bear, the mulberries must be ripe; if you want to fish, the same argument applies, and so on. You then arrange without delay the plan of battle. The *shikari* says you are to sit up in the evenings, and if there is a moon, and you are keen enough at night for a week or so, and this failing "*hánk*" (beat). The *shikari's* great game is to waste time and to give you just as much sport as will keep you going. He does not believe in overpampering his master in the way of *shikar*. In the evening you then proceed to sit up and are

pointed out a rock, far, far away up a hill where you have to perspire to. Now you will see if you have a real genuine *shikari*. As you proceed through brambles and undergrowth behind your *shikari*, if you get swished every two seconds across the face, then you have the satisfaction of knowing that you have got the proper article, as whoever heard of a first class man holding branches for the sahib to pass by safely. You will also have noticed by now that there are, accompanying you, one or two men, perhaps three or four; the greener you are the more there will be, one of them evidently being sweller than the rest. This man is the "gahnwallah" or local village *shikari*, and the others are spotters or pointers who are perched on various elevated places; the places are always elevated because (1) they can see, and (2) its safe. You may begin to ask rude questions about the "gahnwallah," but it is no use doing so, as the professional *shikari* is like the professional chowkidar of the plains; only in the latter case if you don't have one, you get robbed; and in the former, you don't get any shooting. It is only blackmail in a way, and as a young Sub. said quite wisely once, "*Shikaris* are mostly rotters, but if you want shooting, you must have one," and this is quite true. You may for the first time in your life be wearing grass-shoes. Oh! the agony!—will you ever forget putting them on? After pulling on two pairs of split-toed socks, which are bad enough, your wretched foot is grasped by the merciless *shikari* and the grass-shoe shoved on after having your big toe nearly pulled sideways out of its socket. Then the whole thing is pulled so tight that if your feet are cold, the agony of walking is intensified; lumps all over the shop, and going downhill your feet are nearly split in two, and you feel like the gentleman with the cloven hoof, only far less lively. However, after a little perseverance you will swear by them. But I am digressing. You are now sweating up the hill, and at last you sit down gasping on the rock. The *shikari* enjoins complete silence, and all the way up the hill you would have been walking on the tips of your toes like a ballet dancer if you could have found them in those awful grass-shoes. This habit you will soon get out of when shooting black bear, unless you actually see one close and are stalking it, but this is one of the tricks of the trade played off by the *shikari* on the tyro. You now begin to look round eagerly for bear in the distance, but soon get tired of the game, and instead begin to wonder how much snuff your *shikari* can consume at a sitting. Suddenly, if you have any luck, a bear is spotted by one of the pointers about a mile off in another ravine. Then for another limping and sweating match. When you arrive exhausted at the place, the bear may still be there or not; let us be generous and suppose it is up a mulberry tree. You crawl up as close as possible and pot at him somewhere in the middle. You either miss or don't. If the former, you have not lived up to your reputation as an elephant and tiger destroyer, and are eyed with disgust,

and informed that it was the biggest bear ever seen alive. If you do hit it and it does not drop dead on the spot, it is put down as a rotten shot and your bear goes rolling and running downhill, snarling, growling and howling, into the ravine. (I may here sound a note of warning—never shoot a bear above you if there is any possibility of the animal coming your way, as a bear is heavy and uncomfortable, and its difficult to climb a tree in grass-shoes, at which, however, your *shikari* and "gahnwallah" are usually experts.) You try and follow up your success, but it is getting dark, and a wounded bear is not the pleasantest customer to meet in thick jungle. So you wend your weary footsteps homewards, feeling certain you will never get it, and are sleepless all night thinking about it. Early the next morning you venture forth with coolies and dogs, and if you are lucky, find your first bear dead in the nullah.

The skinning operation then takes place, and the head is chopped off, probably with your very best English hunting knife if you are not careful, and you then march home with an admiring throng, which increases the closer you get to the village. The skin is now pegged out and stretched for all it is worth, if you are not looking, making it long and narrow for the sake of a few inches. You then proudly measure it, and your joy will be unbounded if it is anywhere near 7 feet long, as that is a big animal. After paying the coolies (which don't do in proportion to your joy), you settle down to breakfast and think of your next bear.

E. RADCLIFFE.

Distillation of Rusha Grass Oil, Central Provinces.

THE grass, *Andropogon schœnanthus* or Rusha grass, commonly known as "Tikhari," is a native of Central Provinces. It grows wild in swamps with erect culms, and attains a height of 3 to 6 feet. The leaves are long, smooth, and tapering, and have a strong aromatic smell and pungent taste. The root, locally known as "Mirchia Gand," is perennial, with long wiry fibres.

The oil obtained from this plant has become an important article of commerce. It is now chiefly distilled in many parts of Central Provinces, especially in Betul, Nimar and Hoshangabad districts, by private persons, and taken to Ellichpur town, which is the chief market of export. Its current price is from Rs. 2 to Rs. 4 a pound, according to its purity. The grass is very abundant, and the distilling of the oil requires only a moderate skill and very small initial capital. About 50,000 (fifty thousand) pounds are exported annually from Bombay to Arabia, and European Turkey, Jedda and ports along the Red Sea. Its European name is Palma Rosa oil or Geranium oil.

The oil is chiefly used as an adulterant for *attar* of roses. In some places the roses are sprinkled with it and the *attar* is distilled. It is a proved fact, that "Rusha" grass oil does not

solidify by cold, and this is the chief adulterant which stops the crystallizing habit of rose oil when exposed to low temperature and prevents its congealing.

Rusha grass oil should be first refined before it is ready for admixture with *attar* of roses. It is also necessary that it shoud lose its penetrating aromatic smell and acquire the colour of the *attar* of roses. In order to effect this change it is shaken with water, then acidulated with the juice of lemon, and finally exposed to the sun and air. The oil thus refined has a very slight difference from *attar* of roses, and can serve as an admixture which is very difficult to detect. It is very difficult in these days to procure pure Rusha grass oil, as the oil of commerce is more or less adulterated by the local distillers themselves. The chief substances to adulterate this oil are turpentine and the oils of ground nut, linseed, rape, &c., &c. By such adulteration the oil temporarily becomes turbid, but after a time it settles again and becomes clear. Pure oil should be of a pale sherry colour.

The oil, which is considered to be cooling and astringent, is used as a liniment in rheumatism, headache and skin-diseases, and has the property of curing baldness. It is a powerful stimulent when applied externally, but is never taken internally, except in very minute doses for bilious affections. The grass, as far as I know, is not used as a fodder for cattle.

The grass generally flowers in October and November, and is then fit for cutting. It is tied into small bundles not exceeding 12 inches in circumference, and packed tight, horizontally, in a large metal cauldron, which is fitted on a rough masonry furnace, and then a small quantity of water is added. When full, a roughly scooped-out wooden lid is put and sealed with a plaster of ground pulse, or the lid is more firmly fixed by means of metal clamps. Through a hole in the lid one end of a hollow bamboo is inserted and the other end passed into a smaller metal vessel, which is securely fixed under water in the bed of the river. This smaller vessel serves as a condenser, and the bamboo tube in it is kept in position by pieces of cotton cloth well wrapped round the tube and serving as a stopper for the condenser. The furnace is then heated and the vapour passing through the hollow bamboo tube is deposited as oil in the condenser. The oil thus obtained contains a large proportion of water; 500 pounds of grass yields 2 pounds of pure oil when the still is carefully worked, but if the grass in the cauldron is allowed to burn, it communicates a dark colour to the oil.

With better apparatus, and a more scientific method of distilling, there is much room for improvement and every possibility of success. It might be worth while, for experiment, to reserve for departmental working a certain area and to carefully supervise the results.

HOSHANGABAD:
13*th September* 1901.

A. D. BHOTE,
Forest Ranger.

We have received the following reprint from *Indian Gardening and Planting* from the author Mr. Wright, who asks us to say that any assistance will be gratefully acknowledged:—

Tropical Timbers and their Rings of Growth.

By Herbert Wright, A.R.C.S.

There is probably no more interesting study in timbers than that of the seasonal elements which a transverse section of the stem exhibits. The majority of persons are familiar with the historical tables usually attached to, or painted upon, the successive annular rings of stem sections in the museums and gardens of Europe. The validity of the idea that each ring counts for a definite period of time in the life of the plant is accepted as sound, though in past times much controversy was waged on the nature of the causes producing these time-checking arrangements of the timber elements. The bark pressure theories of Sachs and T. Hartig, the theory of osmotic variation waged by Russow, and the ideas of Weiler and Robert Hartig respecting nutritive supplies to the tree, were all found insufficient to explain the nature of the causes which determined the formation of rings of growth. It was left to the genius of Strassburger and his contemporaries to explain the formation of the rings in terms of the varying physiological needs for the plant.

In temperate zones the deciduous trees burst into new foliage during spring, and the main function which the wood has to perform is that of supplying copious quantities of water to the growing leaves. This is accomplished by the production of large lumined, thin-walled elements, which form connected systems from roots to leaves. During autumn the demand for water is not as great, but there is an increased weight of plant tissue, and the necessary elements to give support and rigidity are added in the form of narrow elements possessing very thick walls.

The thick-walled narrow elements of autumn abut directly on the large elements of the next spring, and hence the line of demarcation showing the limit of growth for any particular year is often very conspicuous. The idea that each ring represents one year of time is therefore correct for those trees in temperate zones which exhibit such periodicities in leaf production. In the tropics, however, where as many as four seasons have each a recognised power, and the arborescent vegetation is often characterised by more than one periodicity in leaf production per year, the time represented by each ring of growth is not necessarily one year.

It is obvious to a casual observer that the very great differences between the periodicities in leaf production of the Flamboyante and Cotton trees, or those between the Candle, Almond and Para rubber trees, or better still, between an evergreen having no fixed periodicity and a deciduous tree having the annual regularity of Schizolobium excelsum—such differences must result in the

production of very dissimilar tissue arrangements in the wood of the respective trees. We therefore see that in order to correctly interpret the "seasonal" rings of growth, we must know exactly the characteristic periodicity, and since the climate and vegetation in the tropics are as widely different from those of temperate zones, we may expect the problem to assume some degree of complicity.

In tropical countries, such as Ceylon, where the air is hot and damp throughout the year, the majority of trees are usually considered to be of an evergreen nature. Many of these evergreens, such as species of Cinnamomum and Eugenia, Mango and Jack, &c., have no fixed periodicity, and new leaves may occur any month in the year; others produce leaves at a definite time each year, and of this class the most conspicuous are the Ebony trees. Further, it is worthy of note that those trees of Diospyros embryopteris and Diospyros Gardneri, which as yet have not produced sexual organs, are invariably characterised by a bi-annual foliar periodicity. A comparison between the rings of growth of a young ebony—non-flowering—and one regularly producing flowers, should therefore prove highly interesting. Next to the evergreens we may for comparison place those trees which drop their old leaves simultaneously, but which have produced leaf buds prior to the fall of the old ones, as in Dillenia indica, Rhopalocarpus lucidus, &c. Many others, however, have gone a step further, and the production of new leaves is delayed until the greater part of the old leaves have dropped, and the tree assumes a semi-bare condition, as in Ficus Trimeni. Continuing in this direction we come next to those trees which, like the Inga saman and Candle, are bare for a few days, and finally to those like Erythrina umbrosa, Careya arborea, Bombax, Hevea brasiliensis, Dalbergia frondosa, Plumieria acutifolia, and a host of less familiar trees, which remain leafless for several weeks or months during every year.

There are very few species in Ceylon which drop their old leaves and produce new foliage more than once per year, a notable exception being the almond—Terminalia catappa.

Not only does the foliar periodicity vary with the species, but trees of the same species exhibit great variability, and it is even doubtful whether the same tree produces new leaves at exactly the same time from year to year. These differences must be due either to the varying personal requirements of the plants or the environment under which they exist.

In studying the personal equation of the plant one cannot but conclude that one of the foremost objects in dropping the leaves is to check excessive transpiration. In the Peradeniya districts and in all those parts of the island which feel the dry heat of the N.-E. Monsoon, many of the deciduous trees drop their leaves before or during the hottest months—February to April—and thereby avoid a condition of transpiration which might otherwise prove fatal. The noteworthy examples are Cratæva Roxburghii,

Erythrina indica, Ficus Arnottiana, Sterculia balanchos, Schizolobium excelsum, Oroxylum indicum, Cupania edulis, Antiaris innoxia, the Cotton and Para and Ceara rubber trees, and many others familiar to the tropical tourist. That this is one of the prime objects is further indicated by the behaviour of Careya arborea, Eriodendron anfractuosum, and others in the Bibile and Batticaloa districts, since in these places the production of new leaf is delayed considerably—an obvious advantage where the S.-W. Monsoon is replaced by hot dry weather. If it were necessary to bring proof in support of this idea, one need only point out the behaviour in desert areas where those plants the tissues of which are neither fleshy nor protected by hairs or other contrivances, drop their leaves *prior* to a period of drought. The zerophytic plants having leaves which either in virtue of their succulence retain for a long time the greater part of the water they have obtained, or are so protected by hairs, wax, cuticle, sunken stomata, &c., that loss of water by transpiration is at a minimum, such plants remain evergreen throughout the hottest months. The plants not so adapted must necessarily drop their leaves in order to prevent excessive loss of water. In temperate zones a reversion is seen, since it is during the cool months that the trees become bare, and only when heat and sunshine present their maximum strength that the arborescent vegetation puts on the best show of leaf.

One of the reasons why, in temperate zones, the trees drop their leaf in winter is probably to be found in the fact that the soil is so cold that absorption cannot take place through the roots, and hence no supply being guaranteed, the plants lose their foliage until the warmer weather arrives.

Though the checking of transpiration seems to be one object, it is rather surprising to notice the comparative zerophytic nature of the leaves of Ficus Arnottiana, Ficus Trimeni, and others where the transpiration is probably much less than that from the tender leaves of Brownea grandiceps, and yet the former are deciduous, and the latter is evergreen. Further, we have to face the difficulty that the hottest part of the year is not that chosen by all the deciduous trees, as is instanced by the behaviour of Albizzia procera and Dalbergia frondosa, which become bare in the Peradeniya districts during the dull wet month of July when transpiration cannot be at all excessive. But what is still more difficult to bring into conformity with the theory of checking transpiration is the production of abundance of fresh foliage when the dry heat of the N.-E. Monsoon is asserting its maximum power. This occurs with trees of Sclerocarya caffra and Terminalia melanocarpum during the hot month of March, and similarly Sterculia balanchos and Chloroxylon Swietenia in April. It is highly probable that many of these trees have, in the migration of species, found their way into districts where the climate is not in agreement with their old periodicities. They may, or may not, acquire a new periodicity, and it would be important if we could determine

whether the periodicity of imported species grown from seed remains the same as in the native districts. One might also notice whether a species, native of our country, shows the same periodicity as locally grown trees when introduced again from abroad.

Many of the peculiarities will probably have to be explained on purely personal grounds, since they do not lend themselves to correlation with known environments. The power of the personal equation can be better studied in the tropics than in temperate zones, since the variation of season has such a preponderant influence in the latter areas.

Many instances are known which point to the operation of purely individual forces within the plant. In *Java et ses Habitants*, by J. Chailley-Bert, mention is made of the fact that trees of the same species of Palaquium are growing side by side and under conditions almost identical, and yet one may be bare at a time when the others retain full possession of their foliage.

Mr. Nock also informs me that the English oaks grown at Hakgala, under a comparatively temperate climate, behave in the same irregular manner. This individual variation cannot be better studied than at Peradeniya, where Lagerstrœmia flos-reginæ, a native of the moist low country of Ceylon, grows in abundance. Here, in the month of February, one tree was perfectly bare and yet others only a few yards distant were in full foliage; others were about to drop their leaves, and during the same month one had not only dropped its foliage, but burst into new leaf and followed this by production of flowers. Similarly with trees of Bridelia retusa, also a native of the moist low country. So much then to indicate that internal factors may be at work in determining periodicity of leaf production.

On the other hand, there is considerable evidence in the acclimatisation of trees that the power of environment is very great. A moment's consideration of the powerful influence of a temperate climate on the phases of vegetation is alone sufficient. There are instances which seem to point to the possibility of a new periodicity, without the loss of the old one, being produced by a change of climate. Here we must content ourselves with a few examples which indicate the power of climate. One case of more than usual interest is given by Dr. Watt, Vol. I, p. 46, where the behaviour of Acacia dealbata, Link., indigenous to New South Wales, Victoria and Tasmania, has been entirely changed by the climate in the Nilgiris. The facts are, that in 1845 and up to about 1850, the trees in the Nilgiris flowered in October, which corresponded with the Australian time, but about 1860 they were observed to flower in September; in 1870 they flowered in August; in 1878 in July; and in 1882 they began to flower in June; this being the spring month in the Nilgiris, corresponding with October in Australia. It therefore takes nearly 40 years to regain its habit of flowering in the spring, *i.e.*, to become perfectly acclimatised (*Ind. For.*, VIII, 26).

I am also informed that the English oaks now growing at Johannesburg further illustrate this point, since they begin to drop their leaves towards the end of May, remain bare until near the end of August, when new leaf appears, to be followed by flowers which ripen into fruit by Christmas.

These are very striking examples, and what we are particularly anxious to obtain is a satisfactory table of comparison showing the behaviour of the deciduous trees under different climates. The importance cannot be over-estimated, as we shall obtain one string of facts which, together with some knowledge of the rates of growth of the plants in question, will materially assist us in our attempt to interpret the seasonal peculiarities of tropical woods. Having in view the innumerable side issues to which such a problem may lend itself, we confine ourselves to the following points:—

I.—When the plant drops its leaves.

II.—When the new leaves appear.

III.—When the flowers appear.

A list of those plants which are deciduous in Ceylon is now appended in the hope that all interested will forward as much knowledge as they possess respecting the behaviour of any or all of these plants: Albizzia stipulata, Boivin.; Albizzia Lebbek, Benth.; Albizzia procera, Benth.; Antiaris toxicaria, Lesch.; Anogeisus latifolia; Acacia suma, Kurz.; Aleurites triloba, Forst.; Alstonia scholaris, Br.; Adenanthera bicolor, Moon.; Bombax malabaricum, D. C.; Bassia longifolia, L.; Bauhinia; Bridelia retusa, Spreng.; Cratæva Roxburghii, Br.; Cochlospermum gossypium, D. C.; Cassia multijuga, Rich.; Cassia grandis, Lf.; Cassia nodosa, Ham.; Cassia fistula, L.; Clerodendron Thomsonæ, Balf.; Cedrela serrulata, Mig.; Cedrela odorata, L.; Careya arborea, Gaertn.; Chickrassia tabularis, A. Juss.; Chloroxylon Swietenia, D. C.; Canthium macrocarpum; Cupania edulis; Citherexylum cinereum, L.; Couroupeta guianensis, Aubl.; Derris robusta, Benth.; Derris dalbergioides, Baker; Digellostyles axillaris; Dipterocarpus zeylanicus, Thw.; Dipterocarpus hispidus, Thw.; Dalbergia melanoxylon, G. and P.; Dalbergia frondosa, Roxb.; Dillenia indica, L.; Eriodendron anfractuosum, D. C.; Enterlobium cyclocarpum, Grisib.; Erythrina indica, L.; Erythrina velutina Willd.; Erythrina umbrosa, H. B. K.; Eugenia jambolana; Ficus religiosa, L.; Ficus Trimeni, King; Ficus Arnottiana, Mig.; Ficus Wightiana, Wall; Ficus infectorea, Roxb.; Ficus semicordata, Mig.; Ficus elastica, L.; Ficus altissima, Bl.; Flacourtia Ramontchi, L'Herit; Gmelina arborea, Roxb.; Hevea brasiliensis, Muell. Arg.; Heterophragma adenophylla, Seem.; Litsea sebifera; Lagerstrœmia flos-reginæ, Retz.; Lagerstrœmia tomentosa; Manihot Glaziovii, Mull.; Michelia champaca, L.; Oroxylon indicum, Vent.; Odina Woodier, Roxb.; Pithecolobium saman, Benth.; Pericopsis Mooniana, Thw.; Poinciana regia, Boj.; Plumieria acutifolia, Poir.; Pterospermum semi-sagittatum, Ham.; Phyllanthus Emblica, L.; Pahudia Javanica, Mig.;

Peltophorum Leunei, Benth.; Peltophorum ferruginium, Benth.; Pterocarpus echinatus, Pers.; Pterocarpus marsupium, Roxb.; Pterocarpus indicus, Willd.; Parmentiera cereifera, Seem.; Pityranthe verrucosa, Thw.; Parkia biglandulosa, W. and A.; Rhopalocarpus lucidus, Boj.; Spondias Mangifera, Willd.; Sapindus laurifolia, Vahl.; Sclerocarya caffra, Sond.; Sterculia Balangas; Schizolobium excelsum, Vog.; Stereospermum xylocarpum, B. and Hkf.; Stereospermum chelonoides, D.C.; Stereospermum suaveolens, D. C.; Schleichera trijuga, Willd.; Stephegyne tuberosa; Sarcocephalus esculentus, Afz.; Sapium biglandulosum; Swietenia Mahogani, L.; Styrax Benzoin, Dryand; Terminalia catappa, L.; Terminalia belerica, Roxb.; Terminalia melanocarpum, F. M.; Terminalia parviflora, Thw.; Terminalia chebula; Tectona grandis, L.; Tabebuia Pallida (Lindl.); Tamarindus indicus, L.; Vitex leucoxylon, L. F.; Vitex altissima, L. F.; Zanthoxylun Rhetsa; Zizyphus glabrata, Heyne.

In connection with the foregoing we reproduce from the periodical above quoted, the following article on "The Rings of Trees," reprinted from *American Gardening*:—

The Rings of Trees.

THE following interesting article by Mr. H. H. Chapman, of Grand Rapids, Minnesota, in *American Gardening*, should be read in conjunction with Mr. Herbert Wright's valuable contribution, "Tropical Timbers and their Rings of Growth," which appeared in our issue of 22nd August 1901.

Every tree has its life-history securely locked up in its heart. Each year of its growth a thin ring of wood is formed next to the bark and a corresponding layer of bark adjoining it. As the tree swells and swells, the bark is forced outward and splits into wide fissures. Much of it falls off altogether, but each ring of wood remains a faithful record of the year in which it was formed. When the axe or saw of the woodman ends the life of the tree and brings its body crashing to the earth, this record is unrolled before us, and by it we can determine almost every incident in the life and growth of the tree.

Trees as well as human beings have their period of struggle and hardship, their prosperous times, their terrible misfortunes and hairbreadth escapes, their injuries, and recoveries; their complete submergence in a struggle in which the odds were too great for their feeble strength to cope with.

Here is a sturdy oak, whose tale revealed is that of steady perseverance in the face of difficulties—a slow, gradual growth, never checked, never daunted, till the final goal is reached and it stands supreme, literally monarch of all it surveys.

Here is a mighty spruce which has a tale of perseverance, but of a different sort. The oak conquers by force of character by its fighting qualities. The spruce succeeds by its ability to endure. It is like the patient Jew, frugal living on what would

be starvation to others, till when their day of strength is past, and sudden disaster overtakes them, he enters into his inheritance and prospers amazingly.

See the record of this spruce—fifty, sixty, seventy years, each represented by a ring so small that it takes great care to distinguish them at all, and the whole seventy do not occupy the space of three inches at the heart of the tree. What a tale of hardship this sets forth. Other trees have pre-empted the light in which the existence of a tree depends. The poor spruce must be content with the twilight that filters through the branches of its enemies, the poplar, birch and pine. But it is content. It knows that the young poplars or pine spring up beside it in the shade they could not endure, but would quickly die. It knows that the time will come when old age or disease will weaken the poplars, or perhaps a heavy wind will lay them low, and the spruce, old in years, but insignificant in stature, will escape injury, and still young in vitality, will soon spring ahead in the race.

Now see its rings—it has made as much growth in ten years as in the preceding seventy, and soon becomes a large tree.

What does the stump of this old white pine teach us? Evidently something extraordinary has happened to it, for way in near the heart a black scar runs around the edge of one of the annual rings for nearly one-fourth of its circumference, and outside of this the rings are no longer complete, but have their edges turned in against the face of this scar. Each subsequent ring reaches further across it. By the time they have met in the centre many years have elapsed and there is a deep fissure where the scar once existed. But the later rings have bridged the gap and, growing thicker in the depression, soon fill up the circumference of the tree to its natural roundness, leaving no sign of the old wood. What happened to the tree? While it was still young its mortal enemy, the forest fire, swept through the woods, destroying most of its companions and burning a large strip of the tender bark on its exposed side so that the bark died and fell off. But being better protected than the other and having still three-fourths of its bark left uninjured, it soon recovered and its stump reveals how successfully it strove to heal the wood and grow to maturity to perpetuate its species.

But as it takes many swallows to make the summer, so it takes many trees to make a forest, and the forest has almost as much individuality as the tree itself. Though each tree and each species struggle with each other for life and supremacy, yet in a sense they are helpful to each other, and protect each other from their common enemies.

The enemies of the forest are the wind and the fire. Other enemies there are, such as insects and disease, and sometimes the forest suffers so severely that its whole aspect is changed and new species come in and replace the old. Much of this history the rings will reveal to us, as is the case in some of the following

actual examples from studies recently made in the pine forests of Northern Minnesota.

In one locality where rather small Norway pine stood very close together, making a thick stand, it was found that almost without exception the trees were of the same age—138 years. No matter how large or how tender the tree, it was just as old as its neighbour.

The rings on all these trees were very large at the heart, but as fifty or sixty years went by, they got narrower and narrower, until some of the smaller trees seemed hardly to grow at all. The reason was plain; there were too many trees—and as none would give up the struggle, all suffered alike.

But they were not the only sufferers. Here and there we see a slender, struggling white pine making a vain attempt to capture its share of sun and rain. Count reveals that these white pines are also all of the same age, but unfortunately only 126 years old. The Norways had twelve years the start of them and the delay was fatal.

How did it happen that these trees came in so thickly and all the same year? Perhaps further study will help us to find out. So we go to another cutting over a mile from first. Here we find many trees about the size of those we have left, and counting the rings we find them to be of the same age—138 years. But here there is something more. In a secluded nook stands a group of immense white and Norway pine trees—perhaps a dozen. These prove to be very old, but, remarkably enough, also of even age—each stump showing 315 rings. Where is the rest of this patriarchal forest? Close about the few remaining may be seen the forms of many more stretched upon the ground and slowly decaying. These have evidently been blown down, possibly after being killed by fire. Their fate gives up the clue to the disappearance of the others. It is plain that some time before 1763 a great disaster overtook the pine forest in this place. Most of it was wiped out of existence, either by fire or wind. But here and there a clump remains, and from them in a favourable seed year came the seed which started the new and thriving crop of Norway pine.

To find out if possible whether this conflagration or blow-down was more than local we go to a cutting some ten miles from our first, and here again the oldest and largest of the stand, which is all rather small, prove to be 138 years old. Whatever the cause then, it must have operated over a large area, but this is not a thick stand; in fact, there are many gaps, and much of the timber is limby and knotty, a sure sign that it has not been grown very close together, and soon we find that many—in fact most of the trees—are but 101 years old, there being two distinct age classes.

How did this come about? Let us look at the older trees. Here upon one of them is a fire scar made when the tree was

eighteen years of age. Upon another we find a similar scar, made in the same year, and on close examination we can hardly find one of the older trees free from the marks of this fire. How plain it is that this fire occurring just 120 years ago, or in the year 1781, when the young forest was eighteen years of age, killed nearly all the young pine and gave the forest a blow from which, in this place at least, it never fully recovered. But it did the best it could, for the age of the second class of trees—101 years—shows that the young survivors of the fire grew rapidly, until at the age of 38 years they were enabled to produce a crop of seeds, or possibly the old trees from which the first ones came were still living and seeds down the ground a second time, so that a fairly good stand of trees was finally produced.

These studies lead us to infer that pines reproduce themselves as forests generally under exceptional or unusual circumstances, and that that is their natural way of maintaining themselves as species. The young white and Norway pine, especially the latter, cannot endure much shade when small, and could not possibly grow up as a thick forest under their own shade or the shade of other trees, yet we nearly always find them in dense groves. The rings tell us the secret. In the long period of 200 to 300 years during which the pines live, the "accident" of fire or wind becomes a certainty, and when a of strip forest is laid low or burned up, the neighbouring trees stand ready to scatter the seed far and wide in the wind and the new growth springs up and flourishes.

This is nature's method. But nature's methods are so perfectly harmonized that but little is needed to throw them out of balance.

Nature clears in strips and dashes seed there, and fires are rare and far apart. Man clears over wide areas and fires of his origin sweep repeatedly over his slashings. The young pines spring up even after the second and third fires, but by perseverance the fires finally destroy them all, and what nature intended to be the young pine forest becomes a barren wilderness.

Timber Estimating.

By H. B. Ayres, U. S. Geological Survey.

Timber estimators have, as a rule, been reticent concerning their methods. Their employers, who buy and sell on their estimates, do not ask them.

As long as those immediately concerned are constant, there is no need of literature on the subject, but when the value of the property of people inexperienced in sales by estimate is at a stake and the owners have no personal knowledge of the record of the several estimators, they have a right to some idea of the manner of doing the work.

The fundamental principles of estimating are very simple, and consist in ascertaining the number of trees, their dimensions and the percentage of merchantable timber in them. The measurement of a tree is very simple and of little importance.

The principal difficulties of estimating are :—

1. Locating the land to be estimated.
2. Determining the number of trees.
3. Determining the average size of the trees.
4. Determining the percentage of defects.
5. Determining the proportions of the several grades of timber.

In locating land the most intricate problems of land-surveying may arise even where the land has been subdivided into sections, or when subdivided into so-called forty-acre tracts. In such cases the adjustment of errors and the re-establishment of lost and obliterated corners require a high degree of technical skill. In practice, lines are run and location is kept by compass and pacing or by transit and chain, according to the accuracy desired and the difficulties of the ground.

The counting of trees may seem a very simple matter, and under some circumstances it is. When all of a small group of trees are in view from one point it is easy to count them, but a large tract of dense timber, or a few timber trees among dense saplings, are different problems.

The defects of timber, whether from rot, crooks, or worm-holes, are matters of close study. They are to be familiarised (though never mastered) only by long study, not only in standing timber, but also in seeing defective logs put through the mill.

In estimating grades of timber that may be manufactured from the timber in question, the highest skill is necessary. In considering methods of estimating, the differences of general forest conditions are also to be borne in mind. That is, whether the forest is broken by openings, such as lakes, swamps, meadows, brushland or burns; whether it is young and thrifty or old and defective. In the application of European methods used in estimating cultivated uniform forests there, to primeval or natural or irregular forests here, there should be great caution; for uncultivated forests rarely have such a uniform stand. That one acre may represent a forty-acre tract, or that any portion of a large forest can be chosen to represent the whole, is a very serious question. In this fact lies a difficulty inexperienced men are apt to stumble over. The selection of representative tracts to be measured or closely estimated to serve as a factor for the whole tract, is a problem the most skilled estimators are reluctant to undertake.

June, 1901. THE FORESTER.

The Earthworm and its part in the production of Vegetable Mould.

AT a recent meeting of the Society of Sciences at Nancy, France, Professor E. Henry (Professor of Forestry) presented some interesting notes on the connection between the formation of vegetable soil and the earthworm, and which forms the basis of a concise statement by L. Grandean in the *Revue Horticole*, which is here translated. The relationship was first brought to notice in a short communication presented to the Geological Society of London in 1837 by Darwin, who later, in 1882, devoted an extensive work to these humble aids of the agriculturist. It was in 1877 and 1878, however, that the first detailed studies on the importance of the earthworm in this connection were published. That year record was made of two great factors in the decomposition of organic material in vegetable mould, namely, bacteria and earthworms. Schloesing and Muntz discovered the agent of nitrification, and Van Hensen demonstrated the influence of the earthworm on the fertility of the soil. The works of Mueller, Wollny and Kostitcheff and the recent researches of Henry have added many interesting facts to the observations of the early investigators.

The earthworms fulfil many functions in the soil. They hasten the decomposition of organic matter and the formation of leaf mould, which they mix with the mineral matters of the soil to form vegetable earth. It is well known that earthworms travel at night in search of dead leaves and other organic refuse, which they drag to the extremity of their holes for food, excreting a part in the form of the familiar worm-cast holding organic matters not directly mixed with soil.

This is one of nature's methods of forming vegetable earth, bringing about the mixing of the surface humus with the mineral matters down below.

This transformation and mixing takes place very rapidly. On the surface of a box of about 20 inches cube filled with pure silver sand, Professor Henry laid out a number of poplar leaves. Some weeks after these leaves were gathered into a pile and strongly bound together and mixed with humus. Below this pile was found a hole made by a worm which had bored almost vertically to the bottom of the box, where Professer Henry found it quite alive. The course of the gallery was easily followed, thanks to a black coating (two or three millimetres thick) which lined the walls and extended into the white colour of the surrounding mass. This worm, attracted by the dead leaves, had travelled up over the wall of the box in order to eat the leaves, and in spite of the very unfavourable nature of the medium below, had bored out for itself a retreat where it might rest in the neighbourbood of its food supply. Very few worms are found in quartz sand, the sharp edges and points of which irritate the skin, and especially the intestinal lining of the creature. They know how to protect

themselves, however, by emptying at various points in the channel the humic contents of the intestine, carpeting or plastering the walls with this black and moist material, which is applied between the grains of sand by the tortuous movements of their bodies. If in place of a single worm four or five had discovered the spot, all the leaves would have been converted into humus and mixed with the sand for a depth of 20 inches.

But not only are dead leaves promptly torn up and transformed into humus; organic matter passing through the intestine is decomposed much more quickly than that which has not been so served. The recent experiments of Wollny demonstrate this point, which was known neither by Van Hensen nor Darwin.

Kostitcheff studied the decomposition of leaves gnawed by worms and those which had not been touched, and according to the quantity of carbonic acid liberated, obtained only insignificant results regarding the difference of their decomposition. But quite another thing is proved when, as Wollny did, the investigation is made on material which has actually passed through the digestive canal of the worm. The intestinal secretion of the worm is of much the same nature as the pancreatic secretion of the higher animals, and equally with it possesses the power of emulsionizing fats, dissolving albuminoids, converting starch into sugar, and even of attacking cellulose. It may be safely concluded *à priori* that organic matters taken in by the worm undergo complicated chemical changes during their passage through the digestive canal—changes which facilitate ultimate decomposition.

To satisfy himself Wollny made the following experiments:—

(1) A limestone soil rich with humus was divided into two portions; one was worked over for six months by worms, the other kept intact. (2) Of arable land rich in humus two equal quantities (weighing one kilo) were taken. Into one of these ten earthworms were introduced and the experiment lasted three months. In the autumn these lots were dried in the sun, the worms taken out and the masses immediately analysed with a view of determining the alteration of organic matters and the proportion of soluble nutritive matter in the soil.

The volume of carbonic acid contained in it serves to measure the stage of decomposition of organic matters of which it is the principal product, and the liberation of carbonic acid is much greater in a soil containing worms than in one without them. The quantity of oxidized matter does not sensibly vary after the passage through the worms, but the same does not hold true of the soluble mineral matters, which are three to five times more abundant in the wormy soil. A third service, possibly a most important one, which the worms render, consists in increasing the porosity of the soil, and giving it granular texture which allows plant roots as well as the air and water of which they stand in need, to circulate easily through the mass.—*American Gardening.*

Forestry in India.

(From the Journal of the Society of Arts.)

UNDER the heading "Forestry in Madras," the *Journal of the Society of Arts* of the 28th June, 1901, contains an article by Sir George King, in which he takes Mr. Rees to task for not pointing out in his paper on the Madras Presidency, that it was in that part of India where the earliest successful attempt was made to initiate an organisation for the preservation and control of the forests. A letter on the same subject by Sir George Birdwood will be found in the *Journal* of July 12th, 1901. Mr. Rees in his paper has eight lines on "Forest Conservancy," in which he says:—"We should never forget, in Madras, that it was Sir M. Grant-Duff who, with the aid of Sir D. Brandis, took steps to preserve and reserve the magnificent forests of the Presidency, and to constitute them a haven of refuge for its fauna and flora as well as a fuel and fodder supply for its inhabitants." No doubt Mr. Rees would have done better to explain more fully what he meant. I do not think he intended to imply that forest conservancy was commenced when Sir M. Grant-Duff was Governor of Madras; that happened much earlier; but he was quite correct in saying that the action of Sir M. Grant-Duff and Sir D. Brandis put forest conservancy for the first time on a sound and rational basis. But when Sir G. King states that forest conservancy dates from 1848 (when Lieutenant Michael was appointed to the charge of a timber agency in the Annamalays), then he is certainly at least as much in the wrong as Mr. Rees. That date is either too late or too early, according as to how the matter is looked at. As a matter of fact, attempts at forest conservancy commenced about a century ago, when a timber agency was established on the west coast of the peninsula. Various steps followed, which sometimes tended to improve the attempts at forest conservancy, and sometimes they had the reverse effect. The first *substantial* step was taken by Mr. Conolly, Collector of Malabar, who, in 1843, started the Nilambur teak plantations, which have now become of great value. This was five years before 1848. In the latter year Lieutenant Michael was appointed to the charge of a timber agency in the Annamalays, an appointment which he held until 1855, when he went on leave. During his absence in Europe he was, I understand, transferred to some other appointment. In 1856 Dr. Cleghorn was appointed Conservator of Forests in Madras; he started forest conservancy on more regular lines, and he did a great amount of good. Unfortunately he was succeeded by a gentleman during whose tenancy most of the good done by Dr. Cleghorn vanished again, until, in the year 1881, His Excellency the Viceroy (the Marquis of Ripon) found himself bound to interfere. He vetoed a Forest Act sent up by the Madras Government, and directed his Inspector-General of Forests (Sir D. Brandis) to proceed to Madras, inquire into the system of forest manage-

ment, and report to him. It was at this juncture that Sir M. Grant-Duff become Governor of Madras. With his powerful support, Sir D. Brandis worked out a revised organisation, which is the foundations of forest conservancy as now practised in Madras. This is what Mr. Rees meant when he wrote the above-quoted few lines. Sir G. King, in his article, brings in my name as the author of a paper on Indian Forestry, read before the Colonial Institute in 1890, and he quotes from a speech of Sir Alexander Arbuthnot, in which that gentleman is represented as having found fault with my statements regarding the early history of the Indian Forest Department. As this is likely to produce an erroneous impression, I must ask you to reprint what I said at the Colonial Institute. (Pages 199 and 204 of vol xxi., 1889-90, of the Proceedings of the Colonial Institute.)

At page 199 I said:—"The forest question commenced to attract attention in the early part of this century, in consequence of which a timber agency was established on the west coast of the peninsula. Next we find, in the year 1843, Mr. Conolly, Collector of Malabar, planting teak on a large scale at Nilambur. Dr. Gibson was appointed Conservator of Forests in Bombay in 1847. In 1848, Captain Frederick Conyers Cotton caused the appointment of Lieutenant James Michael (now Major-General J. Michael, C.S.I.,) as Forest Officer in the Annamalays, which post he retained for seven years. Dr. H. Cleghorn became connected with forest conservancy in Mysore in 1847, and he was appointed Conservator of Forests in Madras in 1856. He was on special duty with the Government of India about the years 1860-62, when he inquired into forest matters in the North-Western Himalayas and elsewhere. In the Central Provinces, Colonel Pearson was the first Conservator who took up forestry in a businesslike manner. These gentlemen and others were the pioneers of forest conservancy in India. Their action, though localised, caused the matter to be discussed and brought before the public, and it led, ultimately, to the organisation of a general Department by Dr. D. Brandis (now Sir Dietrich Brandis, K.C.I.E.). The latter was appointed Superintendent of Forests in Pegu in 1856. . . . . In 1862 he was attached to the Government of India, and in 1864 appointed the first Inspector-General of Forests to that Government. He then went to work to establish the Indian Forest Department, and to introduce a systematic management of the forests. At first he devoted himself to the provinces directly under the Government of India; subsequently, he was twice deputed to Bombay, and he totally re-organised the Forest Department in Madras in 1881-83, immediately before his final retirement from India."

On page 204, again, you will find the following:—"The question has repeatedly been asked, to whom do we owe the development of forestry in India. I think I am correct in saying that no single person can be considered to be the originator of the business, which grew up gradually. Every one of the pioneers of the

Department helped in a greater or less degree, commencing from the early part of the century (19th). It was Sir Dietrich Brandis's good fortune to arrive upon the scene when matters were ripe for a general move. He seized the opportunity promptly, and, by his remarkable ability and perseverance, carried the business to a successful issue. By saying that the name of Brandis must for ever be associated with the establishment of systematic forest management as now understood in India, we do not in any way depreciate or forget the valuable services which the pioneers of the Indian Forest Department have rendered to the State, or the services of those who worked with Sir D. Brandis, or who followed him. Even now the development of systematic and scientific forestry in India is by no means a closed book; there is a great deal to be done yet, and a great many improvements to be effected. The important point is, that the development of systematic forestry in India is considered something to be proud of; never mind who did it, or who shared in the honour of having accomplished a feat which is of such importance to the welfare of the Indian people, and, I may add, to the Indian exchequer—a consideration by no means to be despised in these days of low exchange."

These are the statements which Sir Alexander Arbuthnot tried to attack at the meeting of March, 1890. I feel sure he would not have done so had he looked at the full text as set down in the paper. Anyhow, it is a matter of astonishment, and regret, to see that now efforts are made to belittle the great merits of Sir D. Brandis, apparently with the object of bringing into greater relief another of the pioneers of Indian forestry.

W. SCHLICH.

Cooper's Hill, 3rd August, 1901.

I have read with pain Dr. Schlich's note on "Forestry in India" in the *Journal of the Society of Arts* of the 30th ultimo. The imputation in the last paragraph of an unworthy motive to the various eminent Indian officials who have at different times publicly recognised the incontestible claim of General James Michael, C.S.I., to be regarded as the practical pioneer of Forest Conservancy in India, is altogether unworthy of Dr. Schlich, and I am sure that he will himself be the first to regret it on seeing it in plain print. Sir Alexander Arbuthnot, Sir Charles Bernard, General Frederick Cotton, Sir Joseph Fayrer, Sir George King, Sir Clements Markham, and Mr. C. B. Thomas, Collector of the Coimbatore District, under whom General Michael worked in the forests of Coimbatore and Cochin, have all held responsible office, and attained high distinction in the service of the Indian Government. They are all men who must know what they write and speak about; when they, each in his own independent manner, state, in effect, that General Michael scored the earliest effective

success in forest conservancy in British India, they are not for a moment to be suspected of being actuated in making such a statement by a desire "to belittle the great merits of Sir D. Brandis," and "apparently with the object of bringing into greater relief another of the pioneers of Indian Forestry."

As for anything that I may have said in praise of General Michael, there is most fortunately the patent proof that it implied no disparagement of the pre-eminent services of Sir Dietrich Brandis. I wrote the Introduction to the Catalogue of the Contributions of the Government of India to the Forestry Exhibition held at Edinburgh in 1884, of which General Michael was placed in charge by the Government of India; and after pointing out the suggestive and fruitful part Scotland had taken in promoting forest conservancy in India, through the action of the British Association when they met in Edinburgh in 1850, and through the labours of Roxburgh, Royle and Wallich, the greatest of the pioneer botanists of India, and Hugh Cleghorn, the first officially styled "Conservator of Forests" in the Madras Presidency—all these men having been students of the University of Edinburgh—I went on to say:—

"Cleghorn carried out the organisation of the new department in Madras with such astonishing energy and success that he was soon called on to extend the sphere of his operations into the Punjab. He also afforded Mr. Dietrich Brandis, C.I.E., the most efficient assistance in introducing and systematically working conservancy in the forests of Bengal, and with the most satisfactory results. Brandis had previously done very distinguished forest work in Burmah, and in 1862 was appointed Inspector-General of Forests under the Government of India. From that time the successful future of forest conservancy in India was assured. The eminent scientific and administrative abilities of Brandis have been widely recognised; and to him we owe the introduction of the Indian Forest Acts, which, while strengthening the hands of the Government, have secured to the people the maintenance of all the ancient rights and privileges inherited by them from time immemorial. He, in fact, by his great capacity, his wise recommendations, and his personal example of enthusiastic devotion to duty, has made the Forest Department of India what it now is."

It happened that I was correcting the proofs of the Introduction when General Michael unexpectedly entered my room, and on my reading over certain portions of them to him, he, in coming to the above-quoted passage, objected that it was not explicit enough on the point of the statesmanlike insight and wisdom with which Brandis had, in his marvellous administration, dealt with the prescriptive rights of the people of India in the forests. It irritates me to rewrite anything once in proof, but General Michael was resolute, and then, while he waited, I wrote the following footnote on the above word, "immemorial":—

"One of the main difficulties with which the Forest Department almost throughout India have had to cope is that of the customary privileges of common. The people, especially the agriculturalists, have for generations been accustomed to use the forests for cutting firewood, grazing, and even clearing for cultivation, without restriction. The exercise of these rights without regulation was tending to the certain destruction of the forests, and, with the rapid increase of population under the British Government, was every year becoming more injurious to the public welfare. It was, therefore, absolutely necessary to bring the Indian forests under some control; while at the same time it was felt that to suddenly prohibit the traditionary rights of the people in them would be most cruel and unjust. What, therefore, Brandis aimed at in his Acts was to forbid altogether the exercise of those privileges which were incompatible with the existence of the forests, and to allow others to as great an extent as possible. Thus in every locality some of the forest land is still left open to grazing and firewood-cutting, &c., and some is strictly closed for a period long enough to enable the trees on it to recover."

The remainder of the introduction is taken up with a brief exposition of the Forestry Department of the Government of India as completely reconstituted by Brandis; and I conclude with the words:—

"It is a happy omen also that the first International Exhibition of Forestry should have been held in the stately capital of Scotland, where scientific forestry throughout the British Empire received its earliest impulse, and that the Exhibition should be so much indebted for its prosperous issue to the co-operation of Colonel Michael, the pioneer of practical forestry, and of Cleghorn, the father of scientific forestry, in India."

Here, in a nutshell, is the solid, just, and righteous claim made for General Michael; and here, in a nutshell, the comprehensive and unreserved affirmation of the splendid genius and work of Brandis, for, great as he is as an administrator in forestry, he is greater still as a man.

Scarcely less astray than these insinuations is Dr. Schlich's retrospect of the initial history of forestry conservancy in British India. Thus in the second paragraph he writes:—"In the latter year [1848, it should be 1847] Lieut. Michael was appointed to the charge of *a timber agency* [the italics are mine, for this is the second use in the same paragraph of this most misleading phrase] in the Annamalays, an appointment he held until 1855, when he went on leave. During his absence in Europe he was, I understand, transferred to some other appointment." This, indeed, is "belittling" the seven years of General Michael's yeoman's service to Indian forest conservancy, on the success of which so much, in the result depended; and, therefore, instead of following Dr. Schlich's retrospect through all its details, for the personal controversy over General Michael is of quite secondary importance,

I will reply to it indirectly, with an independent retrospect, abstracted from a summary prepared eleven years ago from official sources, expressly for the purpose of discovering the obscure beginnings of British Indian forestry, and placing the ascertainable facts on readily accessible record. The report, indeed, has long been in the hands of all interested in its subject, and I presume that Dr. Schlich's retrospect is reduced from it, as he reproduces a conspicuous clerical error in it. So far back as 1807 the Government of Bombay assumed all communal rights over the forests of that Presidency, and attempted a scheme of conservancy which, however, they abandoned in 1822. A letter from the Superintendent of the Indian Navy to the Bombay Government, dated the 27th of March 1844, states that the Canara forests had been many years back under conservancy; that Colonel Gilbert then held the situation of Conservator for 16 years, and that he was succeeded by Captain Jakes, Indian Navy, who was withdrawn in 1823-4, and the establishment broken up. In 1840 Dr. Alexander Gibson ["Daddy Gibson" of affectionate local fame], Superintendent of the Botanical Gardens, Bombay, was deputed to report on the forests of the Northern Division of Bombay, and in 1846 he was formally appointed Conservator of Forests for the presidency. In 1851 the Military Board, under whom he acted, reported that no profit had been made, and recommended that he should restrict his operations. Widespread local disaffection had been caused by the regulations enforced by the administration; but Dr. Gibson, who was a man of great natural capacity and enlarged learning, remained Conservator until 1860.

As far back as 1847 there was an officer designated "Forest Ranger" in Scinde; and the appointment was held successively by Major Scott, Captain Crawford, Dr. Stocks, the well-known botanist, Captain Hamilton [Out-of-Door Hamilton he called himself, in antithesis to Sir Robert Hamilton, of Indore], and Mr. Dalzell, another accomplished botanist.

In Madras, the first we read of forest conservancy is a report by Dr. Wallich, in 1827, recommending the Government of the Presidency to take steps for the preservation of the teak forests of Tenasserim. Efforts were consequently made, in 1833, to establish control of them, but owing to the opposition of vested interests, they failed for the time. Again, in 1837-38, Dr. Helfer (a most promising botanist, who was murdered in the Andamans, 1839) reported on the Tenasserim teak forests, with the result that Captain Tremenheere was appointed Superintendent of Forests. A code of rules for their management was drawn up in 1842, but disallowed by the Court of Directors; and we hear no more of the matter until 1847, when the late Mr. T. R. Colvin again attempted to organise a forestry department for the Madras Presidency, but again in vain. Even in Burmah the Madras Government arranged for the supply of timber with a timber merchant at Maulmain; and it was only after the second Burmese war that

Dr. McClelland (an eminent Indian naturalist, who first introduced Indian isinglass into the markets of Europe) was appointed Superintendent of Forests in Pegu, in 1853, being succeeded by Dr. (now Sir Dietrich) Brandis, in 1856.

Owing to the rapidly-increasing demands by the great mercantile port of Bombay for the teak timber of Madras, the latter Government, in 1843, began to take alarm at the prospect of an exhaustion of the supply, and Mr. Henry Valentine Conolly (he was one of four famous brothers,—Captain Edward, killed at Purwan Durrah, 1840, Captain Arthur, murdered with Colonel Stoddard, Bokhara, 1840, Captain John, killed at capture of Cabool, 1842, and Henry Valentine, of the Madras Civil Service, assassinated by the Moplas, 11th September, 1855—a sample of the price of Empire!) formed a nursery of teak trees at Nilambur. As an interesting experiment it was a great success, and at the Edinburgh Forestry Exhibition of 1884 there were 33 sections of teak trees from this plantation, the largest of which was 8ft. 4in. in girth. But nothing came of it practically. In 1847, however, at the earnest recommendation of General Frederick Cotton [a brother of the late Sir Arthur Cotton], the Government of Madras took determined action in the matter, and resolved to bring one of the most valuable teak tracts in the Presidency into their own management; and accordingly, in 1848, appointed Captain [now General] Michael to the charge of the Annamallay forests in the Coimbatore District. The whole tract was at once placed by General Michael under the most careful conservancy of the tentative kind then only possible. Roads were laid out, a timber slip constructed; and axe men, sawyers, carters, and other workmen imported from adjacent districts; while the hill people were conciliated by their being employed in clearing brushwood round saplings and girdled trees, and on other similar light sylvan occupations for which they were naturally fitted. Also all ancient rights were scrupulously respected, and compensation liberally paid when their surrender was necessitated. Consequently there was no friction with the village authorities and the aboriginal people; timber of large scantling was freely floated down the rivers for shipment to the dockyard at Bombay, or transported by land to the Nilgherry Barrack Works and the Madras Gun Carriage Manufactory. Within a few years the success was so marked, and the financial result so satisfactory, that the Board of Directors in their "Financial Despatch," No. 15 of 1854, acknowledged their gratification in the handsomest terms.

The Committee, appointed by the British Association at Edinburgh in 1850, issued their report in 1851, drawing attention to the need of extending forest conservancy in India, and to the fact that where supervision had been wisely exercised improvement had at once taken place; and undoubtedly this also contributed to the resolution arrived at by the Court of Directors on the basis of General Michael's operations to make the conservancy

of the forests henceforth an object of primary solicitude in India. General Michael is an enthusiastic Indian *shikari* [sportsman], and his popularity on this account with the natives greatly facilitated him in his administration of the Annamallay teak forests, and, consequently, on his enforced retirement in 1855, on account of "jungle fever," contracted during his seven years' exposure to every vicissitude of climate, he was replaced by General Douglas Hamilton [a brother of Captain Hamilton] the most famous *shikari* Southern India has ever raised. Meanwhile Dr. Cleghorn had been carrying on botanical and forestry work in Mysore from 1847 [observe how everywhere in India forestry begins about 1846—8]; and in 1856 he was appointed Conservator of Forests over the whole Madras Presidency [including Burmah], with General Douglas Hamilton, and Colonel [then Lieutenant] Beddome [the author of *Flora Sylvatica*, embracing the forest flora of Madras and Ceylon], and Dr. Drew, as his assistants.

In the Punjaub nothing was done in forest conservancy until Hugh Cleghorn was sent up there temporarily in 1861, to advise Sir Robert Montgomery. The same may be said of the North-West Provinces and Oude, and of the Central Provinces, until Colonel Pearson was, as Dr. Schlich says, sent there. Sir Dietrich Brandis was appointed Superintendent of Forests in Pegu in 1856. He at once made his mark, and when at last the time was ripe for an Imperial Forest Department, acting over the whole of the British Indian Empire, he was called up from Burmah, in 1862, to consult with Cleghorn on its organisation and establishment, and in 1864 was appointed the first Inspector-General of Forests.

This is the round, unvarnished tale of the whole course of the rise and administration of Forest Conservancy in India—nothing has been extenuated, nor aught set down in malice—and the official report from which I have draughted it (adding here and there only an illustrative, or an appreciative, gloss of my own) was one submitted by General Michael himself to the Secretary of State for India on the 14th of June 1890. His whole anxiety throughout it is to do full justice to everyone, and particularly to the half-forgotten forestry officials anterior to the great period in Indian forestry which begins with Cleghorn and Brandis. Obviously he has no other thought really than to see full justice done to Madras and the Madras officials in the apportionment of the enormous credit due to the Government of India for their magnificent administration of its glorious subtropical forests.

This is a vain consideration now. Hugh Cleghorn is dead, and one of the most—I will not say heartless, but— thoughtless defaults of the Indian authorities was letting him die without any recognition whatever of his great and incalculable services to Indian forest conservancy. And if there is too much in Dr. Schlich's latest and previous utterances in our *Journal*, and elsewhere, on the subject, of the sentiment—"Pereant qui ante nos nostra dixerunt," I would fain attribute it also entirely to heed-

essness, arising out of a pardonable provincial prejudice—"Nul n'aura de l'esprit hors nous et nos amis;" for I have a strong prejudice myself of the essential goodness of heart—the generosity and magnanimity—of every forester and gardener, and lover whatsoever of trees and flowers, as being men above all others cast in the image of their Creator, as quaintly phrased by Dante, "the Eternal Gardener"—*Il Ortolano Eterno.*—GEORGE BIRDWOOD.

September 6th 1901.

If Sir George Birdwood was pained on reading my note on the above subject in the *Journal* of the 30th August, then he has only to thank himself and Sir George King. *They* are the attacking party and not I, who was just as much pained as Sir George Birdwood by what he and Sir George King had published. Why did the latter bring in my name? As he had done so, surely I was justified in defending myself. Had he left me alone I should have been the last person in the world to write on the subject.

And now Sir George Birdwood, in his last note, brings in the names of quite a number of other gentlemen, of whom I did not think for moment when I wrote my note. In the original draft of my note I had introduced in the last paragraph the names of Sir George King and Sir George Birdwood; but on the Secretary's advice that it would be better to leave out any reference to individuals, I struck out the two names when correcting the proof. I now regret this, since it has enabled Sir George Birdwood to introduce the names of the other gentlemen as champions on his side. As far as I am concerned, however, this controversy rests only between Sir George King and Sir George Birdwood on one side, and myself on the other.

As to the merits of the case, I am content to leave that to the judgment of those readers of the *Journal* who are fully acquainted with the facts.

16th September, 1901. W. SCHLICH.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

October 3rd, 1901.

EAST INDIAN TEAK.—The deliveries for the first three-quarters of the year amount to 10,580 loads, as compared with 8,207 loads for the same period of 1900. For September last they are 1,059 loads, and for September 1900, they were 897 loads. In London a good deal of business has been effected at rather more than the August level of price, but stagnation is still the epithet which best fits the cargo trade, wholesale buyers lacking courage to pay the prices necessary to cover cost.

ROSEWOOD, EAST INDIA.—Sales can only be effected at low prices and stocks are too heavy.

SATINWOOD, EAST INDIA.—Stocks are heavy, sales small, and prices weak.

EBONY, EAST INDIA.—There is no stock, but only a moderate demand.

PRICE CURRENT.

Indian Teak, per load	...	...	£10 to £17.
Rosewood „ ton	...	...	£5 to £10.
Satinwood „ superficial foot		...	5*d.* to 12*d.*
Ebony „ ton	...	...	£9 to £12.

Denny, Mott and Dickson, Limited.

WOOD MARKET REPORT.

2nd October, 1901.

TEAK.—The landings in the London Docks during September consisted of 302 loads of logs and 359 loads of planks and scantlings, or a total of 661 loads as against 1,445 loads for the corresponding month of last year. The deliveries into consumption were 632 loads of logs and 483 loads of planks and scantlings, together 1,115 loads, as against 900 in September, 1900.

The dock stocks at date analyse as follows :—

	7,540	loads of	logs as against	9,305	loads at the same date last year.		
	4,994	„	planks „	4,479	„	„	„
	114	„	blocks „	1	„	„	„
Total	12,648	loads	„	13,785	loads	„	„

The above figures shew a sound position, especially in respect to logs. Shippers of these find their stocks at the shipping ports so moderate as to give them no temptation to speculative consignments, and thus succeed in getting good *f.o.b.* prices against actual orders; and they continue to treat any falling off in European consumption with equanimity. Although the consumption of teak in the United Kingdom and Europe has been curtailed by the check to general trade, it is to be noted that London and district has consumed during the first nine months of this year nearly 2,500 loads *more* than during the same period of last year, and that the delivery from the docks into consumption during this period has exceeded the quantity of wood landed. With the satisfactory attitude maintained by shippers, it seems that prices should remain steady for some time to come for general specifications, whilst shippers will probably continue to succeed in obtaining high rates for special specifications to be shipped to order.

Business during September improved in tone if not in volume. The sound attitude of shippers in refraining from

forcing forward goods on a congested market has appreciably steadied the softwood position, and the hardwood market continues to suffer from weakness in the demand rather than excessive stocks, so that the panic tendency of the summer months in respect to prices has given place to a better balanced mental attitude; and the holiday exodus being practically over, business during the remaining quarter of the year should be of a stronger character than that of the depressing quarter just ended.

Market Rates for Produce.

Tropical Agriculturist, October 1st, 1901.

Cardamoms	...	... per lb.	2*s*. 3*d*. to 2*s*. 4*d*.
Croton seeds	...	... „ cwt.	15*s*. to 20*s*.
Cutch	...	... „ „	23*s*. to 35*s*.
Gum Arabic	...	... „ „	20*s*. to 35*s*.
Do. Kino	...	... „ „	1*s*. 3*d*. to 1*s*. 6*d*.
India-rubber,	Assam	... „ lb.	2*s*. to 2*s*. 6*d*.
Do.	Burma	... „ „	2*s*. to 2*s*. 6*d*.
Myrobalans,	Madras	... „ cwt.	5*s*. to 5*s*. 6*d*.
Do.	Bombay	... „ „	4*s*. 3*d*. to 7*s*. 6*d*.
Do.	Jubbulpore	... „ „	5*s*. to 6*s*. 3*d*.
Do.	Calcutta	... „ „	4*s*. 3*d*. to 6*s*.
Nux Vomica	...	... „ „	7*s*. to 10*s*. 6*d*.
Oil, Lemon-grass	...	... „ lb.	5*d*. to 5¾*d*.
Orchella weed, Ceylon		... „ cwt.	10*s*. to 12*s*. 6*d*.
Sandalwood, Logs	...	... „ ton	£20 to £50.
Do. Chips	...	... „ „	£5 to £8.
Sapanwood	...	... „ „	£5 to £5 10*s*.
Tamarinds,	Calcutta	... „ cwt.	10*s*. to 11*s*.
Do.	Madras ...	... „ „	7*s*. 6*d*. to 10*s*.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

21*st November* 1900.—No. 905-F.—130-14.—With reference to the Notification of this Department No. 611-F., dated the 13th July last, Mr. R. S. Troup, Officiating Deputy Conservator, 4th grade, was relieved of his duties as Instructor at the Imperial Forest School, Dehra Dun, on the afternoon of the 31st October 1900, by Mr. R. McIntosh, Deputy Conservator, 4th (officiating 3rd) grade, Madras, who is appointed Instructor until further orders.

From the same date Mr. Troup reverted to the Burma Forest List.

2.—Madras Gazette.

20*th November* 1900.—M. R. Ry. V. P. Ramalingam Pillai, Ranger, 2nd grade, Tinnevelly district, is granted leave on medical certificate, under Article 369 of the Civil Service Regulations for six months from date of relief.

24*th November* 1900.—Mr. N. M. Rego, Forest Ranger 1st grade, is transferred from South Canara to Tinnevelly.

M. R. Ry. V. S. Gurunatha Pillai, Extra-Assistant Conservator, 3rd grade, on special duty, is transferred to South Canara.

3.—Bombay Gazette.

24*th November* 1900.—No. 2407.—Mr. Dattatraya Manjunath Bijur, Extra-Assistant Conservator of Forests, 2nd grade, proceeded on three months' privilege leave from 16th November 1900. He was relieved of his duties as Sub-Divisional Forest Officer, North Thána, by Mr. Mancherji Byramji, merchant, Acting Extra-Assistant Conservator of Forests, 4th grade, on the afternoon of the 15th November 1900. (*Vide* Government Notification No. 6583, dated 19th October 1900.)

30*th November* 1900.—No. 2471.—(1) Mr. Vishnu Madhav Tilak, Extra-Assistant Conservator of Forests, 3rd grade, was relieved of his duties as Sub-Divisional Forest Officer, Central Thána, and directed to proceed to Poona to take up the duties of the Professor of Forestry, College of Science Poona, on the forenoon of 26th November 1900.

(2) Mr. G. M. Ryan, Deputy Conservator of Forests, 3rd grade, and Divisional Forest Officer, Central Thána, has been placed in charge of the Office of the Sub-Divisional Forest Officer, Central Thána, during the absence of Mr. V. M. Tilak on deputation.

4.—BENGAL GAZETTE.

3rd December 1900.—No. 3678.—Consequent on the addition of three new appointments in the Imperial Forest Service in Bengal, sanctioned in Her Majesty's Secretary of State's Despatch No. 76 (Revenue), dated 10th May 1900, the following promotions are made in that service with effect from the 28th May 1900 :—

Mr. F. B. Manson, Deputy Conservator of Forests, 2nd grade, and Officiating Conservator of Forests in Burma, is promoted to Deputy Conservator, 1st grade.

Mr. W. M. Green, Deputy Conservator of Forests, 3rd grade, and Officiating Deputy Conservator of Forests, 2nd grade, is confirmed in the latter grade, and promoted to officiate in the 1st grade of Deputy Conservators.

Mr. H. D. D. French, Deputy Conservator of Forests, 4th grade, and Officiating Deputy Conservator of Forests, 3rd grade, is confirmed in the latter grade, and promoted to officiate in the 2nd grade of Deputy Conservators.

Mr. C. G. Rogers, F.C.H., Deputy Conservator of Forests, 4th grade, and Officiating Deputy Conservator of Forests, 3rd grade, is confirmed in the latter grade.

Mr. H. H. Haines, F.C.H., Deputy Conservator of Forests, 4th grade, to officiate in the 3rd grade of Deputy Conservators.

Mr. C. C. Hatt, Assistant Conservator of Forests, 1st grade, is promoted to Deputy Conservator of Forests, 4th grade.

Mr. F. Trafford, Assistant Conservator of Forests, 1st grade, officiating in the 4th grade of Deputy Conservators, to officiate in the 3rd grade of Deputy Conservators.

Mr. J. W. A. Grieve, Assistant Conservator of Forests, 2nd grade, and Officiating Deputy Conservator of Forests, 4th grade, is promoted to the 1st grade of Assistant Conservator of Forests, and will continue to officiate in the 4th grade of Deputy Conservators.

Mr. H. A. Farrington, Assistant Conservator of Forests, 2nd grade, officiating in the 1st grade of Assistant Conservators, to officiate in the 4th grade of Deputy Conservators.

Mr. T. H. Monteath, Assistant Conservator of Forests, 2nd grade, officiating in the 1st grade of Assistant Conservators, to officiate in the 4th grade of Deputy Conservators.

3rd December 1900.—No. 3679.—Consequent on the departure of Mr. C. G. D. Fordyce, Deputy Conservator of Forests, 2nd (and officiating 1st) grade, on the 31st July 1900 on the three months' privilege leave granted him in Notification No. 1298 T.R., dated the 7th July 1900, the following temporary promotions are ordered with effect from the above date :—

Mr. R. L. Heinig, Deputy Conservator of Forests, 3rd grade, and Officiating Deputy Conservator of Forests, 2nd grade, to officiate in the 1st grade of Deputy Conservators of Forests.

Mr. C. G. Rogers, F.C.H., Deputy Conservator of Forests, 3rd grade, to officiate in the 2nd grade of Deputy Conservators of Forests.

Mr. E. P. Stebbling, Assistant Conservator of Forests, 1st grade, and Officiating Deputy Conservator of Forests, 4th grade, to officiate in the 3rd grade of Deputy Conservators of Forests.

4th December 1900.—No. 3728.—Mr. W. F. Lloyd, Deputy Conservator of Forests, having returned from leave on medical certificate, is posted to the charge of the Sundarbans Forest Division, with effect from the forenoon of the 20th November 1900.

Mr. A. H. Mee, Extra-Assistant Conservator of Forests, on being relieved by Mr. Lloyd, will be attached to that Division till further orders.

5.—N.-W. P. and Oudh Gazette.

23rd November 1900.—No. $\frac{4756}{\text{II}-31c}$.—Pandit Rama Datt, Extra-Assistant Conservator of Forests, attached to the Jaunsar Forest Division of the School Circle, privilege leave for two months, with effect from the 1st December 1900.

29th November 1900.—No. $\frac{4836}{\text{II}-673c}$.—Mr. J. C. Tulloch, Assistant Conservator of Forests, on return from furlough, to the charge of the Jaunsar Forest Division of the School Circle.

29th November 1900.—No. $\frac{4840}{\text{II}-114c}$.—Mr. P. H. Clutterbuck, Deputy Conservator of Forests and Working Plans Officer, Jaunsar Forest Division of the School Circle, to hold charge of that Division in addition to his other duties as a temporary measure.

30th November 1900.—No. $\frac{4861}{\text{II}-835c}$.—Babu Karuna Nidhan Mukerji, Extra-Assistant Conservator of Forests, on return from leave, to be attached to the Kheri Forest Division of the Oudh Circle.

5th December 1900.—No. $\frac{4926}{\text{II}-429c}$.—Babu Raghunath Pathak, Extra-Assistant Conservator of Forests, attached to the Kheri Forest Division of the Oudh Circle, to the charge of the Saharanpur Forest Division of the School Circle.

6.—Punjab Gazette.

Nil.

7.—Central Provinces Gazette.

18th November 1900.—No. 9836.—Mr. R. C. Thompson, Extra-Assistant Conservator of Forests, who was deputed to famine duty in the Saugor district by Order No. 742, dated the 25th January last, was appointed a Charge Officer and posted to the Mandla district.

19*th November* 1900.—No. 149.—Leave on medical certificate for two months, under Article 369 of the Civil Service Regulations, is granted to Ranger Kazim Husain Khan, Permanent Establishment, Mandla Division, with effect from the 1st November 1900.

20*th November* 1900.—No. 153.—Privilege leave for three months, under Article 291 of the Civil Service Regulations, is granted to Ranger Shyam Sundar Lal, Permanent Establishment, Hoshangabad Division, with effect from the 21st December 1900, or such subsequent date as he may be permitted to avail himself of it.

20*th November* 1900.—No. 154.—Privilege leave for one month, under Article 291 of the Civil Service Regulations, is granted to Deputy Ranger Sukhdeo Rai, Permanent Establishment, Nimar Division, with effect from such date as he may be permitted to avail himself of it.

23*rd November* 1900.—No. 4707.—Privilege leave for three months, under Article 291 of the Civil Service Regulations, is granted to Mr. R. C. Thompson, Extra-Assistant Conservator of Forests, Mandla, with effect from the 1st December 1900, or the subsequent date on which he may avail himself of it.

23*rd November* 1900.—No. 156.—Privilege leave for three months, under Article 291 of the Civil Service Regulations, is granted to Deputy Ranger, Moiuddin, Permanent Establishment, Saugor Division, with effect from the 20th October 1900.

24*th November* 1900.—No. 15.—Surmust Khan, Ranger, 5th grade, in charge of East Pench Range, in the Nagpur-Wardha Division, is granted one month's privilege leave with effect from the 1st November 1900.

26*th November* 1900.—No. 10123.—Mr. S. R. Parsons, Extra-Assistant Conservator of Forests, who was appointed a Charge Officer for employment on famine duty in the Nimar district by Order No. 3787, dated the 30th April last, has been allowed to revert to his substantive appointment in the Forest Department, with effect from the 10th November 1900.

28*th November* 1900.—No. 4754.—Consequent on the new appointment of Extra-Assistant Conservator of Forests, 2nd grade, transferred from the Imperial to the Provincial Forest Service in the Central Provinces, *vide* Government of India Order No. 445-F-152—5, dated the 23rd May 1900, in the Revenue and Agriculture Department, the following promotions are ordered with effect from the 23rd May 1900 :—

Mr. R. C. Thompson, Extra-Assistant Conservator of Forests, 3rd grade, to be Extra-Assistant Conservator of Forests, 2nd grade.

Mr. S. R. Parsons, Extra-Assistant Conservator of Forests, 4th grade, to be Extra-Assistant Conservator of Forests, 3rd grade.

Mr. A. Punaswamy Mudaliar, Extra-Assistant Conservator of Forests, 4th grade, sub. *pro tem.*, is confirmed in that grade.

Mr. B. Inamati Sham Rao, Ranger, 1st grade, to be Extra-Assistant Conservator of Forests, 4th grade, sub. *pro tem.*, *vice* Mr. A. Punaswamy Mudaliar, confirmed.

28*th November* 1900.—No. 4757.—Mr. S. R. Parsons, Extra-Assistant Conservator of Forests, 4th grade, sub. *pro tem.*, is confirmed in that grade, with effect from the 6th October 1899.

Order No. 3087, dated the 30th July 1900, is hereby cancelled.

28*th November* 1900.—No. 4758.—Mr. Ganga Parshad Khatri, Forest Ranger, 1st grade, is appointed to be an Extra-Assistant Conservator of Forests, 4th grade, sub. *pro tem.*, with effect from the 6th October 1899, *vice* Mr. S. R. Parsons, confirmed.

Order No. 3088, dated the 30th July 1900, is hereby cancelled.

28*th November* 1900.—No. 4770.—On return from the furlough granted him by Order No. 2187, dated the 5th June last, Mr. C. O. Hanson, Deputy Conservator of Forests, is posted to the charge of the Seoni Forest Division.

28*th November* 1900.—No. 4771.—On being relieved by Mr. C. O. Hanson, Mr. Ganga Parshad Khatri, Extra-Assistant Conservator of Forests, will remain attached to the Seoni Forest Division as Working-Plans Inspector.

8.—Burma Gazette.

19*th November* 1900.—No. 16.—Mr. R. L. Pocock, Extra-Assistant Conservator of Forests, on return from the three months' privilege leave granted him in Revenue Department Notification No. 315 (Forests), dated the 11th August 1900, received charge of the Shwegu Sub-Division from Mr. H. McL. Carson, Forest Ranger, on the forenoon of the 6th November 1900.

19*th November* 1900.—No. 20.—With reference to Revenue Department Notification No. 427, dated the 8th November 1900, Mr. C. L. Toussaint, Deputy Conservator of Forests, relieved Mr. A. Rodger, Assistant Conservator of Forests, of the charge of the Thayetmyo Division on the forenoon of the 12th November 1900.

20*th November* 1900.—No. 22.—With reference to Revenue Department Notification No. 425 (Forests), dated the 8th November 1900, Mr. W. T. T. McHarg, Deputy Conservator of Forests, assumed charge of the Toungoo Division on the forenoon of the 16th November 1900, relieving Mr. G. E. S. Cubitt, Deputy Conservator of Forests.

20*th November* 1900.—No. 738.—Mr. D. A. Allan, Forest Ranger, 3rd grade, supernumerary, to be Forest Ranger, 3rd grade, provisionally substantive. during the deputation to Siam of Mr. J. G. F. Marshall, Extra Deputy Conservator of Forests.

20*th November* 1900.—No. 739.—Maung Po Thin, Forest Ranger, 3rd grade, supernumerary, to be Forest Ranger, 3rd grade, provisionally substantive, during the deputation to the Andamans of Mr. C. W. B. Anderson, Extra-Assistant Conservator of Forests.

20*th November* 1900.—No. 740.—Maung Ba O, Forest Ranger, 3rd grade, supernumerary, to be Forest Ranger, 3rd grade,

provisionally substantive, during the deputation to Siam of Mr. S. A. Wood, Extra-Assistant Conservator of Forests, supernumerary.

21*st November* 1900.—No. 17.—With reference to Revenue Department Notification No. 429 (Forests), dated the 8th November 1900, Mr. H. L. P. Walsh, Assistant Conservator of Forests, assumed charge of his duties in the Upper Chindwin Division on the forenoon of the 14th November 1900.

22*nd November* 1900.—No. 23.—With reference to Revenue Department Notification No. 430 (Forests), dated the 8th November 1900, Mr. R. S. Troup, Officiating Deputy Conservator of Forests, assumed charge of the Shwegyin Division on the forenoon of the 20th November 1900, relieving Mr. A. E. Ross, Officiating Deputy Conservator of Forests.

26*th November* 1900.—No. 24.—With reference to Revenue Department Notification No. 434 (Forests), dated the 8th November 1900, Mr. R. C. A. Pinder, Extra-Assistant Conservator of Forests, was relieved of his duties in Toungoo on the forenoon of the 20th November 1900.

27*th November* 1900.—No. 25.—With reference to Revenue Department Notification No. 428 (Forests), dated the 8th November 1900, Mr. A. Rodger, Assistant Conservator of Forests, reported his arrival at Toungoo on the forenoon of the 17th November 1900.

28*th November* 1900.—No. 464.—Mr. R. C. A. Pinder, Extra-Assistant Conservator of Forests, is posted to the Yaw Division, with headquarters at Pakôkku.

9.—ASSAM GAZETTE.

Nil.

10.—HYDERABAD RESIDENCY GAZETTE.

Nil.

11.—MYSORE GAZETTE.

Nil.

PIONEER PRESS, No. 2045.—26-12-00.—500.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

13th December 1900.—No. 980—229-8-F.—Mr. J. A. McKee, Conservator Forests, is transferred from the Assam Forest Circle to the Northern Forest Circle, Central Provinces.

No. 983—229-9-F.—Mr. C. G. D. Fordyce, Deputy Conservator Forests, Bengal, to officiate as Conservator of Forests, 3rd grade, Assam Forest Circle, from the date he relieves Mr. J. A. McKee, Conservator Forests.

No. 986.—37-17-F.—Mr. B. B. Osmaston, Deputy Conservator Forests, is transferred from the North-Western Provinces and Oudh to Bengal.

2.—Madras Gazette.

No. 518.—*Dated 5th December* 1900.—*Postings.*

No.	Name of Officer.	District.	Nature of charge.	Remarks.
1	Mr. H. F. Arbuthnot	South Malabar.	On special duty in connection with the supply of sleepers.	To join on the expiry of the Christmas holidays handing over charge of the District Forest Office, Madura, to Ranger Saldanha, on the afternoon of the 22nd December 1900.
2	„ H. F. Arbuthnot	Do.	District Forest Officer.	With effect from 1st February 1901.
3	„ F. A. Lodge ...	Salem ...	On special duty under the orders of the Conservator of Forests, Central Circle.	To join on relief by Mr. Arbuthnot.
4	„ E. R. Murray ...	Nellore ...	District Forest Officer.	To join on return from furlough.

No. 519.—*Dated 7th December* 1900.

No.	Name and designation of Officer.	Circle.	Nature of charge.
1	Mr. Marsden, Assistant Conservator of Forests, 2nd grade.	Southern ...	To do duty under the orders of the Conservator of Forests.
2	Mr. Barlow Poole, Assistant Conservator of Forests, 2nd grade.	Northern ...	
3	Mr. Aitchison, Assistant Conservator of Forests, 2nd grade.	Central ...	

PROMOTIONS.

No. 520.—Dated 7th December 1900.

No	Name of Officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. C. D. P. Thornton	Deputy Conservator of Forests, 3rd grade (acting).	Deputy Conservator of Forests, 3rd grade.	Permanent ...	With effect from 25th March 1900, the date of retirement of Mr. E. P. Popert.
2	„ A. B. Jackson ...	Do.	Do.	Do. ...	With effect from 4th May 1900, the date of retirement of Mr. C. G. Douglas.
3	„ E. D. M. Hooper ...	Conservator of Forests, 2nd grade (acting).	Conservator of Forests, 2nd grade.	Do. ...	
4	„ H. A. Gass ...	Conservator of Forests, 3rd grade (acting).	Conservator of Forests, 3rd grade.	Do. ...	
5	„ C. E. Brasier ...	Deputy Conservator of Forests, 1st grade (acting).	Deputy Conservator of Forests, 1st grade.	Do. ...	
6	„ F. A. Lodge ...	Deputy Conservator of Forests, 3rd grade.	Deputy Conservator of Forests, 2nd grade.	Do. ...	
7	M. R. Ry. M. Muttanna Garu, Rai Bahadur.	Extra Deputy Conservator of Forests, 4th grade.	Extra Deputy Conservator of Forests, 3rd grade.	Do. (Supernumerary).	With effect from 27th July 1900, the date of retirement of Mr. J. W. Cherry.
	Mr. R. McIntosh ...	Deputy Conservator of Forests, 3rd grade (acting).	Deputy Conservator of Forests, 3rd grade.	Permanent ...	
8	„ H. F. A. Wood ...	Deputy Conservator of Forests, 4th grade (acting).	Deputy Conservator of Forests, 4th grade.	Do. ...	
9	„ C. B. Dawson ...	Assistant Conservator of Forests, 1st grade (acting).	Assistant Conservator of Forests, 1st grade.	Do. ...	
10	„ J. S. Battie ...	Deputy Conservator of Forests, 3rd grade, and acting in the 2nd grade.	Deputy Conservator of Forests, 2nd grade.	Acting ...	Until Mr. Lodge's return from furlough.

11	„ R. McIntosh ...	Deputy Conservator of Forests, 4th grade.	Deputy Conservator of Forests, 3rd grade.	Do. ...	During the absence of Mr. P. M. Lushington on furlough until the date of Mr. Cherry's departure on special leave.
12	„ F. C. L. Cowley-Brown.	Do.	Do.	Do. ...	From the date of Mr. Douglas's retirement to the date of Mr. Cherry's departure on special leave *vice* Mr. Lodge on furlough, and from that date to the date of Mr. P. M. Lushington's return to duty *vice* Mr. P. M. Lushington on furlough.
13	„ H. A. Latham ...	Do.	Do.	Do. ...	From the date of Mr. Cherry's departure on special leave during the absence of Mr. Lodge on furlough.
	During the absence of Mr. C. D. P. Thornton on special leave from 5th May 1900.				
1	Mr. G. F. F. Foulkes ...	Deputy Conservator of Forests, 4th grade.	Deputy Conservator of Forests, 3rd grade.	Acting ...	.....
2	„ H. F. Arbuthnot ...	Assistant Conservator of Forests, 1st grade.	Deputy Conservator of Forests, 4th grade.	Do. ...	Until the date of Mr. Cherry's departure on special leave.
3	„ J. S. Scot ...	Do.	Do.	Do. ...	From the date of Mr. Cherry's departure on special leave to the date of Mr. Lodge's return to duty.
4	„ C. E. C. Fischer ...	Assistant Conservator of Forests, 1st grade, and Acting Deputy Conservator of Forests, 4th grade.	Do.	Do. ...	From the date of Mr. Lodge's return to duty.
	During the absence of Mr. H. B. Bryant on furlough.				
1	Mr. H. F. Arbuthnot ...	Assistant Conservator of Forests, 1st Grade, and Acting Deputy Conservator of Forests, 4th grade.	Deputy Conservator of Forests, 4th grade.	Acting ...	From the date of Mr. Cherry's retirement.

No. 520.—Dated 7th December 1900—(concld.)

No.	Name of Officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
		During the absence of Mr. E. R. Murray on furlough from 30th June 1900.			
1	Mr. S. Cox ...	Deputy Conservator of Forests, 4th grade.	Deputy Conservator of Forests, 3rd grade.	Acting ...	Until the date of Mr. Lodge's return to duty.
2	,, H. A. Latham ...	Do.	Do.	Do. ...	From the date of Mr. Lodge's return to duty to the date of Mr. P. M. Lushington's return to duty.
3	,, F. C. L. Cowley-Brown.	Do.	Do.	Do. ...	From the date of Mr. P. M. Lushington's return to duty to the date of Mr. C. D. P. Thornton's return to duty.
4	,, G. F. F. Foulkes ...	Do.	Do.	Do. ...	From the date of Mr. Thornton's return to duty.
5	,, J. S. Scot ...	Assistant Conservator of Forests, 1st grade.	Deputy Conservator of Forests, 4th grade.	Do. ...	From the date of Mr. Lodge's return to duty to the date of Mr. Tireman's return from extraordinary leave.
6	,, H. Tireman ...	Do.	Do.	Do. ...	From the date of his return from extraordinary leave.
		During the absence of Mr. P. M. Lushington on furlough.			
1	Mr. C. B. Dawson ...	Assistant Conservator of Forests, 1st grade (acting).	Deputy Conservator of Forests, 4th grade.	Acting ...	From the date of Mr. Tireman's departure on extraordinary leave.

Promotions.—The following promotions are ordered in the Southern Circle with effect from 1st November 1900 :—

Name.	Present grade.	Grade to which promoted.	Nature of promotion.
Mr. A. B. Myers	Ranger, IV. ...	Ranger, III. ...	Sub *pro tem. vice* Mr. J. A. Daly, Ranger, Central Circle, acting in the 2nd grade.
„ F. S. Brito ...	Ranger, VI. ...	Ranger, V. ...	Permanent.
M. P. Govindan...	Deputy Ranger, I.	Ranger, VI. ...	Sub *pro tem.* until further orders.

Promotions.—Rangers V. Kalyanarama Aiyar and L. Hanumanthulu are promoted from 3rd to 2nd grade from 1st November 1900.

3.—Bombay Gazette.

8th December 1900.—No. 2567.—As the services of Mr. C. G. Dalia, Extra-Assistant Conservator of Forests, 3rd grade, for Famine duty in the Panch Mahals, were no longer required from the 1st December 1900, he reported himself for duty to the Divisional Forest Officer, Surat, and received from him the charge of the Sub-Division Forest Office in the forenoon of the 3rd of December 1900.

4.—Bengal Gazette.

The 15th December 1900.—No. 3941.—Mr. J. L. Baker, Assistant Conservator of Forests, 2nd grade, lately appointed by Her Majesty's Secretary of State to the Forest Department of India, is posted to the Singhbhum Forest Division, to which he will be attached.

Calcutta, the 21st December 1900.—No. 1019—152-23F.—The undermentioned officers, who have been appointed by Her Majesty's Secretary of State to the Forest Department of India, are appointed to be Assistant Conservators, Second Grade, with effect from the dates specified opposite their names, and are posted to the provinces noted below :—

* * * * * * *

Mr. J. L. Baker, Bengal, 13th December 1900.

The 24th December 1900.—No. 5239A.—The Report of Central Examination Committee having been received, the result of the half-yearly Departmental Examination of Assistant Magistrates and other officers held on the 12th November 1900, and the two following days, is published for general information :—

III.—The following Forest Officer has passed in the subject mentioned opposite his name :—

1. Mr. E. R. Stevens ... ... Forest Law (with credit).

The 24th December 1900.—No. 4108.—The Government of India having sanctioned the transfer of an appointment of Assistant Conservator of

Forests, 2nd grade, from the Imperial to the Provincial Service, the following promotions are ordered with effect from the 28th May 1900 :—

Mr. E. E. Slane, Extra-Assistant Conservator of Forests, 3rd grade, to the 2nd grade of Extra-Assistant Conservators.

Babu Guru Das Chatterjee, Extra-Assistant Conservator of Forests, 4th grade, to the 3rd grade of Extra-Assistant Conservators.

Mr. P. J. Draper, Forest Ranger, 1st grade, is appointed to the Provincial Forest Service and placed in the 4th grade of Extra-Assistant Conservators of Forests.

F. A. SLACKE,
Secy. to the Govt. of Bengal.

The 24th December 1900.—No. 4109.—Consequent on the resignation of Mr. R. Quinnell, Extra-Assistant Conservator of Forests, 1st grade, with effect from the 24th June 1900, the following promotions are ordered from that date :—

Babu Sreedhur Chakraborty, Extra-Assistant Conservator of Forests 2nd grade, to the 1st grade of Extra-Assistant Conservators.

Mr. J. P. Haslett, Extra-Assistant Conservator of Forest, 3rd grade, to the 2nd grade of Extra-Assistant Conservators.

Mr. R. G. A. Hanna, Extra-Assistant Conservator of Forests, 4th grade, to the 3rd grade of Extra-Assistant Conservators.

Mr. J. P. Gregson, Forest Ranger, is appointed to the Provincial Service, and is placed in the 4th grade of Extra-Assistant Conservator of Forests.

The 24th December 1900.—No. 4110.—Consequent on the retirement from the service of Babu Sreedhur Chakraborty, Extra-Assistant Conservator of Forests, 1st grade, with effect from the 10th August 1900, the following promotions are ordered from that date :—

Mr. A. H. Mee, Extra-Assistant Conservator of Forests, 2nd grade, to the 1st grade of Extra-Assistant Conservators.

Mr. T. I. Pocock, Extra-Assistant Conservator of Forests, 3rd grade, to the 2nd grade of Extra-Assistant Conservators.

Babu Lolit Mohon Sen, Forest Ranger, is appointed to the Provincial Forest Service, and is promoted to the 4th grade of Extra-Assistant Conservator of Forests.

F. A. SLACKE,
Secy. to the Govt. of Bengal.

The 24th December 1900.—No. 4130.—Under Section 71 of the Indian Forest Act (VII. of 1878, as amended by Act V. of 1890), the Officer in charge of the Angul Forest Division is vested with the powers specified in clause (*d*) of the section.

Angul.

C

5.—N.-W. PROVINCES AND OUDH GAZETTE.

29th November 1900.—No. $\frac{4840}{\text{II}-114\text{C}}$.—Mr. P. H. Clutterbuck, Deputy Conservator of Forests and Working Plans Officer, Jaunsar Forest Division of the School Circle, to hold charge of that Division, in addition to his other duties, as a temporary measure.

29th November 1900.—No. $\frac{4836}{\text{II}.-673\text{C}}$.—Mr. J. C. Tulloch, Assistant Conservator of Forests, on return from furlough, to the charge of the Jaunsar Forest Division of the School Circle.

30th November 1900.—No. $\frac{4861}{\text{II}.-835\text{C}}$.—Babu Karuna-Nidhan Mukerjee, Extra-Assistant Conservator of Forests, on return from leave, to be attached to the Kheri Forest Division of the Oudh Circle.

5th December 1900.—No. $\frac{4926}{II-429C.}$—Babu Raghu Nath Pathak, Extra-Assistant Conservator of Forests, attached to the Kheri Forest Division of the Oudh Circle, to the charge of the Saharanpur Forest Division of the School Circle.

6.—PUNJAB GAZETTE.

The 7th December 1900.—No. 597.—*Promotions.*—In consequence of the death of Mr. R. S. DeCourcy, Extra-Assistant Conservator of Forests, His Honor the Lieutenant-Governor is pleased to make the following promotions with effect from 7th October 1900 :—

(1) Lala Devi Ditta, Extra-Assistant Conservator of Forests, 4th grade, Provisional Substantive, to be Probationary Extra-Assistant Conservator of Forests, 4th grade.

(2) Babu Bishan Singh, Forest Ranger, 2nd grade, to be Extra-Assistant Conservator of Forests, 4th grade, Provisional Substantive, on probation.

No. $\frac{601}{A.\ L.\ No.\ 21}$.—*Notification.*— Mr. A. V. Monro, Deputy Conservator of Forests, on return from furlough granted in Punjab Government No. 248, dated 7th May 1899, landed at Bombay on November 16th, forenoon, and reported his arrival at Lahore on November 22nd, afternoon, when he took overcharge of the Direction Division, relieving Mr. A. J. Gibson, Assistant Conservator of Forests, who will remain attached to the Direction Division from the same date.

Dated the 12th December 1900.—*No.* $\frac{619}{A.\ L.\ No.\ 22}$.—*Notification.*—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified against each :—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. R. M. Williamson	Provisional Deputy Conservator, 4th grade.	Deputy Conservator, 4th, and Officiating Deputy Conservator, 3rd grade.	May 1st, 1900.	Consequent on Mr. Pinder's retirement.
Mr. A. St. V. Beechey	Officiating Deputy Conservator, 4th grade.	Provisional Deputy Conservator, 4th grade.	Ditto.	
Mr. H. E. Bartlett ...	Provisional Assistant Conservator, 1st grade.	Assistant Conservator, 1st, and Officiating Deputy Conservator, 4th grade.	Ditto.	
Mr. R. S. Hole ...	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	Ditto.	
Mr. H. E. Bartlett ...	Officiating Deputy Conservator, 4th grade.	Provisional Deputy Conservator, 4th grade.	Ditto.	Consequent on Mr. Bartlett becoming Substantive Assistant Conservator, 1st grade.

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. A. St. V. Beechey	Provisional Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 4th grade.	May 1st, 1900.	
Mr. D. O. Wit ...	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	June 3rd, 1900.	Consequent on Mr. Hanson proceeding on six months' furlough.
Mr. A. J. Gibson ...	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	June 30th, 1900.	Consequent on Mr. Bartlett's departure on six weeks' privilege leave.
Mr. A. J. Gibson ...	Officiating Deputy Conservavor, 4th grade.	Provisional Assistant Conservator, 1st grade.	July 13th, 1900, afternoon.	Consequent on the return of Mr. Bartlett from privilege leave.

Dated 12*th December* 1900.—*No.* $\frac{630}{A.\ L.\ No.\ 23}$.—*Notification.*—Mr. A. D. Blascheck, who has been appointed as Assistant Conservator of Forests of the 2nd grade and posted to the Punjab, reported his arrival at Bombay on the forenoon of 30th November 1900, and at Lahore on the forenoon of 5th December 1900, from which date he has been attached to the Direction Division.

Dated the 18*th December* 1900.—*No.* 653.—*Notification.*—The Hon'ble the Lieutenant-Governor is pleased, under Section 2 of the Indian Forest Act, VII. of 1878, to appoint Lieutenant J. H. Doveton, 16th Bengal Lancers, to be a Forest Officer, and under Section 75 of the same Act, is pleased to appoint the said Lieutenant Doveton to do all acts and exercise all powers that are prescribed by the Act or by rules made under it to be done by a Forest Officer or by any Forest Officer: such powers to be exercised in respect of the rakh known as Saila Baila in the Jhelum District.

7.—Central Provinces Gazette.

Jubbulpore, the 6th December 1900.—No. 166.—The privilege leave for one month, under Article 291 of the Civil Service Regulations, granted to Deputy Ranger Puttulal, Permanent Establishment, Nimar Division, by Departmental Order No. 138, dated the 2nd November 1900, is extended by one month.

No. 168.—The leave on medical certificate for four months and eleven days, under Article 369 of the Civil Service Regulations, granted to Deputy Ranger Imdadali, Permanent Establishment, Betul Division, by Departmental Order No. 120, dated the 2nd October 1900, is extended by three months.

Jubbulpore, the 14*th December* 1900.—No. 170.—With the sanction of the Officiating Chief Commissioner, Mr. R. N. Thompson, Ranger, 3rd grade, Northern Circle, Central Provinces, is permitted to accept the appointment of Extra-Assistant Commissioner, 5th grade, Assam, on probation.

He made over charge of his duties in this Circle on the 5th December in the afternoon.

Nagpur, the 19th December 1900.—No. 5077.—Privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. Sridhar Ganesh Pranjpe, Extra-Assistant Conservator of Forests, with effect from the 15th January 1901, or the subsequent date on which he may avail himself of it.

No. 5078.—Mr. Ganga Parshad Khetri, Extra-Assistant Conservator of Forests, 4th grade, sub *pro tem.*, is appointed to hold charge of the Betul Forest Division during the absence of Mr. Shridhar Ganesh Pranjpe on leave, or until further orders.

8.—Burma Gazette.

Dated the 27th November 1900.—No. 24.—Mr. C. S. Rogers, Extra-Assistant Conservator of Forests,. returned from the three months and 15 days' privilege leave granted to him in Revenue Department Notification No. 276 (Forests), dated the 6th July 1900, and took over charge of the Mogok Sub-Division, of the Ruby Mines Division, on the 19th October 1900, before noon.

Dated the 3rd December 1900.—No. 25.—With reference to Revenue Department Notification No. 464 (Forests), dated the 28th November 1900, Mr. R. C. A. Pinder, Extra-Assistant Conservator of Forests, assumed charge of his duties in the Yaw Division on the afternoon of the 28th November 1900.

The 4th December 1900.—No. 474 (*Forests*).—Mr. Leonard Coleridge Davis, who has been appointed by Her Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, 2nd grade, reported his arrival in Rangoon on the 3rd December 1900, afternoon. Mr. Davis is posted to the head-quarters of the Tharrawaddy Forest Division of the Pegu Circle.

Dated the 4th December 1900.—No. 26.—With reference to Revenue Department Notification No. 426 (Forests), dated the 8th November 1900, Mr. H. Carter, Deputy Conservator of Forests, made over, and Mr. G. E. S. Cubitt, Officiating Deputy Conservator of Forests, received, charge of No. 1 Working Plans Division, Pyinmana, on the afternoon of the 23rd November 1900.

Dated the 4th December 1900.—No. 21.—With reference to Revenue Department Notifications Nos. 755 and 756 (Forests), dated the 29th November 1900, Mr. C. C. Chill, Civil Forest Ranger, relieved Mr. C. A. Clerk, Forest Ranger, of the charge of the Wakèma Range, Bassein-Myaungmya Division, on the forenoon of the 29th November 1900.

5th December 1900.—No. 476 (*Forests*).—The Lieutenant-Governor appoints the Divisional Forest Officer, Yaw Division, to succeed the Sub-Divisional Forest Officer, Gangaw Forest Sub-Division, as the Forest Officer who shall assist the Forest Settlement Officer in the enquiry ordered in this Department Notification No. 347, dated the 6th September 1900, regarding the proposed Peinnè reserve, Pakôkku district.

No. 477 (Forests).—Mr. H. C. Walker, Assistant Conservator of Forests, is placed in charge of the Prome Division, as a temporary measure, *vice* Mr. G. K. Parker, Officiating Deputy Conservator of Forests, transferred.

Dated the 7th December 1900.—No. 18.—With reference to Revenue Department Notification No. 403 (Forests), dated the 29th October 1900, Mr. R. M. Kavanagh, Extra-Assistant Conservator of Forests, made over, and Mr. A. P. Grenfell, Deputy Conservator of Forests, received, charge of the Myittha Division on the forenoon of the 19th November 1900.

Dated the 7th December 1900.—No. 22.—Mr. G. K. Parker, Deputy Conservator of Forests, was relieved of the charge of the Prome Division by Mr. H. C. Walker, Assistant Conservator of Forests, on the afternoon of the 5th December 1900.

Dated the 11th December 1900.—No. 19.—With reference to Revenue Department Notification No. 756 (Forests), dated the 26th November 1900, Mr. C. A. Clerk, Forest Ranger, reported himself for duty in the Mu Division on the forenoon of the 8th December 1900.

Dated the 11th December 1900.—No 482 (*Forests*).—On return from privilege leave, Mr. S. E. F. Jenkins, Extra-Assistant Conservator of Forests, is posted to special duty in the Northern Circle, under the orders of the Conservator of Forests, Northern Circle.

Dated the 13th December 1900.—No. 264.—At the departmental examination held at Rangoon on the 5th and 6th November 1900, Mr. H. C. Walker, Assistant Conservator of Forests, passed in Law according to the standard prescribed for the examination of Forest Officers.

17th December 1900.—No 494 (*Forests*).—Mr. J. Copeland Deputy Conservator of Forests, has been permitted by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

The 18th December 1900.—No. 496 (*Forests*).—Under the provisions of Article 282 (i) and 291 of the Civil Service Regulations, privilege leave for three months and ten days is granted to Mr S. F. L. Cappel, Officiating Deputy Conservator of Forests, with effect from the date on which he may avail himself of it.

Mr. Cappel is permitted to overstay his leave by five days under Article 282 (ii) of the Civil Service Regulations.

No. 497 (*Forests*).—The Lieutenant-Governor appoints Mr. A. Breithaupt, Extra-Assistant Commissioner, to succeed the Adviser to the Hsipaw Sawbwa as Forest Settlement Officer for the purpose of the enquiry ordered in this Department Notification No. 334, dated the 27th August 1900, regarding the proposed Nam Ma, Tonglong-Nam Un, Myèsu Tunpyè, Panghsa and Tawnghkè-Nam Tu reserves in the Hsipaw State, Northern Shan States.

The 19th December 1900.—No. 498 (*Forests*).—The Lieutenant-Governor is pleased to order the following promotions in the Provisional Forest Service with effect from the date of this Notification :—

Mr. W. A Hearsey, Extra-Assistant Conservator of Forests, 2nd grade, to be Extra-Assistant Conservator of Forests, 1st grade.

Mr. D. H. Allan, Extra-Assistant Conservator of Forests, 3rd grade, to be Extra-Assistant Conservator of Forests, 2nd grade.

Mr. R. L. Pocock, Extra-Assistant Conservator of Forests, 4th grade, to be Extra-Assistant Conservator of Forests, 3rd grade.

Mr. D. H. Craddock, Extra-Assistant Conservator of Forests, 4th grade, to be Extra-Assistant Conservator of Forests, 3rd grade.

Mr. C. E. Allen, Extra-Assistant Conservator of Forests, 4th grade, to be Extra-Assistant Conservator of Forests, 3rd grade.

Dated the 19th December 1900.—No. 26.—With reference to Revenue Department Notification No. 435 (Forests), dated the 8th November 1900, Mr G. K. Parker, Officiating Deputy Conservator of Forests, assumed charge of the West Salween Division on the afternoon of the 10th December 1900, relieving Mr. S. F. L. Cappel, Officiating Deputy Conservator of Forests.

No. 27.—With reference to Revenue Department Notification No. 485 (Forests), dated the 12th December 1900, Mr. G K. Parker, Officiating Deputy Conservator of Forests, assumed charge of the Thaungyin Division on the afternoon of the 10th December 1900, relieving Mr. S. F. L. Cappel, Officiating Deputy Conservator of Forests.

9.—ASSAM GAZETTE.

Dated the 20th December 1900.—No. 10885G.—The undermentioned officer has been granted by Her Majesty's Secretary of State for India, extension of leave as advised in list, dated the 23rd November 1900 :—

Name.	Service.	Appointment.	Period and nature of extension.
Mr. J. C. Caroll ..	...	Assistant Conservator of Forests, Assam.	One month's extraordinary leave on medical certificate, without pay.

10—HYDERABAD RESIDENCY GAZETTE.

Nil.

11.—MYSORE GAZETTE.

Nil.

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VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

17*th December* 1900.—No. 1010—242-2-F.—Special leave. on urgent private affairs, for six months, under Article 348 of the Civil Service Regulations, is granted to Mr. S. Eardley-Wilmot, Conservator, Second (Officiating First) Grade, in charge of the Northern Forest Circle, Upper Burma, with effect from the 25th March 1901, or the subsequent date on which he may be permitted to avail himself of it.

21*st December* 1900.—1019—152-23-F.—The undermentioned officers, who have been appointed by Her Majesty's Secretary of State to the Forest Department of India, are appointed to be Assistant Conservators, Second Grade, with effect from the dates specified opposite their names, and are posted to the provinces noted below :—

Mr. A. D. Blascheck, Punjab, 30th November 1900.
Mr. L. C. Davis, Burma, 3rd December 1900.
Mr. J. L. Baker, Bengal, 13th December 1900.

2.—Madras Gazette.

18*th December* 1900.—*Privilege Leave.*—To M.R.Ry. A. N. Venkatachalam, Ranger, Fifth Grade, South Arcot district, for two months, under Article 291 of the Civil Service Regulations, from 9th December 1900.

1*st January* 1901.—*Leave.*—Mr. J P. Nazareth, Ranger, Sixth Grade, North Malabar Division, is granted leave on medical certificate, under Article 369 of the Civil Service Regulations, for two months, from date of relief. Coimbatore, 13th December 1900.

Transfer.—M.R. Ry. A. S. Mariapragasam Pillai, Ranger, Second Grade, now on leave, is transferred from the Nilgiris to Tinnevelly district.

7*th January* 1901.—*Privilege Leave.*—To M.R.Ry. N. Arumuga Mudaliar, Ranger, Third Grade, Nellore district, under Article 291 of the Civil Service Regulations, for 20 days, from 14th January 1901, or from date of relief.

9*th January* 1901.—*Leave.*—M.R.Ry. P. V. Alagiriswamy Naidu, Ranger, Sixth Grade, Trichinopoly district, will be considered to have been on privilege leave under Article 291 of the Civil Service Regulations, for five days, in continuation of the one month's privilege leave granted to him in April last.

11*th January* 1901.—*Transfer.*—M.R. Ry. T. Bapu Row, Extra-Assistant Conservator, Fourth Grade, from the Nellore district, to the South Arcot district. To join on relief by Mr. C. J. Woutersz.

M.R.Ry. A. N. Venkatachellam Chetti, Ranger, Fifth Grade, from the South Arcot district, to the Nellore district, for the Coast Range. To join at the expiration of his leave.

3.—Bombay Gazette.

7*th January* 1901.—No. 86.—Mr. Ganpat Ramji Mane, Extra-Assistant Conservator of Forests, Fourth Grade, is granted privilege leave of absence for three months.

2. His Excellency the Governor in Council is pleased to appoint Mr. Gopal Manjunath Bhatkal to be Extra-Assistant Conservator of Forests, Fourth Grade, *vice* Mr. Harihar Anant Nadkarni, L.C.E., and to act as

Sub-Divisional Forest Officer, N. D. Kánara, during the absence, on leave, of Mr. Ganpat Ramji Mane, or pending further orders.

11*th January* 1901.—No. 2801.—Mr. Vishnu Madhave Tilak, Extra-Assistant Conservator of Forests, Third Grade, having been relieved of his duties as Professor of Forestry, College of Science, Poona, reported himself for duty to the Divisional Forest Officer, Central Thana, and received from him the charge of the Sub-Division Forest Office, Central Thana, on the forenoon of the 9th January 1901.

12*th January* 1901.—No. 3308.—Messrs. C. S. McKenzie, Assistant Conservator of Forests, and A. G. Edie, Acting Deputy Conservator of Forests, respectively, delivered over and received charge of the Sub-Division Forest Office, East Khandesh, on the forenoon of the 2nd January 1901.

4.—Bengal Gazette.

5*th January* 1901.—No. 121.—Mr. J. P. Haslett, Extra-Assistant Conservator of Forests, attached to the Darjeeling Forest Division, is temporarily attached to the Direction Division, for the purpose of valuing forests on tea grants in the Jalpaiguri district, with effect from the 11th December 1900.

Jalpaiguri.

7*th January* 1901.—No. 156 F.—Mr. B. B. Osmaston, Deputy Conservator of Forests (transferred from the North-Western Provinces and Oudh, *vide* Notification No. $\frac{986\ F.}{37\text{-}17}$, dated 13th December 1900, issued by the Government of India, Department Revenue and Agriculture), is posted to the charge of the Chittagong Forest Division, with effect from the 28th December 1900.

The services of Mr. E. P. Stebbing, Deputy Conservator of Forests, Chittagong Division, are placed at the disposal of the Government of India, Revenue and Agricultural Department, with effect from the 28th December 1900, the date on which he made over charge of the Chittagong Division to Mr. B. B. Osmaston.

15*th January* 1901.—No. 317-F.—Consequent on the return to duty, on the forenoon of the 31st October 1900, of Mr. C. G. D. Fordyce, Deputy Conservator of Forests, second and officiating first grade, from the three months' privilege leave granted him in Notification No. 1298T.R., dated the 7th July 1900, the following reversions are ordered with effect from that date :—

Mr. R. L. Heinig, Deputy Conservator of Forests, Third Grade officiating in the first grade of Deputy Conservators, to Officiating Deputy Conservator of Forests, Second Grade.

Mr. C. G. Rogers, F.C.H. Deputy Conservator of Forests Third Grade, officiating in the second grade, to the third grade of Deputy Conservators.

Mr. E. P. Stebbing, Assistant Conservator of Forests, First Grade, officiating in the third grade of Deputy Conservators, to Officiating Deputy Conservators of Forests, Fourth Grade.

15*th January* 1901.—No. 318-F.—With effect from the 1st November 1900, the following promotions are made in consequence of the appointment of Mr. F. B. Manson to be Conservator of Forests :—

Mr. C. G. D. Fordyce, to be Deputy Conservator of Forests, First Grade.

Mr. R. L. Heinig, to be Deputy Conservator of Forests, Second Grade.

15*th January* 1901.—No. 319-F.—In supersession of that portion of Notification No. 367SF., dated the 3rd December 1900, which relates to Messrs. Trafford and Farrington, the following promotions are ordered, with effect from the 28th May 1900 :—

Mr. F. Trafford, Assistant Conservator of Forests, First Grade, and Officiating Deputy Conservator of Forests, Fourth Grade, is confirmed in the latter appointment, and promoted to officiate in the third grade of Deputy Conservators.

Mr. H. A. Farrington, Assistant Conservator of Forests, Second Grade, and officiating in the first grade of Assistant Conservators, is confirmed in the latter grade and promoted to officiate in the fourth grade of Deputy Conservators.

15*th January* 1901.—No. 320-F.—Mr. E. R. Stevens, Assistant Conservator of Forests, of the second grade, is promoted to officiate in the first grade, with effect from the 12th November 1900.

15*th January* 1901.—No. 321-F.—Consequent on the services of Mr. C. G. D. Fordyce, Deputy Conservator of Forests, First Grade, having been placed at the disposal of the Government of India, the following promotions are ordered, with effect from the 15th November 1900 :—

Mr. R. L. Heinig, Deputy Conservator of Forests, Second Grade, to officiate in the first grade of Deputy Conservators.

Mr. C. G. Rogers, F.C.H., Deputy Conservator of Forests, Third Grade, to officiate in the second grade of Deputy Conservators.

Mr. E. P. Stebbing, Assistant Conservator of Forests, First Grade, and Officiating Deputy Conservator, Fourth Grade, to officiate in the third grade of Deputy Conservators.

Mr. E. R. Stevens, Assistant Conservator of Forests, Second Grade, officiating in the first grade, to officiate in the fourth grade of Deputy Conservators.

15*th January* 1901.—No. 322-F.—Consequent on the return of Mr. W. F. Lloyd, Deputy Conservator of Forests, Fourth Grade, on the 20th November 1900, from the leave granted him by Her Majesty's Secretary of State for India, the following changes are made, with effect from that date :—

Mr. W. F. Lloyd is promoted to officiate in the third grade of Deputy Conservators of Forests.

Mr. E. P. Stebbing, Assistant Conservator of Forests, First Grade, and Officiating Deputy Conservator of Forests, Third Grade, to revert to Officiating Deputy Conservator of Forests, Fourth Grade.

Mr. E. R. Stevens, Assistant Conservator of Forests, Second Grade, and officiating in the fourth grade of Deputy Conservators, to revert to Officiating Assistant Conservator of Forests, First Grade.

5.—N.-W. P. and Oudh Gazette.

24*th December* 1900.—No. $\frac{6099}{\text{II.}-835c}$.—Notification No. $\frac{4861}{\text{II.}-835c}$, dated the 30th November 1900, posting Babu Karuna Nidhan Mukerji, Extra-Assistant Conservator of Forests, to the Kheri Forest Division of the Oudh Circle, is hereby cancelled.

24*th December* 1900.—No. $\frac{7000}{\text{II.}-835c}$.—Babu Karuna Nidhan Mukerji, Extra-Assistant Conservator of Forests, in charge of the Saharanpur Forest Division of the School Circle, leave on medical certificate for twelve months, with effect from the 15th December 1900.

4*th January* 1901.—No. $\frac{64}{\text{II.}-720c}$.—Mr. H. G. Billson, Assistant Conservator of Forests, in charge of the Gorakhpur Forest Division, to hold charge of the Gonda Forest Division, in addition to his other duties.

4*th January* 1901.—No. $\frac{57}{\text{II.}-227c}$.—Mr. R. H. B. M. Dobree, Assistant Conservator of Forests, attached to the Ganges Forest Division, to the Gonda Forest Division, in the same capacity.

4*th January* 1901.—No. $\frac{61}{\text{II.}-595c}$.—Mr. F. F. R. Channer, Assistant Conservator of Forests, in charge of the Gonda Forest Division, to the Bahraich Forest Division, in the same capacity.

5th January 1901.—No. $\frac{28}{VII.-455B18}$.—The Hon'ble the Lieutenant-Governor and Chief Commissioner is pleased to declare the undermentioned gentlemen to have passed the Departmental Examination of Junior Officers, held on the 29th October 1900, and following days, in the subjects specified below :—

FOREST OFFICERS.

VERNACULAR.

By the Higher Standard.

Mr. R. H. B. M. Dobree.
Lala Gulab Rai.

FOREST LAW.

Mr. R. H. B. B. Dobree.
Mr. A. Pacheco.
Lala Madho Prasad.

PROCEDURE AND ACCOUNTS.

Mr. R. H. B. M. Dobree.
Mr. E. L Haslett.
Mr. A. Pacheco.
Lala Madho Prasad.

LAND REVENUE SYSTEMS.

Mr. R. H. B. M. Dobree.
Mr. G. O. Coombs.
Mr. A. Pacheco.
Lala Gulab Rai.
Lala Madho Prasad.

6.—PUNJAB GAZETTE.

8th January 1901.—No. 10.—Notification.—Pundit Gokal Das and Mr. Fazl-ud-din, Extra-Assistant Conservators of Forests, respectively, made over and received charge of the Chenab Forest Division on the afternoon of the 12th October 1900, consequent on the former's departure on three months' privilege leave.

Mr. Fazl-ud-din will hold charge of the Chenab Division in addition to the charge of the Lahore Division.

7.—CENTRAL PROVINCES GAZETTE.

22nd December 1900.—No. 174.—Privilege leave for one month and 14 days, under Article 277 of the Civil Service Regulations, is granted to Deputy Ranger Baldeo Singh, of the Permanent Establishment, in the Jubbulpore Forest Division, from the 9th October to the 22nd November 1900, both dates inclusive.

3rd January 1901.—No. 3.—On being relieved of his duties in the Direction Division in the Northern Circle, Mr. A. A. Dunbar-Brander, Assistant Conservator of Forests, Second Grade, is posted temporarily to the Jubbulpore Forest Division, for employment on special duty in connection with the Hurra Enumeration Survey.

8.—BURMA GAZETTE.

16th December 1900.—No. 27.—With reference to Revenue Department Notification No. 431-F., dated the 8th November 1900, Mr. H. Calthrop, Deputy Conservator of Forests, made over, and Mr. A. E. Ross, Officiating Deputy Conservator of Forests, received charge of the Minbu Division, on the forenoon of the 3rd December 1900.

18th December 1900.—No. 23.—With reference to Revenue Department, Notification No 474-F., dated the 14th December 1900, Mr. L. C. Davis, Assistant Conservator of Forests, joined the Tharrawaddy Division on the afternoon of the 9th December 1900.

19th December 1900.—No. 28.—Mr. D A. Allan, Forest Ranger, Third Grade, provisionally substantive, on being relieved of his duties of timber measuring at Toungoo, on the afternoon of the 23rd November 1900, is posted to Ruby Mines Division, where he reported for duty on the forenoon of the 29th November 1900.

22nd December 1900.—No. 28.—With reference to Revenue Department, Notification No. 754-F., dated the 23rd November 1900, Mr. C. H. Hearsey reported himself for duty on first appointment as Forest Ranger, Third Grade, supernumerary, on the afternoon of the 12th November 1900.

27th December 1900.—No. 504-F.—The Lieutenant-Governor appoints Maung Myat Tha Dun, Myook, Second Grade, to succeed the Sub-Divisional Officer, Nyaunglebin, as Forest Settlement Officer for the purpose of the enquiry ordered in this department Notifications Nos. 233, 234 and 235, dated the 12th June 1900, regarding the proposed Inpatle, Okpalin and Pyuntaza fuel reserves in the Pegu district

No. 505-F.—The Lieutenant-Governor appoints Maung Myat Tha Dun, Myook, Second Grade, to succeed the Sub-Divisional Officer, Kyaikto, as Forest Settlement Officer for the purposes of the enquiry ordered in this department Notification No. 184, dated the 25th April 1900, regarding the proposed Bilin fuel and fodder reserve in the Thaton district.

No. 506-F.—The Lieutenant-Governor appoints Maung Mayat Tha Dun, Myook, Second Grade, to succeed the Sub-Divisional Officer, Myanaung, as Forest Settlement Officer for the purpose of the enquiry ordered in this department Notifications Nos. 207 and 208, dated the 14th May 1900, regarding the Yenandaung and Shwethamin reserves in the Henzada districts.

28th December 1900.—No. 507-F.—The Lieutenant-Governor appoints Maung Myat Tha Dun, Myook, Second Grade, to succeed the Sub-Divisional Officer, Myanaung, as Forest Settlement Officer, for the purpose of the enquiries ordered in this department Notifications Nos. 411 and 412, dated the 3rd November 1900, regarding the proposed Myinwadaung extension reserves, Nos. I. and II., in the Henzada district.

No. 508-F.—The Lieutenant-Governor appoints Maung, Myat Tha Dun, Myook, Second Grade, to succeed the Sub-Divisional Officer, Bassein, as Forest Settlement Officer, for the purpose of the enquiry ordered in this department Notification No. 379, dated the 1st October 1900, regarding the proposed Thitpok reserve in the Bassein district.

8th January 1901.—No. 1.—With reference to Revenue Department Notification No. 390, dated the 18th October 1900, Mr. B. P. Kelly, Extra-Assistant Conservator of Forests, received charge of the Kindat Revenue Sub-Division, Upper Chindwin Division, from Mr. H. S. Ker-Edie, Deputy Conservator of Forests, on the afternoon of the 27th October 1900.

9.—ASSAM GAZETTE.

Nil.

10.—HYDERABAD RESIDENCY GAZETTE.—

Nil.

11.—MYSORE GAZETTE.

22nd-24th December 1900.—No. 377—Ft.. F. 1-96—Under Article 171 of the Mysore Service Regulations, Mr. P. E. Benson, Sub-Assistant Conservator of Forests, Kolar district, was granted casual leave of absence for one day, *viz.*, on the 8th December 1900.

PIONEER PRESS—No. 172—23-2-1901—500.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

7th January 1901.—No. 80.—261-3-F.—Privilege leave for three months and fifteen days, under Articles 277, 291 and 282 (*i*) of the Civil Service Regulations, is granted to Mr. C. W. B. Anderson, Extra-Assistant Conservator of Forests, Andamans, with effect from the 17th January 1901, or such subsequent date on which he may be permitted to avail himself of it.

24th January 1901.—No. 139-F.—34-2.—Mr. A. L. Home, Conservator, 1st grade, in charge, Oudh Forest Circle, North-Western Provinces and Oudh, is permitted to retire from the service of Government, with effect from the 1st January 1901.

From the same date the following appointments are made :—

(I) Mr. S. Eardley-Wilmot, Conservator, 2nd (officiating 1st) grade, Burma—to be Conservator, 1st grade.

(II) Mr. A. E. Wild, Conservator, 2nd grade, Bengal—to officiate in the 1st grade.

(III) Mr. C. F. Elliot, Conservator, 3rd (officiating 2nd) grade, Punjab—to be Conservator, 2nd grade.

(IV) Mr. A. Smythies, Conservator, 3rd grade, Central Provinces—to officiate in the 2nd grade.

(V) Mr. E. G. Chester, Deputy Conservator, 1st grade, Bengal (on furlough)—to be Conservator, 3rd grade.

(VI) Mr. A. G Hobart-Hampden, Deputy Conservator, North-Western Provinces and Oudh—to officiate as Conservator, 3rd grade, in charge, Oudh Circle, of which he relieved Mr. Home in the afternoon of the 27th December 1900.

30th January 1901.—No. 156-F.—41-2.—With reference to the Notification of the Government of Bengal, No. 156-F., dated the 7th instant, Mr. E. P. Stebbing, Officiating Deputy Conservator, 4th grade, is placed on special duty, under the Inspector-General of Forests as Forest Entomologist, for a period of two years, with effect from the afternoon of the 4th January 1901.

2.—MADRAS GAZETTE.

18th Jannary 1901.—No. 34.—Mr. H. A. Latham, Acting District Forest Officer, South Canara, is granted privilege leave for three months, under Article 291 of the Civil Service Regulations, with effect from the 1st February 1901.

22nd January 1901.—*No.* 35.—*Appointments.*

No	Name of Officer.	Present grade.	Grade to which appointed.	Nature of appointment.	Remarks showing cause of vacancy, &c.
During the absence of Mr. H. J. A. Porter, on privilege leave, from 24th September 1900.					
1	Mr. J. S. Battle ...	Deputy Conservator of Forests, 3rd grade.	Deputy Conservator of Forests, 2nd grade.	Acting...	...
2	,, S. Cox. ...	Deputy Conservator of Forests 4th grade.	Deputy Conservator of Forests, 3rd grade.	Do.	Until the date of Mr. P. M Lushington's return from furough.

No.	Name of Officer.	Present grade.	Grade to which appointed.	Nature of appointment.	Remarks showing cause of vacancy, &c.
3	Mr. H. A. Latham	Deputy Conservator of Forests, 4th grade, and acting in the 3rd grade.	Deputy Conservator of Forests, 3rd grade.	Acting ..	From the date of Mr. P. M. Lushington's return from furlough to the date of Mr. C. D. P. Thornton's return from special leave.
4	,, F. C. L. Cowley-Brown.	Do.	Do.	Do. ...	From the date of Mr. C. D. P. Thornton's return from special leave.
5	,, C. B. Dawson .	Assistant Conservator of Forests, 1st grade, and Acting Deputy Conservator of Forests, 4th grade	Deputy Conservator of Forests, 4th grade.	Do. ...	From the date of Mr. P. M. Lushington's return from furlough to the date of Mr. H. B. Bryant's return from furlough.
6	,, H. F. Arbuthnot.	Do.	Do.	Do. ...	From the date of Mr. H. B. Bryant's return from furlough.

During the deputation of Mr. R. McIntosh as Instructor at the Imperial Forest School, Dehra Dun, from 1st November 1900.

1	Mr. S. Cox ...	Deputy Conservator of Forests, 4th grade.	Deputy Conservator of Forests, 3rd grade	Acting...	Until the date of Mr. H. B Bryant's return from furlough.
2	,, H. B. Bryant ...	Do.	Do.	Do. ...	From the date of his return from furlough to the date of Mr. E. R Murray's return from furlough.
3	,, G. F. F. Foulkes.	Deputy Conservator of Forests, 4th grade, and acting in the 3rd grade.	Do.	Do. ...	From the date of Mr. E. R. Murray's return from furlough.
4	,, J. S. Scot ...	Assistant Conservator of Forests, 1st grade.	Deputy Conservator of Forests, 4th grade.	Do. ...	Until the date of Mr. C. D. P. Thornton's return from special leave.
5	,, C. E. C. Fischer.	Assistant Conservator of Forests, 1st grade, and Acting Deputy Conservator of Forests, 4th grade.	Do.	Do. ...	From the date of Mr. C. D. P. Thornton's return from special leave to the date of Mr. E. R. Murray's return from furlough.
6	,, H Tireman ...	Do.	Do.	Do. ...	From the date of Mr. E. R. Murray's return from furlough.

19*th January* 1901.—*Transfer*.—M. Srinivasa Iyengar, Forest Ranger, 5th grade, is transferred from Madura district to South Canara district.

20*th January* 1901.—*Leave*.—M.R. Ry. A.P. Singaravelu Mudaliar, Ranger. 5th grade, South Coimbatore Division, is granted privilege leave, under Article 291 of the Civil Service Regulations, for one month, from 11th January 1901.

22*nd January* 1901.—*Transfer*.—The transfer of M.R.Ry. T. Bapu Row, Extra-Assistant Conservator of Forests, from Nellore to South Arcot, notified in Page 32, Part II. of the *Fort St. George Gazette*, dated 15th January 1901, is cancelled. He is transferred to North Arcot.

8th *February* 1901.—No. 61.—Mr. A. B. Jackson, District Forest Officer, South Coimbatore, is granted privilege leave for three months, from or after the 1st March 1901, under Article 291 of the Civil Service Regulations.

9th February 1901.—*Departmental Test.*—The following Subordinates passed the Departmental Test held in January 1901, in the subjects noted against each:—

K. K. Ramasami Iyer, Temporary Deputy Ranger, Kurnool,—Code and Accounts and Act and Rules.

C. Venkatanarayaniah, Forester, Godavari,—Code and Accounts.

N. L. Narasimmam, Forester, Ganjam district,—Code and Accounts.

S. Venugopalachari, Temporary Deputy Ranger, Ganjam district,—Act and Rules.

Departmental Test.—The following Subordinate has passed the Departmental Test in the part noted against him of section 69 of the Forest Code, at the examination held on the 23rd January 1901:—

Name and designation	In parts (*a*) or (*b*).
C. Narayanan, Forester, III	(*b*).

9th February 1901.—*Leave.*—P. Venkatakrishnama Naidu, Ranger, 5th grade, South Canara district, will be considered to have been on privilege leave, under Article 291 of the Civil Service Regulations, for one and-a-half months, from 28th October 1900.

Extension of Leave.—The one month's privilege leave, under Article 291 of the Civil Service Regulations, granted in service order No. 10 of 1901 to Ranger M.R.Ry. A. P Singaravelu Mudaliar, South Coimbatore Division, is extended by one month.

12th February 1901.—*Leave.*—M.R.Ry. C. Subramania Iyer, Ranger, 3rd grade, Nellore district, is granted twenty-five days' privilege leave, under Article 291 of the Civil Service Regulations, from or after 3rd March next.

15th February 1901.—*Leave on private affairs.*—To M.R.Ry. C A. Ramakrishna Aiyar, Ranger, 6th grade, Salem district, under Article 370 of the Civil Service Regulations, for fifteen days, from 7th February 1901.

Extension of Leave.—To M.R. Ry. N. Arumuga Mudaliar, Ranger, 3rd grade, Nellore district, for three days, under Article 291 of the Civil Service Regulations, in continuation of the leave notified in Page 3 of Part II. of the *Fort St. George Gazette*, dated 8th January 1901.

10*th February* 1901.—*No.* 66.—*Postings.*

No.	Name of Officer.	District.	Nature of charge.	Remarks.
1	Mr. F. A. Lodge ...	South Coimbatore.	Acting District Forest Officer.	During the absence of Mr. A. B. Jackson, on privilege leave, or until further orders.
2	„ H. F. Arbuthnot.	South Malabar,	To work under the orders of the District Forest Officer.	Until Mr. Lodge's transfer to South Coimbatore.
3	„ H. F. Arbuthnot.	Do.	District Forest Officer.	On Mr. Lodge's transfer to South Coimbatore.

Note.—The above supersedes so much of Notification No 518, published at Page 1724 of Part I. of the *Fort St. George Gazette*, dated 11th December 1900, as relates to the postings of Messrs. Lodge and Arbuthnot.

16th February 1901.—No. 75.—Mr. W. Carroll, Extra-Assistant Conservator of Forests, North Arcot, is granted leave on medical certificate for

six months, with effect from or after the 1st February 1901, under Article 369 of the Civil Service Regulations.

3.—Bombay Gazette.

18*th January* 1901.—No 6507.—Mr. K. R. Bamanji, Collector of Ratnagiri, handed over, and Mr. G. W. Hatch, Acting Collector, received, charge of the Ratnagiri Forest Division on the afternoon of 12th January 1901.

21*st January* 1901 —No. 6575.—Mr. G. R. Mane, Extra-Assistant Conservator of Forests, handed over charge of the Sub-Divisional Office, N. D. Canara, to Mr. R. S F. Fagan, Divisional Forest Officer, N. D. Canara, and availed himself of the three months' privilege leave sanctioned in Government Notification No. 86 dated 7th January 1901, on the afternoon of the 16th idem.

29*th January* 1901.—No. 563.—Mr. T. B Fry, Conservator of Forests, Southern Circle, is granted furlough for eight months and eight days, from or after 7th March 1901.

30*th January* 1901.—Mr. V. D. P. Rebeiro, Divisional Forest Officer, Panch Mahals, passed an examination in Gujrati according to the Higher Standard on 11th January 1901.

Mr. G. R. Mane, Extra-Assistant Conservator of Forests and Sub-Divisional Forest Officer, N. D. Canara, S. C., passed an examination in Canarese according to the Higher Standard on 11th January 1901.

12*th February* 1901.—No. 965.—His Excellency the Governor in Council is pleased to appoint Mr. W E Copleston to act as Divisional Forest Officer, S. D Canara, in addition to his own duties, *vice* Mr. W. A. Talbot, pending further orders.

4.—Bengal Gazette.

15*th January* 1901.—No. 323-F.—Consequent on the promotion of Mr. F. B. Manson to a Conservatorship of the 3rd grade, the following promotion and reversion are ordered, with effect from the 28th December 1900:—

Mr. B B. Osmaston, F.C.H., Deputy Conservator, 4th grade, lately transferred from the North-Western Provinces and Oudh to Bengal, is promoted to Deputy Conservator of Forests, 3rd grade.

Mr. F. Trafford, officiating in the 3rd grade of Deputy Conservators, to revert to the 4th grade.

21*st January* 1901.—No. 469-F.—Mr. A. H. Mee, Extra-Assistant Conservator of Forests, attached to the Sundarbans Forest Division, is granted privilege leave for twenty-three days, under Articles 277 and 291 of the Civil Service Regulations, with effect from the 24th November 1900.

On return to duty on the afternoon of the 17th December 1900, Mr. Mee is attached to the Chittagong Forest Division.

5.—N.-W. P. and Oudh Gazette.

Nil.

6.—Punjab Gazette.

4*th February* 1901.—No. 38.—*Notification.*—Pandit Gokal Das, Extra-Assistant Conservator of Forests, on return from the three months' privilege leave granted in Punjab Government Notification No. 10, dated 8th January 1901, took over charge of the Chenab Forest Division on the afternoon of the 12th idem, relieving Mr. Fazl-ud-din, Extra-Assistant Conservator of Forests, who will, from that date, remain in charge of the Lahore Forest Division only.

15*th February* 1901.—No. 65.—A.-L. No. 1.—*Notification.*—Mr. A. D. Blascheck, Assistant Conservator of Forests, was transferred from the

Direction Division and attached to the Kangra Forest Division, with effect from the afternoon of the 1st February 1901.

19*th February* 1901 —No. 73.—*Powers.*—In exercise of the powers conferred by clause (1) of section 2 of the Hazara Forest Regulation, 1893, the Hon'ble the Lieutenant-Governor is pleased to invest, and hereby invests, Mr. H. D. Watson, Settlement Officer, Hazara District, with all the powers of a Deputy Commissioner under and for the purposes of that Regulation.

7.—CENTRAL PROVINCES GAZETTE.

18*th January* 1901.—No. 178 —Privilege leave for twenty-one days, under Article 291 of the Civil Service Regulations, was granted to Deputy Ranger Balmukand, Permanent Establishment, Hoshangabad Division, with effect from the 9th to the 29th November 1900, both days inclusive.

21*st January* 1901.—No. 184.—Leave on medical certificate for two months, under Article 369 of the Civil Service Regulations, granted to Ranger Kazim Husain Khan, Permanent Establishment, Mandla Division, by Departmental Order No. 149, dated the 19th November 1900, is extended by one month.

25*th January* 1901.—No. 16.—The following changes will take place in the list of Rangers in the Central Provinces, with effect from the 6th October 1899, consequent on the confirmation of Mr. S. R. Parsons, Extra-Assistant Conservator of Forests, in the 4th grade, and to the promotion of Mr. Ganga Parshad to the 4th grade Extra-Assistant Conservator of Forests, sub *pro tem.* :—

Faiz Baksh, Ranger, 1st grade, sub *pro tem.*, to be Ranger, 1st grade, substantive, *vice* Mr. S. R. Parsons, confirmed as an Extra-Assistant Conservator of Forests, 4th grade.

Amrit Lal Chatterji, Ranger, 2nd grade, to be Ranger, 1st grade, sub *pro tem.*, *vice* Mr. Ganga Parshad, promoted to Extra-Assistant Conservator of Forests, 4th grade, sub *pro tem.*

P. Shankarnath, Ranger, 2nd grade, sub *pro tem.*, to be Ranger, 2nd grade, substantive, *vice* Faiz Baksh, confirmed.

Gaori Shankar, Ranger, 3rd grade, to be Ranger, 2nd grade, sub *pro tem.*, *vice* Amrit Lal Chatterji, promoted.

Mr. W. J. Anthony, Ranger, 3rd grade, sub *pro tem.*, to be Ranger, 3rd grade, substantive, *vice* P. Shankarnath, confirmed.

Vinayak Chimnaji Bhagwat, Ranger, 4th grade, to be Ranger, 3rd grade, sub *pro tem.*, *vice* Gaori Shankar, promoted.

Jairam Raghunath, Ranger 4th grade, sub *pro tem.*, to be Ranger, 4th grade, substantive, *vice* Mr W. J Anthony, confirmed.

Muhammad Sahib, Ranger, 5th grade, to be Ranger, 4th grade, sub *pro tem.*, *vice* Jairam Raghunath, confirmed.

No. 17.—The following changes will take place in the list of Rangers in the Central Provinces, with effect from the 23rd May 1900, in consequence of the confirmation of Mr. A. Punuswamy Mudaliar as Extra-Assistant Conservator of Forests, 4th grade :—

Mr. F. W. Wightman, Ranger, 1st grade, sub *pro tem.*, to be Ranger, 1st grade, substantive, *vice* Mr. A. Punuswamy Mudaliar, confirmed as Extra-Assistant Conservator of Forests, 4th grade.

Dhanjishah Nasarwanji Avasia, Ranger, 2nd grade, to be Ranger, 1st grade, sub *pro tem.*, *vice* Mr. Inamati Shama Rao, appointed to be an Extra-Assistant Conservator of Forests, 4th grade, sub *pro tem.*

Mr. J. D St. Joseph, Ranger, 2nd grade sub *pro tem.* (on three years' extraordinary leave from the 1st February 1898), to be Ranger, 2nd grade, substantive (seconded), *vice* Mr. F. W. Wightman, confirmed.

Mr. F. J. Langhorne, Ranger, 3rd grade, to be Ranger, 2nd grade, sub *pro tem.*, *vice* Dhanjishah, promoted.

Mathura Parshad, Ranger, 3rd grade, sub *pro tem.*, to be Ranger 3rd grade, substantive, *vice* J. D. St. Joseph, confirmed.

Mr. E. A. Rooke, Ranger, 4th grade, to be Ranger, 3rd grade, sub *pro tem.*, *vice* Mr. F. J. Langhorne, promoted.

D. G. Vishwanath, Ranger, 4th grade, sub *pro tem.*, to be Ranger, 4th grade, substantive, *vice* Mathura Parshad, confirmed.

No. 18.—The following promotions among Rangers in the Central Provinces are made to fill up existing vacancies, with effect from the 23rd May 1900 :—

Y. M. Vadikar, Ranger, 4th grade, sub *pro tem.*, to be Ranger, 4th grade, substantive.

Muhammad Sahib, Ranger, 4th grade, sub *pro tem.*, to be Ranger, 4th grade, substantive.

Govind Gangadhar Sapre, Ranger, 5th grade, to be Ranger, 4th grade, sub *pro tem.*, *vice* Muhammad Sahib, confirmed.

No. 19.—Nirmal Chander Chhatterji, Forest Ranger, 3rd grade, transferred to the Seoni Division, is placed in charge of the duties of Working-Plans Inspector in the same Division, with effect from the afternoon of the 5th instant.

No. 20.—Mr. F. W. Wightman, deputed to Famine duty as 5th Famine Assistant to the Deputy Commissioner, Chanda, reverts to his substantive appointment of Forest Ranger in the Chanda Division, with effect from the forenoon of the 16th December 1900.

No. 21.—Muhammad Ismail, whose services were placed at the disposal of the Public Works Department for employment as Officer-in-charge, Famine-relief Works, in the Balaghat district, reverted to his substantive appointment of Ranger in the Balaghat Division, with effect from the 12th October 1900.

30*th January* 1901.—No. 193.—The privilege leave for one month, under Article 291 of the Civil Service Regulations, granted to Deputy Ranger Sukdeo Rai, Permanent Establishment, Nimar Division, by Departmental Order No. 154, dated the 20th November 1900, is cancelled at his own request.

1*st February* 1901.—No. 22.—D. Govind Vishwanath, Forest Ranger 4th grade, sub *pro tem.*, in the Balaghat Division, is granted twenty days' privilege leave, with effect from the 23rd February to the 14th March 1901, inclusive.

4*th February* 1901.—No. 197.—The extraordinary leave without pay for three years, granted to Mr. J. D. St. Joseph, Forest Ranger, in Departmental Order No. 37, dated the 4th February 1898, is extended by three months.

6*th February* 1901.—No. 457.—Privilege leave for twelve days, under Article 291 of the Civil Service Regulations, is granted to Mr. B. Inamati Shama Rao, Extra-Assistant Conservator of Forests, Bilaspur, with effect from the 1st February 1901, or the subsequent date on which he may avail himself of it.

8.—Burma Gazette.

9*th January* 1901.—No. 2.—With reference to Revenue Department Notification No. 482 (Forests), dated the 11th December 1900, Mr. S. E. F. Jenkins, Extra-Assistant Conservator of Forests, reported his arrival on special duty in the Northern Circle on the afternoon of the 21st December 1900.

10*th January* 1901.—No. 7.-F.—Mr. H. Calthrop, Deputy Conservator of Forests, was placed on special duty in Mandalay, from the 9th to the 22nd December 1900.

17*th January* 1901.—No. 1.—With reference to Revenue Department Notification No. 433 (Forests), dated the 8th November 1900, Mr. A. H. M. Lawson, Deputy Conservator of Forests, relieved Mr. H. C. Walker, Assistant Conservator of Forests, of the charge of the Prome Division, on the afternoon of the 23rd December 1900.

15*th January* 1901.—No. 1.—Maung Sein Gale, Forest Ranger, made over, and Mr. D. A. Allan, 3rd grade, Forest Ranger, received, charge of the Mogôk Range, Ruby Mines Division, on the afternoon of the 23rd December 1900.

17*th January* 1901.—No. 15-F.—The following alterations in rank are ordered in the Forest Department :—

(1) With effect from the 11th February 1900, consequent on the departure on privilege leave of Lieutenant-Colonel C. T. Bingham, Conservator of Forests, and the appointment of Mr H. B. Ward to officiate as Conservator :
Mr. H. Jackson,* Deputy Conservator, 3rd (officiating 2nd) grade, to officiate as Deputy Conservator, 1st grade.
Mr. H. N. Thompson, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.
Mr. F. Linnell, Deputy Conservator, 4th grade, substantive provisional, to officiate as Deputy Conservator, 3rd grade.

(2) With effect from the 16th February 1900, consequent on the departure on furlough of Mr. C. W. A. Bruce, Deputy Conservator, 3rd grade, substantive provisional :
Mr. C. B Smales, Deputy Conservator, 4th grade, substantive provisional, to officiate as Deputy Conservator, 3rd grade.

(3) With effect from the 13th March 1900, consequent on the departure on leave on medical certificate of Mr. C. L. Toussaint, Deputy Conservator, 3rd grade :
Mr. A. P. Grenfell, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.
Mr. A. H. M. Lawson, Deputy Conservator, 4th grade, substantive provisional, to officiate as Deputy Conservator, 3rd grade.

(4) With effect from the 8th May 1900, consequent on the return from furlough of Mr. T. A. Hauxwell, Deputy Conservator, 1st grade :
Mr. H. Jackson, Deputy Conservator, 3rd (officiating 1st) grade, to officiate as Deputy Conservator, 2nd grade.
Mr. A. P. Grenfell, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive appointment.
Mr. A. H. M. Lawson, Deputy Conservator, 4th grade, substantive provisional, Officiating Deputy Conservator, 3rd grade, to revert to his substantive appointment.

(5) With effect from the 19th May 1900, consequent on the departure on furlough of Messrs. H. H. Forteath and S. Carr, Deputy Conservators of Forests, 4th grade :
Mr. A. H. M. Lawson, Deputy Conservator, 4th grade, substantive provisional, to officiate as Deputy Conservator, 3rd grade.
Mr. C. W. Doveton, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

(6) With effect from the 2nd June 1900, consequent on the departure on furlough of Mr. G. R. Long, Deputy Conservator, 3rd grade, substantive provisional :
Mr. A. E. Ross, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

(7) With effect from the 5th June 1900, the date on which Messrs. Cappel and Todd, Assistant Conservators, passed the prescribed examinations :

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*Mr. A. F. Gradon is entitled, while on deputation at the Forest School, Dehra Dun, to officiating promotion with Mr. H. Jackson, and will revert with him.

Mr. S. F. L. Cappel, Assistant Conservator, 2nd grade, to officiate as Deputy Conservator, 4th grade.

Mr. F. H. Todd, Assistant Conservator, 2nd grade, to officiate as Deputy Conservator, 4th grade.

(8) With effect from the 11th June 1900, consequent on the departure on furlough of Mr. A. M. Burn-Murdoch, Deputy Conservator, 4th grade.

Mr. G. E. S. Cubitt, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

(9) With effect from the 15th July 1900, consequent on the return from deputation to Siam, and departure on furlough of Mr. W. F. L. Tottenham, Deputy Conservator, 3rd grade :

Mr. C. W. A. Bruce (on leave), Deputy Conservator, 3rd grade, substantive provisional, to revert to his substantive appointment in the 4th grade of Deputy Conservators.

Mr. A. H. M. Lawson, Deputy Conservator, 4th grade, substantive provisional (officiating 3rd grade), to be Assistant Conservator, 1st grade, and to continue to officiate as Deputy Conservator, 3rd grade.

Mr. J. J. Rorie, Assistant Conservator, 1st grade, substantive provisional, Officiating Deputy Conservator, 4th grade, to be Assistant Conservator, 2nd grade, and to continue to officiate at Deputy Conservator, 4th grade.

(10) With effect from the 24th July 1900, consequent on the departure on privilege leave of Mr. H. Jackson, Deputy Conservator, 3rd (officiating 2nd) grade :

Mr. A. P. Grenfell, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. R. S. Troup, Assistant Conservator, 1st grade, substantive provisional (Officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

(11) With effect from the 4th August 1900, consequent on the return from furlough of Mr. F. J. Branthwaite, Deputy Conservator, 3rd grade.

M. F. J. Branthwaite, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. A. P. Grenfell, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive appointment.

Mr. R. S. Troup, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

(12) With effect from the 16th October 1900, consequent on the return from privilege leave of Mr. G. E. S. Cubitt, Assistant Conservator, 1st grade, Officiating Deputy Conservator, 3rd grade :

Mr. G. K. Parker, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

(13) With effect from the 7th November 1900, consequent on the return from leave of Mr. H. Jackson, Deputy Conservator, 3rd grade.

Mr. H. N. Thompson, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive appointment.

Mr. G. E. S. Cubitt, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

(14) With effect from the 12th November 1900, consequent on the return from leave of Mr. C. L. Toussaint, Deputy Conservator, 3rd grade.

Mr. C. L. Toussaint, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. F. J. Branthwaite, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive appointment.

Mr. A. Ross, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

(15) With effect from the 16th November 1900, consequent on the return from leave of Mr. W. T. T. McHarg, Deputy Conservator, 3rd grade.

Mr. C. W. Doveton, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

Items 13 to 20 of this Department Notification No. 352, dated the 6th eptember 1900, are hereby cancelled.

22nd January 1901.—No. 20-F.—Mr. J. Copeland, Deputy Conservator of Forests, has been granted, by Her Majesty's Secretary of State for India, an extension of furlough for six days.

6th February 1901 —No 4.—Under the provisions of Article 291 of the Civil Service Regulations, privilege leave for two months and fifteen days is granted to Mr. F. C. Purkis, Forest Ranger, 3rd grade, attached to the Pyinmana Division, with effect from the 19th January 1901.

9.—Assam Gazette.

21st January 1901.—No. 573-G.—Mr. J. E. Barrett, Deputy Conservator of Forests, on return from leave, is placed in charge of the Garo Hills Forest Division.

21st January 1901.—No. 574-G.—Mr F. H. Cavendish, Assistant Conservator of Forests, in charge of the Garo Hills Forest Division, on being relieved by Mr. J. E Barrett, is deputed on special duty to the Kashi and Jaintia Hills Forest Division.

14th February 1901.—No. 1239-G.—The following is published :

The undermentioned officer has been granted, by Her Majesty's Secretary of State for India, permission to return to duty, as advised in list, dated the 18th January 1901 :—

Name.	Service.	Appointment.	Date on which permitted to return.
Mr. J. C. Carroll.	..	Assistant Conservator of Forests, Assam.	Within period of leave.

15th February 1901.—No. 1278-G.—In supersession of Notification No. 573-G., dated the 21st January 1901, Mr. J. E. Barrett, Deputy Conservator of Forests, on return from leave, is placed in charge of the Kamrup Forest Division.

15th February 1901.—No. 1279-G.—Babu Nilkanta Mukharji, Extra-Assistant Conservator of Forests, in charge of the Kamrup Forest Division, on being relieved by Mr. J. E. Barrett, is placed in charge of the Garo Hills Forest Division.

15th February 1901.—No. 1280-G.—In General Department Notification No. 574-G., dated the 21st January 1901, published at Page 51 of Part I. of the *Assam Gazette* of the 26th idem, *for* the words "on being relieved by Mr. J. E. Barrett" *read* "on being relieved by Babu Nilkanta Mukharji."

10.—Hyderabad Residency Gazette.

Nil.

11.—Mysore Gazette.

No. 445.—*Ft. F.* 64-95, *dated* 18*th January* 1901.—The four days' casual leave of absence granted to Mr. M. Venkatanaranappa, Assistant Conservator of Forests, Mysore district, in Government Notification No. 315—Ft. F. 64-95, dated the 14th November 1900, is hereby extended by one day.

No. 477—*Ft. F.* 62-95, *dated* 29*th January* 1901.—Under Article 171 of the Mysore Service Regulations, Mr. M. G. Rama Row, Assistant Conservator of Forests, Tumkur district, is granted casual leave of absence for five days, with effect from the 22nd January 1901, or such other date as he may avail himself of the same.

No. 483—*Ft. F.* 119-95, *dated* 29*th January* 1901.—Consequent on the retirement, as ordered, of Mr. Muthappa, Assistant Conservator of Forests, 1st grade, and District Forest Officer, Mysore, from the 1st January 1901, the following postings are ordered as a temporary arrangement:—

Mr. M. Venkatanaranappa, Assistant Conservator, to be District Forest Officer, Mysore district.

Mr. H. Sreenivasa Row, Sub-Assistant Conservator, to be in charge of the Heggaddevankote Range.

PIONEER PRESS—No. 251—18-3-1901—525.

Advertisements.

Advertisements.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

5th February 1901.—No. 194-F.—29-6.—The services of Lieutenant-Colonel C. T. Bingham, I.S.C., Conservator of Forests, Burma, are replaced at the disposal of the Military Department, with effect from the 5th March 1901.

18th February 1901.—No. 268-F.—34-5.—Mr. J. H. Lace, Assistant Inspector-General of Forests and Superintendent of Working Plans, is appointed, under article 35 of the Forest Department Code, to officiate in the 3rd grade of Conservators, with effect from the 1st January 1901, but will continue to hold his present post, and be seconded on the list of Conservators, until further orders.

27th February 1901.—No. 306-F.—29-8.—Consequent on the reversion to the Military Department of Lieutenant-Colonel C. T. Bingham, I.S.C., Conservator of Forests, 2nd grade, the following promotions are ordered, with effect from the 5th March 1901 :—

(I) Mr. A. Smythies, Conservator, 3rd (officiating 2nd) grade, Central Provinces, to the 2nd grade.

(II) Mr. F. B. Manson, Conservator, 3rd grade, Burma, to officiate in the 2nd grade.

27th February 1901.—No 309-F.—72-1.—With reference to the notification of this Department No. 443-F, dated the 1st June 1898, Mr A.M.F. Caccia, Deputy Conservator, 4th grade, was retransferred from the list of Forest Officers in the North-Western Provinces and Oudh, to that in the Central Provinces, with effect from the 22nd October 1898, but continued to hold the post of Instructor at the Imperial Forest School, Dehra Dun.

27th February 1901.—No. 170.—Mr A. M. F. Caccia, Instructor at the Imperial Forest School, Dehra Dun, is granted, under Articles 227, 291 and 340 (b) of the Civil Service Regulations, and Home Department Resolution No 224 240, dated the 25th January 1901, three months' privilege leave, in combination with four months' furlough, with effect from the 1st April 1901, or the subsequent date on which he may avail himself of it.

12th March 1901.—No. 352 F.—29-11.—Consequent on Colonel Bingham's retirement from the Forest Department, the following arrangements have been made until further orders :—

(I) Mr. T. A. Hauxwell, Deputy Conservator, 1st grade, to hold charge, as Officiating Conservator, 3rd grade, of the Pegu Forest Circle in Lower Burma, *vice* Mr. A. M. Reuther, Officiating Conservator, 3rd grade, with effect from the afternoon of the 25th February 1901.

(II) Mr. Reuther to hold charge of the Southern Forest Circle in Upper Burma, *vice* Colonel Bingham, with effect from the afternoon of the 4th March 1901.

15th March 1901.—No. 356-F.—56-4.—Mr. R. E Marsden, Assistant Conservator of Forests, 2nd grade, Madras Presidency, is transferred to Burma in the interests of the public service.

2.—Madras Gazette.

27th February 1901.—*Extension of Leave.*—The privilege leave for two months, from 11th January 1901, granted to M. R Ry. A. P. Singaravelu Mudaliar, Ranger, 5th grade, South Coimbatore Division, and notified in pages 130 and 239 of Part II of the *Fort St. George Gazette*, dated 29th January and 19th February 1901, respectively, is further extended by one month.

1st March 1901.—*Departmental Test.*—The following Forest Subordinates have passed the Departmental Test held on the 4th February 1901, in the subjects noted against each :—

Name.	Designation.	Subjects in which passed.
T. Kesavalu Naidu.. ...	Forester, 2nd grade, Nellore ...	Forest Act and Rules.
C. P. Garudachella Mudaliyar,	Do. do. do.	Procedure and Accounts.
T. Parthasarathy Pillai ...	Do. 3rd grade, sub *pro tem.*, Nellore.	Forest Act and Rules.
D. Seshagiri Rao ...	Clerk, District Forest Office, Cuddapah.	Forest Act and Rules and Procedure and Accounts.
M. Hanumantha Rao ...	Do. do.	Do. do.
C. A. Padmanabiah ...	Forester, 2nd grade, sub *pro tem.*, Cuddapah.	Do. do.
K. Rangasayi Naidu ...	Forester, 2nd grade, sub *pro tem.*, North Arcot.	Do. do.
A. Rajoo Mudaliyar ...	Clerk, District Forest Office, North Arcot.	Do. do.
N. Vencatarama Aiyar ...	Do. do.	Forest Act and Rules.
S. V. Dova Dasan ...	Deputy Ranger, 3rd grade, sub *pro tem.*, North Arcot.	Forest Act and Rules and Procedure and Accounts.
M. Ramaswami Chetty ..	Forester, 3rd grade, Salem ...	Forest Act and Rules.

2nd March 1901.—*Extension of Leave*—To Mr. H. W. A. Gaudoin, Ranger, 6th grade, Cuddapah district, for fifteen days, under article 291 of the Civil Service Regulations, in continuation of the two months' leave already granted to him.

5th March 1901.—No. 102—*Posting.*—

No.	Name of officer.	District.	Nature of charge.	Remarks.
1	Mr. F. A. Seager, Extra-Assistant Conservator of Forests, 2nd grade.	Cuddapah ...	...	To join on relief by Mr. Hearsey.

No. 103.—

No.	Name of officer.	District.	Nature of charge.	Remarks.
9	Mr A. W. Lushington.	South Coimbatore.	Acting District Forest Officer.	During the absence of Mr. A. B. Jackson, on privilege leave, or until further orders To hold charge of the division without prejudice to his own duties as District Forest Officer, North Coimbatore.

Note.—This cancels the posting of Mr. F. A. Lodge to South Coimbatore notified at page 195 of Part I. of the *Fort St. George Gazette*, dated 12th February 1901. *For* the words "South Coimbatore" in the remarks column against Mr. Arbuthnot's name in the same notification, *substitute* the words "another district."

2.—Madras Gazette.

7th March 1901.—*Transfers.*—Mr. M. Callanan, Ranger, 2nd grade, from the Cuddapah district to the Nellore district. To join forthwith.

M. R. Ry. C. Rajagopal Naidu, Ranger, 4th grade, from the Nellore district to the North Arcot district. To join on relief by Ranger Mr. M. Callanan.

7th March 1901.—No. 107.—Mr. C. A. Eber Hardie, District Forest Officer, Kistna, is granted privilege leave for three months, under article 291 of the Civil Service Regulations, in continuation of the Easter holidays, subject to the conditions of Article 251 of the Civil Service Regulations.

7th March 1901.—No 109.

No.	Name of officer.	District.	Name of charge.	Remarks.
1	M. R. Ry. T. M. Nallaswami Nayudu Garu.	Kistna ...	Acting District Forest Officer.	During the absence of Mr. C. A. Eber Hardie, on privilege leave, or until further orders.

8th March 1901.—*Leave*—Under article 291, Civil Service Regulations, the Board resolves to grant privilege leave for twenty-eight days, from 7th January to 3rd February 1901, to Mr. H. F. Arbuthnot, Assistant Conservator of Forests, 1st grade.

11th March 1901 —No. 110.—The services of Mr. T. N. Hearsey, Extra-Assistant Conservator of Forests, 2nd grade, are placed at the disposal of the Chief Commissioner of Coorg.

11th March 1901 —*Leave.*—M. R. Ry. V. Reman Menon, Ranger, 5th grade, South Malabar Division, is granted privilege leave, under Article 291 of the Civil Service Regulations, for two months, from or after 1st April 1901.

13th March 1901.—No. 116—E. D. M. Hooper, Esq., Conservator of Forests, Northern Circle, is granted privilege leave for three months under section 291 of the Civil Service Regulations, and in continuation thereof furlough for three months and-a-half under section 340 (*b*).

13th March 1901 —No 117.—Mr. T. P. Peake, District Forest Officer, South Arcot district, is granted privilege leave for three months under section 291 of the Civil Service Regulations and furlough in continuation thereof for six months, under section 340 (*b*), from or after the 14th instant.

18th March 1901.—No 126 —

No.	Name of officer.	Circle or district.	Nature of charge.	Remarks.
1	Mr. C. E. Brasier...	Northern Circle.	Acting Conservator of Forests.	During the absence of Mr. E. D. M. Hooper on leave, or until further orders.
2	F. A. Lodge ...	Salem ...	Acting District Forest Officer.	*Vice* No. 1. To join on being relieved in South Malabar, the period from the date of joining in Salem to the date of taking over charge from Mr. Brasier being treated as special duty.

3.—Bombay Gazette.

12*th March* 1901.—No. 1718.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. Ganesh Sakharam Hingé to be Extra Assistant Conservator of Forests, Central Circle.

Mr. Bajibhai Jadhavbhai Patel, L.C.E., to be Extra-Assistant Conservator of Forests, Sind Circle.

14*th March* 1901.—No 1772 —Mr. J. Dodgson, Assistant Conservator of Forests, 1st grade, has been allowed by His Majesty's Secretary of State for India an extension of furlough on medical certificate for three months.

19*th March* 1901.—No. 1876.—In modification of the orders contained in Government Notification No. 688, dated 6th February 1901, Mr. E. G. Oliver, Deputy Conservator of Forests, 3rd grade, and Divisional Forest Officer, Belgaum, is allowed privilege leave of absence for two months and ten days, in combination with furlough for fifteen months and twenty days, from or after 15th April 1901.

19*th March* 1901.—No. 1877.—In modification of the orders contained in Government Notification No 563, dated 29th January 1901, Mr. T. B. Fry, Conservator of Forests, Southern Circle, is allowed privilege leave of absence for one month and nineteen days, in combination with furlough for eight months and eight days

19*th March* 1901.—No. 1878.—Mr. E. M. Hodgson, Assistant Conservator of Forests, 1st grade, is granted special leave on urgent private affairs for six months, from or after 20th April 1901.

His Excellency the Governor in Council is pleased to appoint Mr. Chunilal Gulabchand Dalia, L.C.E., to act as Divisional Forest Officer, Surat, during the absence of Mr. E. M. Hodgson, or pending further orders.

19*th March* 1901. - No. 1885.—Mr. O. H. L. Napier, Deputy Conservater of Forests, 4th grade, and Divisional Forest Officer, Working Plans, Central Circle, is granted privilege leave for three months in combination with furlough for nine months, from or after 15th March 1901.

4.—Bengal Gazette.

27*th February* 1901.—No. 1149.—Mr. W. M. Green, Deputy Conservator of Forests, in charge Kurseong Division, is granted three months' privilege leave, combined with five months' ordinary furlough, under Article 340 of the Civil Service Regulations, with effect from the 1st March 1901, or from such subsequent date as he may avail himself of it.

Darjeeling. Singhbhum.

Mr. E. E. Slane, Extra Assistant Conservator of Forests, attached to the Singhbhum Division, is transferred to the charge of the Kurseong Division.

27*th February* 1901.—No. 1150.—Mr B. B. Osmaston, F.C.H., Deputy Conservator of Forests, in charge Chittagong Division, is granted three months' privilege leave, combined with five months' ordinary furlough, under Article 340 of the Civil Service Regulations, with effect from the 1st March 1901, or from such subsequent date as he may avail himself of it.

Chittagong.

Mr. A. H. Mee, Extra-Assistant Conservator of Forests, attached to the Chittagong Division, is posted to the charge of that Division.

27*th February* 1901.—No. 1151.—Mr. H. H. Haines, F.F.H., Deputy Conservator of Forests, in charge Singhbhum Division, is granted three months' privilege leave, combined with five months' ordinary furlough, under article 340 of the Civil Service Regulations, with effect from the 10th March 1901, or from such subsequent date as he may avail himself of it.

Singhbhum,

Mr. E. R. Stevens Assistant Conservator of Forests, attached to the Singhbhum Division, is posted to the charge of that Division.

27*th February* 1901.—No. 1152.—Mr. H. D. D. French, Deputy Conservator of Forests, in charge Sonthal Parganas Division, is granted privilege leave for one month and eleven days, combined with six months' ordinary furlough, under Article 340 of the Civil Service Regulations, with effect from the 20th March 1901, or from such subsequent date as he may avail himself of it.

Sonthal Parganas.

12*th March* 1901.—No. 1334.—Mr J. P. Haslett, Extra Assistant Conservator of Forests, is transferred to the charge of the Sonthal Parganas Division, *vice* Mr. H. D. D. French, Deputy Conservator of Forests, granted leave, with effect from the 20th March 1901.

Sonthal Parganas.

16*th March* 1901.—No. 1492.—In supersession of the Government Notification No. 1152-F., dated the 27th February 1901, Mr. H. D. D. French, Deputy Conservator of Forests, in charge of the Sonthal Parganas Division, is granted privilege leave for one month and fifteen days, combined with six months' ordinary furlough, under Article 340 of the Civil Service Regulations, with effect from the 21st March 1901, or from such subsequent date as he may avail himself of it.

5.—North-Western Provinces and Oudh Gazette.

22*nd February* 1901.—No. 694-II,—673 C.—Mr. J. C. Tulloch, Officiating Deputy Conservator of Forests, was attached to the Jaunsar Forest Division of the School Circle, from the 2nd to the 6th January 1901, both days inclusive.

19*th February* 1901.—Erratum No. 621 II.—86A-8.—In Notification No. 292 II—86A-8, dated the 24th January 1901, against entry No. 1 in column No. 4, *substitute* "Mr. W. H. Lovegrove" for "Mr. P. H. Clutterbuck" and against entry No. 2 in column No. 4, *substitute* "Mr. P. H. Clutterbuck" for "Mr. W. H. Lovegrove".

13*th March* 1901.—No. 1073-II.—114-C.—Mr. P. H. Clutterbuck, Deputy Conservator of Forests, and Working-Plans Officer, Jaunsar Forest Division, School Circle, to the charge of the Kheri Forest Division in the Oudh Circle.

6.—Punjab Gazette.

13*th March* 1901.—No. 114 A. L. No. 2.—For the first two entries given in the statement appended to the Notification of the Punjab Government in the Forest Department, No. 456 A. L. No. 23, dated the 10th of November 1899. substitute the following:—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from.	Remarks.
Mr. C. O. Hanson	Officiating Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.	21st October 1899	Consequent on the departure of Mr. A. V. Monro on one year's furlough.

16*th March* 1901.—No. 130 A. L. No. 3.—Mr. J. C. Carroll, Assistant Conservator of Forests, who was transferred from Assam to the Punjab, under Government of India, Department of Revenue and Agriculture Notification No. 251-F.—87-2, dated 2nd March 1900, landed at Bombay on return from extraordinary leave without pay on the forenoon of the 2nd instant, and reported his arrival at the office of the Conservator of Forests, Punjab, Lahore, on the forenoon of the 7th idem, from which date he has been attached to the Direction Division.

18*th March* 1901.—No. 134 A. L. No. 4.—The following changes have taken place in the list of Forest Officers in the Associated Provinces, with effect from the date specified against each.

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from.	Remarks.
Mr. E. A. Down ...	Provisional Deputy Conservator, 1st grade.	Deputy Conservator, 1st grade,	1st October 1900	Consequent on Mr. F. O. Lemarchant's retirement.
Mr. J. H. Lace (on deputation).	Officiating Deputy Conservator, 1st grade.	Provisional Deputy Conservator, 1st grade.	Ditto.	
Mr. L. G. Smith ...	Officiating Deputy Conservator, 1st grade.	Provisional Deputy Conservator, 1st grade.	Ditto.	
Mr. A. L. McIntire	Provisional Deputy Conservator, 2nd grade.	Deputy Conservator, 2nd grade.	Ditto.	
Mr. A. E. Lowrie ..	Officiating Deputy Conservator, 2nd grade.	Provisional Deputy Conservator, 2nd grade.	Ditto.	
Mr. C. Somers Smith.	Provisional Deputy Conservator, 3rd grade.	Deputy Conservator, 3rd grade.	Ditto,	
Mr. A. W. Blunt (on furlough).	Officiating Deputy Conservator, 3rd grade.	Provisional Deputy Conservator, 3rd grade.	Ditto.	
Mr. C. O. Hanson (on furlough).	Provisional Deputy Conservator, 4th grade.	Deputy Conservator, 4th grade.	Ditto.	
Mr. A. St. V. Beechey.	Officiating Deputy Conservator, 4th grade.	Provisional Deputy Conservator, 4th grade,	Ditto.	
Mr. R. S. Hole ...	Provisional Assistant Conservator, 1st grade.	Assistant Conservator, 1st grade, and Officiating Deputy Conservator, 4th grade,	Ditto.	
Mr. A. P. Percival	Assistant Conservator, 2nd grade.	Provisional Assistant Conservator, 1st grade,	23rd October 1900,	Consequent on passing prescribed examinations.
Mr. R. M. Williamson.	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.	8th November 1900.	Consequent on Mr. A. W. Blunt's return from furlough.
Mr. D. O. Witt ...	Officiating Deputy Conservator 4th grade.	Provisional Assistant Conservator, 1st grade.	Ditto.	
Mr. A. M. Long ...	Officiating Deputy Conservator, 3rd Grade.	Deputy Conservator, 4th grade.	23rd November 1900.	Consequent on Mr. A. V. Monro's return from furlough.
Mr. R. S. Hole ...	Officiating Deputy Conservator, 4th grade.	Assistant Conservator, 1st grade.	Ditto.	
Mr. S. L. Kenny (on privilege leave).	Officiating Deputy Conservator, 4th grade.	Assistant Conservator, 1st grade.	11th December 1900.	Consequent on Mr. C. O. Hanson's return from furlough.

18*th March* 1901.—No. 139 A. L. No. 5.—Messrs. A. V. Monro, Deputy Conservator of Forests, and A. J. Gibson, Assistant Conservator of Forests, respectively made over and received charge of the Direction Division and the duties of Personal Assistant to the Conservator of Forests, Punjab, on the afternoon of the 6th March 1901, consequent on the former's transfer to Hazara Division.

7.—Central Provinces Gazette.

12*th February* 1901—No. 208.—Privilege leave for two weeks, under Article 291 of the Civil Service Regulations, is granted to Ranger Chintaman Vishwanath, Permanent Establishment, Narsinghpur Division, with effect from the 21st February 1901, or such subsequent date as he may be permitted to avail himself of it.

16*th February* 1901—No. 723.—Privilege leave for three months, in combination with six months' furlough under Articles 277, 291 and 340 (*b*) of the Civil Service Regulations, and Government of India, Home Department Resolution No. 224-240 of the 25th January 1901, is granted to Mr. G. F. Taylor, Deputy Conservator of Forests, 2nd grade, Nimar, with effect from the 6th March 1901.

16*th February* 1901—No. 724.—Mr. A. St. V. Beechey, Assistant Conservator of Forests, 1st grade, in charge of the Sambalpur Forest Division, is directed to hold charge of the Nimar Forest Division during the absence of Mr. G. F. Taylor on leave or until further orders.

16*th February* 1901—No 725.—Mr. Narayan Parshad Bajpai, Extra-Assistant Conservator of Forests, Raipur Division, is appointed to hold charge of the Sambalpur Forest Division, *vice* Mr. A. St. V. Beechey, transferred to Nimar.

19*th February* 1901—No. 205.—The privilege leave for two months, under Article 291 of the Civil Service Regulations, granted to Paltu Lal, Deputy Ranger, Permanent Establishment, Nimar Division, by Departmental Orders Nos. 138 and 166, dated respectively 2nd November and 6th December 1900, is extended by 28 days.

26*th February* 1901—No. 220.—The leave on medical certificate for two months, under Article 369 of the Civil Service Regulations, granted to Mr. J. F Anthony, Ranger, Permanent Establishment, Mandla Division, by Departmental Order No. 143, dated the 8th November 1900, is extended by six months.

4*th March* 1901—No. 937.—Mr. F. O. Lemarchand, Deputy Conservator of Forests, 1st grade, is permitted to retire from the service, with effect from the 1st October 1900.

4*th March* 1901.—No. 224.—Ilahidad Khan, Officiating Ranger, 6th grade, is confirmed in that grade with effect from the 1st January 1901.

Ilahidad Khan, Ranger, 6th grade, is promoted to Ranger, 5th grade, sub. *pro tem.*, with effect from the 1st January 1901.

4*th March* 1901—No. 225.—Abdul Jalil Siddiqui, Ranger, 5th grade, sub. *pro tem.*, to be Ranger, 5th grade, with effect from the 12th October 1900.

Muhammad Ismail, Ranger, 5th grade, to be Ranger, 5th grade, sub. *pro tem.*, with effect from the 12th October 1900.

Departmental Order No. 13, dated the 18th October 1900, is hereby cancelled.

14*th March* 1901—No. 1102.—Privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. McCrie, Officiating Deputy Conservator of Forests, Nagpur-Wardha Division, with effect from the 4th April 1901, or the subsequent date on which he may avail himself of it.

No. 1103—Mr. A. P. Percival, Assistant Conservator of Forests, Chanda Forest Division, is directed to hold charge of the Nagpur-Wardha Forest Division, during the absence of Mr. McCrie on leave or until further orders.

16*th March* 1901—No. 2611.—Mr. W. G. Slaney, Forest Ranger, Balaghat, is appointed to officiate as an Extra-Assistant Commissioner, and is posted to the Bilaspur District.

18*th March* 1901—No. 239.—Privilege leave for sixteen days, under Article 291 of the Civil Service Regulations, is granted to Ranger Chintaman Vishwanath, Permanent Establishment Narsinghpur Division, with effect from the 22nd February 1901.

Departmental Order No. 208, dated the 12th February 1901, is hereby cancelled.

8.—BURMA GAZETTE.

29*th January* 1901—No. 2.—With reference to Revenue Department Notification No. 432 (Forests), dated the 8th November 1900, Mr. A. H. M. Lawson, Officiating Deputy Conservator of Forests, made over, and Mr. H. Calthrop, Deputy Conservator of Forests, received charge of the Mandalay Depôt Division, on the afternoon of the 20th December 1900.

31*st January* 1901—No. 3—Maung Ba O, Ranger, 3rd grade, has been granted furlough for six months on medical certificate, with effect from the 19th January 1901.

16*th February* 1901—No. 4.—With reference to Revenue Department Notification No. 25 (Forests), dated the 30th January 1901, Mr. J. Messer, Deputy Conservator of Forests, availed himself of the one month and nineteen days' privilege leave granted him in the above notification on the forenoon of the 31st December 1901.

No. 5.—With reference to Revenue Department Notification No. 26 (Forests), dated the 30th January 1901, Mr. E. P. Powell, Extra-Assistant Conservator of Forests, received charge of the Katha Division on the forenoon of the 31st December 1900.

22*nd February* 1901—No. 33.—On return from furlough Mr. J. Copeland, Deputy Conservator of Forests, is posted to the charge of the Tharrawaddy Forest Division.

25*th February* 1901—No. 2.—With reference to Revenue Department Notification No. 33 (Forests), dated the 22nd February 1901, Mr. J. Copeland, Deputy Conservator of Forests, assumed charge of the Tharrawaddy Division on the afternoon of the 23rd February 1901, relieving Mr. T. A. Hauxwell, Deputy Conservator of Forests.

25*th February* 1901—No. 6.—Mr. J. Messer, Deputy Conservator of Forests, on his return from privilege leave granted him in Revenue Department Notification No. 25 (Forests), dated the 30th January 1901, received charge of the Katha Division from Mr. E B. Powell, Extra-Assistant Conservator of Forests, in the afternoon of the 20th February 1901.

27*th February* 1901—No. 37.—Mr. F. J. Branthwaite, Deputy Conservator of Forests, was placed on special duty at Rangoon from the 4th to the 11th August 1900, both days inclusive.

28*th February* 1901—No. 46.—Under the provisions of Articles 291 and 340 of the Civil Service Regulations, and Government of India's Home Department Resolution No. 224-240, dated the 25th January 1901, privilege leave for one month and 19 days, combined with furlough for four months and 11 days, on medical certificate, is granted to Mr. A. E Ross, Assistant Conservator of Forests, with effect from the 28th February 1901.

7*th March* 1901—No. 5.—Mr. A. E. Ross, Deputy Conservator of Forests, was relieved of the charge of the Minbu Division on the afternoon of the 23rd February 1901, by Mr. S. Jenkins, Extra-Assistant Conservator of Forests.

9*th March* 1901—No. 55.—Under the provisions of Articles 277 and 291 of the Civil Service Regulations, privilege leave for two months and 11 days is granted to Mr. R. M. Kavanagh, Extra-Assistant Conservator of Forests, with effect from the 5th February 1901.

Mr. Kavanagh is permitted to overstay his leave by 15 days, under Article 282 (ii) of the Civil Service Regulations.

9.—Assam Gazette.

8th March 1901.—No. 1867G.—With effect from the 6th February 1901, in consequence of the return from furlough of Mr. J. E. Barrett, Deputy Conservator of Forests, 3rd grade, *provisionally substantive*,—

Mr. W. F. Perrée, Officiating Deputy Conservator of Forests, 3rd grade, reverts to his substantive appointment of Deputy Conservator of Forests, 4th grade.

10.—Hyderabad Residency Gazette.

2nd March 1901—No. 59.—Mr. S. L. Kenny, Officiating Deputy Conservator of Forests, in charge of the Kohana Sub-Division in the Ellichpur Forest Division, has been granted privilege leave for three months, with effect from the 7th December 1900.

11.—Mysore Gazette.

27th February 1901—No. 559—*Ft. F.* 27-95.—The following promotions of Assistant Conservators are ordered, with effect from the 1st January 1901 :—

Mr. G. E. Ricketts, seconded for foreign service in the Jeypore Samsthánam, to be Assistant Conservator, 1st Class.

Mr. B. Hira Singh, B.A., to be Assistant Conservator, 1st Class, sub. *pro tem.*, *vice* Mr. Ricketts, seconded.

Mr. M. G. Rama Rao, B.A., to be Assistant Conservator, 2nd Class, acting.

27th February 1901—No. 562—*Ft. F.* 7-96.—The five days' casual leave of absence granted in Notification No. 279—Ft. F. 7-96, dated the 3rd November 1900, to Mr. J. J. Monteiro, Assistant Conservator of Forests, sub. *pro tem.*, Shimoga district, was not taken, and the leave is hereby cancelled.

28th February 1901—No. 566—*Ft. F.* 1-96.—Under Article 171 of the Mysore Service Regulations, Mr. P. E. Benson, Sub-Assistant Conservator of Forests, Kolar district, is granted casual leave of absence for two days, with effect from the 28th February 1901.

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VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

20th March 1901.—No. 379-F.—29-12—Mr. A. M. Reuther, Officiating Conservator of Forests, 3rd grade, Burma, is confirmed in that grade with effect from the 5th March 1901.

22nd March 1901.—No. 386-F.—79-6.—Mr. C. Bagshawe, Conservator of Forests, 1st grade, Berar, is granted special leave for four months, under Article 348, Civil Service Regulations, with effect from the 1st April 1901, or the subsequent date on which he may avail himself of it.

12th April. 1901.—No. 418—242-5-F.—In supersession of Notification No. 1010-F, dated the 17th December 1900, Mr. S. Eardley-Wilmot, Conservator, 1st grade, in charge of the Northern Forest Circle, Upper Burma, is granted, under the provisions of Articles 264-A, 291 and 348 of the Civil Service Regulations, privilege leave for forty days combined with special leave on urgent private affairs for four months and twenty days, with effect from the 1st April 1901.

19th April 1901.—No. 458—57-22-F.—Mr. C. H. Haldane, Extra-Assistant Conservator of Forests, 2nd grade, is transferred from Berar to Burma in the interests of the public service.

2.—Madras Gazette.

8th March 1901.—No. 142.—The services of Mr. R. E. Marsden, Assistant Conservator of Forests, 2nd grade, are placed at the disposal of the Government of India, Revenue and Agricultural Department, for permanent employment in Burma.

Leave.—Ranger G. W. Thompson is granted privilege leave for three months on medical certificate from date of relief.

22nd March 1901.—No. 137.—M. R. Ry. V. A. Parthasaradhi Mudaliar Avargal, Forest Assistant, Office of the Board of Revenue, Land Revenue, who, in Notification No. 574, dated 14th December 1898, published at page 1254 of Part I of the *Fort St. George Gazette*, dated 20th December 1898, was appointed an Extra-Assistant Conservator of Forests, 2nd grade, will be considered to have been appointed to the 4th grade on 1st July 1898, and to have been promoted to the 3rd and 2nd grades on the 1st July 1898 and 21st July 1900, respectively.

23rd March 1901.—No. 136.—In modification of Notification No. 75, dated 16th February 1901, published at page 234 of Part I of the *Fort St. George Gazette*, dated 19th February 1901, Mr. Carroll is granted privilege leave for one month and fifteen days from 1st February 1901 and leave on medical certificate for six months under section 369 of the Civil Service Regulations in continuation thereof.

23rd March 1901. *Cancellation of Leave.*—The two months' privilege leave granted to Forest Ranger V. Raman Menon, South Malabar Division, in this Office Service Order No. 36 of 1901, and published in page 417 of the *Fort St. George Gazette*, dated 19th March 1901, Part II, is hereby cancelled.

16th April 1901.—To M. R. Ry. V. C. Doraiswami Pillai, Ranger, 5th grade, South Arcot district, under section 291 of the Civil Service Regulations, for two months from or after 1st April 1901.

3.—Bombay Gazette.

20th March 1901.—No. 7764.—Mr. N. D. Satarawala, Extra-Assistant Conservator of Forests, Working Plans, S. C., availed himself of the privi-

lege leave granted to him in Government Notification No. 1564, dated 5th March 1901, from the 11th idem (afternoon).

24th March 1901.—No. 7909.—Messrs. W. A. Talbot and W. E. Coplestone, Deputy Conservators of Forests, respectively delivered over and received charge of the Southern Division of Kanara in the afternoon of 7th March 1901.

25th March 1901.—No. 2053.—His Excellency the Governor in Council is pleased to appoint Mr. C. S. McKenzie to hold charge of the office of the Divisional Forest Officer, Working Plans, Central Circle, in addition to his own duties, from the date of Mr O. H. L. Napier's departure on leave until relieved by Mr. R. C. Wroughton.

1st April 1901.—No. 7.—Messrs. L. H. Napier, Deputy Conservator of Forests, and C. S. McKenzie, Assistant Conservator of Forests, respectively delivered over and received charge of the Division Forest Office, Working Plans, C. C., on the 21st March 1901, in the afternoon.

2nd April 1901.—No. 29.—Mr. M. B. Merchant, acting Extra-Assistant Conservator, 4th grade, delivered over, and Mr. D. M. Bijur, Extra-Assistant Conservator, 2nd grade, received charge of the office of Sub-Division Forest Officer, North Thana, on the 17th February 1901, in the forenoon.

2nd April 1901.—No. 2238—Mr. D. A. Thomson, Deputy Conservator of Forests, 4th grade, is granted privilege leave of absence for one month and thirteen days in combination with special leave on urgent private affairs for four months and seventeen days, from or after 3rd April 1901.

2nd April 1901.—No. 2239.—His Excellency the Governor in Council is pleased to appoint Mr. R. S. Fagan, Divisional Forest Officer, N. D., Kanara, to hold charge of the Belgaum Division, in addition to his own duties, *vice* Mr. E. G. Oliver, proceeding on leave, pending further orders.

10th April 1901.—Mr. C. S. McKenzie, acting Professor of Forestry, College of Science, Poona, passed an examination in Marathi according to the Lower Standard on the 25th March 1901.

16th April 1901.—No. 2485.—His Excellency the Governor in Council is pleased to appoint Mr. Govind Ramchandra Takle to act as Divisional Forest Officer, Kolaba, during the absence of Mr. D. A. Thomson on leave or pending further orders.

4.—Bengal Gazette.

1st April 1901.—No. 1818.—With effect from the 1st January 1901 the following promotions are made in consequence of the appointment of Mr. E. G. Chester to be Conservator of Forests:—

Kurseong.	Mr. W. M. Green to be Deputy Conservator of Forests, 1st grade.
Dumka.	Mr. H. D. D. French to be Deputy Conservator of Forests, 2nd grade.
Singhbhum.	Mr. H. H. Haines, F.C.H., to be Deputy Conservator of Forests, 3rd grade.
Simla.	Mr. E. P. Stebbing to be Deputy Conservator of Forests, 4th grade (on deputation).

5.—N. W.-P. and Oudh Gazette.

19th April 1901.—No. $\frac{1683}{11-116\ C.}$.—Mr. W. Shakespear, Deputy Conservator of Forests, Pilibhit Division, Oudh Forest Circle, is granted furlough

combined with such privilege leave as may be due to him, for a total period of seven months and seven days, with effect from the 16th April 1901.

19th April 1901.—No. $\frac{168}{\text{II—116 C.}}$.—Pandit Sadanand Gairola, Extra-Assistant Conservator of Forests and Working Plans Officer, Direction Division, Oudh Forest Circle, to the charge of the Pilibhit Division of the same Circle, *vice* Mr. W. Shakespear, granted leave.

6.—PUNJAB GAZETTE.

25th March 1901.—*No.* $\frac{156}{\text{A. L. No. 6}}$.—Messrs. H. A. Hoghton and A. V. Monro, Deputy Conservators of Forests, respectively made over and received charge of the Hazára Division, on the afternoon of the 9th March 1901, consequent on the former's departure on privilege leave for two months and ten days and furlough for one year.

25th March 1901.—*No.* $\frac{160}{\text{A. L. No. 7}}$.—The following charges have taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified against each:—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from.	Remarks.
Mr. A. M. F. Caccia	Deputy Conservator, 4th Grade.	Officiating Deputy Conservator, 3rd Grade.	24th May 1898.	Consequent on Mr. Hick's retirement.
	Officiating Deputy Conservator, 3rd Grade.	Deputy Conservator, 4th Grade.	25th July 1898.	Consequent on Mr. A. W. Blunt's return from privilege leave.
	Deputy Conservator, 4th Grade.	Officiating Deputy Conservator, 3rd Grade.	15th November 1898.	Consequent on Mr. H. A. Hoghton's departure on privilege leave.
	Officiating Deputy Conservator, 3rd Grade.	Deputy Conservator, 4th Grade.	30th December 1898.	Consequent on Mr. C. P. Fisher's return from furlough.
	Deputy Conservator, 4th Grade.	Officiating Deputy Conservator, 3rd Grade.	27th August 1899.	Consequent on Mr. A. L. McIntire's departure on privilege leave.
	Officiating Deputy Conservator, 3rd Grade.	Deputy Conservator, 4th Grade.	8th December 1899.	Consequent on Mr. L. G. Smith's return from medical leave.
	Deputy Conservator, 4th Grade.	Officiating Deputy Conservator, 3rd Grade, to date.	22nd February 1900.	Consequent on Mr. J. H. Lace's appointment as Assistant Inspector-General of Forests.

27th March 1901.—*No.* 165.—*Notification.*—Under the provisions of Section 2 of the Indian Forest Act (Act VII of 1878), His Honor the Lieutenant-Governor is pleased to appoint all zaildárs, inámdárs, lambardárs and village watchmen of the Punjab, Lohára and Dharni Tappás, in the Hoshiárpur District, to be Forest Officers within the meaning and for the purposes of Section 64 and Section 78 of the said Act.

6.—Punjab Gazette.

6th April 1901.—No 194.—The following Forest Officer has passed in the subjects mentioned below as the result of an examination held in the office of Conservator of Forests, Punjab, Lahore, on the 3rd and 4th January 1901 :—

Name.	Grade.	Subjects.
Thakur Das ...	Extra-Assistant Conservator of Forests, 4th grade, on probation.	Procedure and Accounts, Forest Law, Land Revenue.

8th April 1901.—No. 197.—*A. L. No.* 8.—Messrs. A. J. Gibson and J. C. Carroll, Assistant Conservators of Forests, respectively made over and received charge of the Direction Division and the duties of Personal Assistant to the Conservator of Forests, Punjab, on the forenoon of the 26th March 1901, consequent on the former's transfer to the Rawalpindi Division.

13th April 1901.—No. $\frac{209}{A\ L.\ No.\ 9}$,—Mr. B. O. Coventry, Deputy Conservator of Forests, and Mr. A. J. Gibson, Assistant Conservator of Forests, respectively made over and received charge of the Rawalpindi Forest Division on the afternoon of 30th March 1901, consequent on the transfer of the former on deputation to officiate as Instructor at the Imperial Forest School.

7.—Central Provinces Gazette.

22nd March 1901.—No. 240.—Leave on medical certificate for two months, under Article 369 of the Civil Service Regulations, is granted to Deputy Ranger Baldeo Singh, Permanent Establishment, Jubbulpore Division, with effect from the 14th February 1901.

27th March 1901.—No. 1354.—Privilege leave for fifteen days, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. A. Ponnaswamy Mudaliar, Extra-Assistant Conservator of Forests, with effect from the 1st April 1901, or the subsequent date on which he may be permitted to avail himself of it.

27th March 1901.—No. 1356.—Mr. F. S. Barker, Deputy Conservator of Forests, has been granted, by His Majesty's Secretary of State for India, three months' extraordinary leave without pay in extension of the extraordinary leave granted him by this Administration's Order No 1229, dated the 21st March 1900.

27th March 1901.—No. 1357.—Under Section 67 of the Indian Forest Act, 1878, the Officiating Chief Commissioner is pleased to invest Ranger Vinayak Chimnaji Bhagwat with the powers described in that section, for such time as he may remain in the 3rd or higher grade of Rangers.

6th April 1901.—No. 1.—K. Rama Rao, Forest Ranger, reduced for one year by the orders of the Hon'ble the Chief Commissioner from the 3rd to the 4th grade is now restored to his place in the 3rd grade of Rangers on Rs.100 per mensem with effect from the 1st April 1901.

6*th April* 1901.—No. 4.—Azam Khan, Deputy Ranger of the Mandla Forest Division, who was placed under suspension since the 1st July 1900, is reinstated in his post with effect from the 1st April 1901.

6*th April* 1901.—No. 5.—Leave without pay for three months and five days, under Article 372 of the Civil Service Regulations, is granted to Manna Tiwari, Deputy Ranger, Permanent Establishment, Mandla Division, with effect from the 27th December 1900.

8*th April* 1901.—No. 7.—The following changes amongst Rangers are ordered with immediate effect :—

Mr. Muhammad Sahib, from Burhanpore Range to Piplod Range, Nimar Division.

Mr. Phirozsha Katpitia, Working Plans Inspector, to Burhanpore Range, Nimar Division.

Mr. Vinayak Chimnaji Bhagwat, from Panasa Range, as Working Plans Inspector, Nimar.

Mr. Bapurao from Mandla Division to Panasa Range, Nimar Division.

Mr. Dhondu Narayan, from Rajaborari Range to Bori Range, Hoshangabad Division.

Mr. Shiam Sunder Lall, attached to the Hoshangabad Division, to Rajaborari Range, Hoshangabad Division.

Mr. Abdul Jalil Siddiqi, from Bori Range, Hoshangabad Division, to the Betul Forest Division.

10*th April* 1901.—No. 8.—Under the authority conferred by Section 31, clause (1), of the Forest Department Code, 5th Edition, Mr. T. Kandaswamy Pillay, Stipendiary Student, who was deputed to the Imperial Forest School, Debra Dun, under Rule 12 (VIII) of the Admission Rules, in March 1899 and who has duly obtained the Higher Standard Certificate of the school, is appointed on probation as a Ranger of the 6th grade, with effect from the 1st April 1901, and is posted to the Mandla Forest Division.

8.—Burma Gazette.

12*th March* 1901.—No. 352 F.-29-11.—Consequent on Colonel Bingham's retirement from the Forest Department, the following arrangements have been made until further orders :—

(i) Mr. T. Hauxwell, Deputy Conservator, 1st grade, to hold charge as Officiating Conservator, 3rd grade, of the Pegu Forest Circle in Lower Burma, *vice* Mr. A. M. Reuther, Officiating Conservator, 3rd grade, with effect from the afternoon of the 25th February 1901.

(ii) Mr. Reuther to hold charge of the Southern Forest Circle in Upper Burma, *vice* Colonel Bingham, with effect from the afternoon of the 4th March 1901.

13*th March* 1901.—No 7.—Mr. R. M. Kavanagh, Extra-Assistant Conservator of Forests, relinquished charge of his duties in the Myitha Division on the afternoon of the 4th February 1901, and proceeded on two months and thirteen days' privilege leave.

15*th March* 1901.—No. 356-F.—56-4.—Mr. R.E. Marsden, Assistant Conservator of Forests, 2nd grade, Madras Presidency, is transferred to Burma in the interests of the public service.

19*th March* 1901.—No. 61.—The following transfers are ordered in the Forest Department :—

Mr. A. Weston, Deputy Conservator of Forests, from Moulmein to the charge of the Northern Circle, Upper Burma.

Mr. R S. Troup, Deputy Conservator of Forests, from Shwegyin to the charge of the Ataran Forest Division.

Mr. F. H. Todd, Assistant Conservator of Forests, from Yamethin to the charge of the Shwegyin Forest Division.

21*st March* 1901.—No. 63.—Privilege leave for two days is granted to Mr. J. Messer, Deputy Conservator of Forests, in extension of the leave

granted to him in this Department Notification No. 25 (Forests), dated the 30th January 1901.

22*nd March* 1901.—No. 75.—Under the provisions of Article 291 of the Civil Service Regulations privilege for one month is granted to Mr. A. M. Lawson, Deputy Conservator of Forests, with effect from the 15th March 1901, or such subsequent date on which he may avail himself of it.

22*nd March* 1901.—No. 76.—Mr. C. L. Toussaint, Deputy Conservator of Forests, is appointed to hold charge of the Prome Forest Division, in addition to his other duties, pending the return from leave of Mr. Lawson, or until further orders.

27*th March* 1901.—No. 83.—The privilege leave for three months and fifteen days granted to Mr S. F. L. Cappel, Assistant Conservator of Forests, in this Department Notification No. 496, dated the 18th December 1900, has been commuted by His Majesty's Secretary of State for India into nine and a half months' leave on medical certificate.

27*th March* 1901.—No 3.—With reference to Revenue Department Notification No. 75 (Forests), dated the 22nd March 1901, Mr. C. L. Toussaint, Deputy Conservator of Forests, assumed charge of the Prome Division on the afternoon of the 16th March 1901, relieving Mr. A. H. M. Lawson, Deputy Conservator of Forests.

4*th April* 1901.—No. 4.—Mr. L. Swarries, Ranger, 1st grade, has been granted six months' leave on medical certificate, with effect from the 1st April 1901.

No. 5.—Maung Aung Ban, Ranger, 3rd grade, has been granted an extension of six months' leave on medical certificate, with effect from the 8th April 1901.

9*th April* 1901.—No. 90.—Mr. R. C. A. Pinder, Extra-Assistant Conservator of Forests, is transferred from the Yaw Forest Division to the charge the Shweli Subdivision, Ruby Mines Forest Division, with headquarters at Möng Mit.

11*th April* 1901.—No. 1.—With reference to Revenue Department Notification No. 61 (Forests), dated the 19th March 1901, Mr J. Murray, Deputy Conservator of Forests, assumed charge of the Ataran Division on the afternoon of the 25th March 1901, relieving Mr. A. Weston, Deputy Conservator of Forests.

9.—Assam Gazette.

4*th April* 1901.—No. 2501G.—The following Notification by the Inspector General of Forests is re-published :—

No. 274, *dated Calcutta, the* 21*st March* 1901.—Babu Upendra Nath Kanji Lal, Vernacular Instructor at the Imperial Forest School, Dehra Dun, is granted, under Articles 277 and 291 of the Civil Service Regulations, privilege leave for three weeks, with effect from the 15th April 1901, or the subsequent date on which he may be permitted to avail himself of it

28*th March* 1901.—No. 2334G.—Mr. A. R Dicks, Deputy Conservator of Forests, was attached to the Sibsagar Forest Division from the 7th to the 8th November 1900, inclusive.

10.—Hyderabad Residency Gazette.

2*nd April* 1901.—No. 88.—Mr. C. Haldane, an Extra-Assistant Conservator of Forests in the Hyderabad Assigned Districts, is granted privilege leave for three months, with effect from the 5th April 1901, or from any subsequent date on which he may avail himself of it.

Mr. Haldane should, on the expiry of his leave, proceed to Rangoon and report himself to the Government of Burma.

4*th April* 1901.—No. 94.—Mr. B. Bhukan, Extra-Assistant Conservator of Forests, in charge of the Buldana Forest Division, having been granted furlough for nine months, under Article 371 (*b*) of the Civil Service Regulations, with effect from the 18th March 1901, Mr. Pandurang Narayen,

Forest Ranger, 1st grade, has been placed temporarily in charge of the Buldana Forest Division, with effect from the same date.

11.—MYSORE GAZETTE.

8*th April* 1901.—No. 631—Ft. F. 1-96.—Under Article 188 of the Mysore Service Regulations, Mr. P. E. Benson, Sub-Assistant Conservator of Forests, Kolar district, is granted privilege leave of absence for three months, with effect from the 3rd May 1901 or such other date as he may avail himself of the same.

11*th April* 1901 — No. 635—Ft. F. 6295.—The five days' casual leave of absence granted in Notification No. 477—Ft. F 62-95, dated the 29th January 1901, to Mr. M. G. Rama Row, Assistant Conservator of Forests, Tumkur district, was not availed of, and the same is hereby cancelled.

PIONEER PRESS, No. 676—30 5-1901 - 525.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

24th April, 1901.—No. 475—260-9-F.—With reference to the Notification of the Inspector-General of Forests, No. 170, dated the 27th February, 1901, Mr. A. M. F. Caccia, officiating Deputy Conservator of Forests, 3rd grade, proceeded on the leave granted therein from the afternoon of the 2nd April, 1901, on which date he was relieved of his duties as Instructor at the Imperial Forest School. From the same date Mr. Caccia reverted to the Central Provinces' Forest List.

Mr. B. O. Coventry, Deputy Conservator, 4th grade, Punjab, is appointed Instructor at the Imperial Forest School, with effect from the forenoon of the 6th April, 1901.

26th April, 1901.—No. 499—242-7-F.—The following arrangements are made, with effect from the 1st April, 1901, during the absence of Mr. S. Eardley-Wilmot, Conservator of Forests, 1st grade, Burma, on leave granted to him in the notification of this Department, No. 418-F., dated the 12th April, 1901, or until further orders:—

(i) Mr. J. A. McKee, Conservator, 2nd grade, Central Provinces, to officiate in the 1st grade.

(ii) Mr. A. M. Reuther, Conservator, 3rd grade, Burma, to officiate in the 2nd grade.

(iii) Mr. A. Weston, Deputy Conservator, 1st grade, Burma, to officiate as Conservator, 3rd grade, in charge, Northern Circle, Upper Burma, of which he relieved Mr. Wilmot in the afternoon of the 31st March, 1901.

26th April, 1901.—No. 502—79-14-F.—Mr. C. Bagshawe, Conservator, 1st grade, in charge of the Berar Forest Circle, proceeded, in the afternoon of the 9th April, 1901, on the leave granted to him in the notification of this Department, No. 386-F., dated the 22nd March, 1901.

The following arrangements are made during Mr. Bagshawe's absence, or until further orders:—

Mr. F. B. Dickinson, Conservator, 2nd grade, North-Western Provinces and Oudh, to officiate in the 1st grade.

Mr. A. L. McIntire, Deputy Conservator, 2nd grade, Punjab, to officiate as Conservator, 3rd grade, in charge of the Berar Forest Circle, of which he received charge in the afternoon of the 15th April, 1901.

2.—Madras Gazette.

14th April, 1901.—C. Seenayya, Acting Deputy Ranger, 2nd grade, who returned with Higher Standard certificate from the Forest School, Dehra Dun, is appointed as acting sub *pro tem.* Ranger, 6th grade, with effect from 1st April, 1901.

16th April, 1901.—Mr. A. G. VanHaeften, Forest Ranger, 2nd grade South Malabar Division, is granted privilege leave, under section 291 of the Civil Service Regulations, for one month from or after 1st May, 1901.

16th April, 1901.—*Leave on private affairs.*—To M. R. Ry. C. A. Ramakrishna Aiyar, Ranger, 6th grade, Salem district, under section 370 of the Civil Service Regulations, for three days in continuation of the leave already granted to him.

18th April, 1901.—To M. R. Ry. A. N. Venkatachalam Chetty, Ranger 5th grade, Nellore district, on medical certificate, under section 369 of the Civil Service Regulations, for three months from 17th April, 1901.

21*st April*, 1901.—F. T. Dalton, private student, who has obtained Dehra Dun Higher Standard certificate in March, 1901, is appointed as sub *pro tem.* Ranger, 6th grade, on Rs.50, to take effect from date of joining.

26*th April*, 1901.—No. 185.—Mr. J. S. Scott, District Forest Officer, Cuddapah, is granted privilege leave for three months, from or after the 1st May, 1901, under section 291 of the Civil Service Regulations.

26*th April*, 1901.—No. 186.—Mr. A. W. C. Stanbrough, District Forest Officer, Chingleput, is granted privilege leave for one month and twenty-two days, and special leave on urgent private affairs for four months and eight days in continuation thereof, with effect from the 16th June, 1901, under sections 291, 348 and 264-A, Civil Service Regulations, third edition.

27*th April*, 1901.—No. 194.—*Postings :—*

No.	Name of officer.	District.	Nature of charge.	Remarks.
1	Mr. H. F. Arbuthnot ...	Bellary ...	District Forest Officer.	To join as soon as possible, handing over charge of the South Malabar Division to Mr. Tireman, who will hold it without prejudice to his duties as District Forest Officer, North Malabar.
2	,, C. A. Eber Hardie	South Malabar	Do.	To join on return from leave.

27*th April*, 1901.—Mr. H. H. Ward, Extra-Assistant Conservator, 2nd grade, from the North Arcot district to the Nellore district as Sub-divisional Officer, Sriharikota, Coast ranges to join.

M. R. Ry. C. M. Maduranayagam Pillai, Extra-Assistant Conservator, 3rd grade, from the South Arcot district to the Cuddapah district on relief.

Mr. F. A. Seager, Extra-Assistant Conservator, 2nd grade, from the Cuddapah district to the Salem district, on relief.

29*th April*, 1901.—No. 207.—*Postings :—*

No.	Name and designation of Officer.	District.	Nature of charge.	Remarks.
1	Mr. T. G. A. Gaudoin, Extra-Assistant Conservator of Forests, 3rd grade.	Cuddapah ..	Acting District Forest Officer.	During the absence of Mr. J. S. Scott on privilege leave.

30*th April*, 1901.—M. R. Ry. K. Gajaraja Mudaliar, Ranger, 5th grade, is granted privilege leave, under section 291 of the Civil Service Regulations, for twelve days, from 11th April. 1901.

30*th April*, 1901.—To Mr. M. Callanan, Ranger, 2nd grade, Nellore district, under section 291 of the Civil Service Regulations, for three months, from 10th May, 1901, or from date of relief.

2*nd May*, 1901.—To Mr. D. J. Evers, Ranger, 6th grade, Salem district, under section 370 of the Civil Service Regulations, for six months from date of relief.

11*th May*, 1901.—No. 226.—M. R. Ry. T. Bapu Rao, Extra-Assistant Conservator of Forests, North Arcot district, is granted privilege leave for two months, from the 15th May, 1901, under section 291 of the Civil Service Regulations.

11*th May*, 1901 —No. 227.—*Promotions :—*

No.	Name of Officer.	Present Grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
	During the absence of Mr. H. A. Latham on privilege leave.				
1	Mr. C. E. C. Fischer	Assistant Conservator of Forests, 1st grade.	Deputy Conservator of Forests, 4th grade.	Acting.	
	During the absence of Mr. A. B. Jackson on privilege leave.				
1	Mr. H. B. Bryant...	Deputy Conservator of Forests, 4th grade.	Deputy Conservator of Forests, 3rd grade.	Acting.	
2	,, H.F. Arbuthnot	Assistant Conservator of Forests, 1st grade.	Deputy Conservator of Forests, 4th grade.	Do.	
	During the absence of Mr. T. P. Peake on leave, or until further orders.				
1	Mr. J. S. Battie	Deputy Conservator of Forests, 3rd grade.	Deputy Conservator of Forests, 2nd grade.	Acting.	
2	,, F. C. L. Cowley-Brown.	Deputy Conservator of Forests, 4th grade.	Deputy Conservator of Forests, 3rd grade.	Do.	Until the date of Mr. Jackson's return to duty.
3	,, H. B. Bryant...	Do.	Do.	Do.	From the date of Mr. Jackson's return to duty.
4	,, J. S. Scot ...	Assistant Conservator of Forests, 1st grade.	Deputy Conservator of Forests, 4th grade.	Do.	Until the date of Mr. Latham's return to duty.
5	,, C. E. C. Fischer	Do.	Do.	Do.	From the date of Mr. Latham's return to duty.
	During the absence of Mr. E. D. M. Hooper on leave, or until further orders.				
1	Mr. H. A. Gass ...	Conservator of Forests, 3rd grade.	Conservator of Forests, 2nd grade.	Acting.	
2	,, C. E. Brasier...	Deputy Conservator of Forests, 1st grade.	Conservator of Forests, 3rd grade.	Do.	
3	,, H. J. A. Porter	Deputy Conservator of Forests, 2nd grade.	Deputy Conservator of Forests, 1st grade.	Do.	
4	,, E. R. Murray	Deputy Conservator of Forests, 3rd grade.	Deputy Conservator of Forests, 2nd grade.	Do.	
5	,, H. A. Latham	Deputy Conservator of Forests, 4th grade.	Deputy Conservator of Forests, 3rd grade.	Do. ...	Until the date of Mr. Jackson's return to duty.
6	,, F. C. L. Cowley-Brown.	Do.	Do.	Do. ..	From the date of Mr. Jackson's return to duty.
7	,, C. B. Dawson	Assistant Conservator of Forests, 1st grade.	Deputy Conservator of Forests, 4th grade.	Do. ...	Until the date of Mr. Latham's return to duty.
8	,, J. S. Scot ..	Do.	Do.	Do. ...	From the date of Mr. Latham's return to duty to the date of M. Jackson's return to duty.
9	,, H.F. Arbuthnot	Do.	Do.	Do. ...	From the date of Mr. Jackson's return to duty.

12*th May*, 1901.—To M. R. Ry. A. Subba Rao, Ranger, 4th grade, North Arcot district, under section 291 of the Civil Service Regulations, for one month and fifteen days, from date of relief.

3.—BOMBAY GAZETTE.

13*th April*, 1901.—No. 339.—Mr. G. J. Rege, Extra-Assistant Conservator of Forests, took over charge of the Belgaum Division from Mr. E. G. Oliver, Deputy Conservator of Forests, on the afternoon of the 2nd instant, and handed over the same to Mr R. S. F. Fagan, Deputy Conservator of Forests, on the afternoon of 8th idem.

16*th April*, 1901.—No. 403.—Messrs. D. A. Thomson, Deputy Conservator of Forests and G. R. Takle, Extra-Assistant Conservator of Forests, respectively delivered over and received charge of the Kolaba Division in the forenoon of the 4th April, 1901.

Mr. B. G. Deshpande, Extra-Assistant Conservator, delivered over, and Rao Bahadur A. R. Chitre, Deputy Collector, received, charge of the Bijapur Division in the forenoon of the 8th April, 1901.

Mr. G. W. Hatch delivered over, and Mr. K. R. Bamanji received, charge of the Ratnagiri Division in the forenoon of the 10th April, 1901.

17*th April*, 1901.—No 207.—Messrs. B J. Patel, Extra-Assistant Conservator of Forests, and L. S. Osmaston, Deputy Conservator of Forests, respectively delivered over and received charge of the Sub-Division Forest Office, Nasik, on the 26th March, 1901, in the afternoon.

19*th April*, 1901.—No. 488.—Rao Bahadur A. R. Chitre, Huzur Deputy Collector, delivered over, and Mr. G. R. Mane, Extra-Assistant Conservator of Forests, received, charge of the Bijapur Division in the forenoon of the 10th instant.

23*rd April*, 1901.—No. 203.—Mr. E M. Hodgson, Deputy Conservator of Forests, 4th grade, delivered over, and Mr. C. G. Dalia, Extra-Assistant Conservator of Forests, 3rd grade, received, charge of the office of the Divisional Forest Officer, Surat, on the 19th April, 1901, in the afternoon.

30*th April*, 1901.—No. 2852.—His Excellency the Governor in Council is pleased to appoint Mr. C. S. McKenzie to do duty as Divisional Forest Officer, Working Plans, C. C., with effect from the date on which he relinquished charge of the office of Professor of Forestry at the College of Science, Poona, pending further orders.

30th *April*, 1901.—No. 2869.—His Excellency the Governor in Council is pleased to appoint Mr. Ganpat Ramji Mane to act as Divisional Forest Officer, Bijapur, during the absence of Mr. Balvant Ganesh Deshpande on leave, or pending further orders.

30*th April*, 1901.—No. 2933.—Mr. Savlyaram Balvant Ranade, L.C.E., Extra-Assistant Conservator of Forests, 3rd grade, and Sub-Divisional Forest Officer, Panch Mahals, is granted privilege leave of absence for two months, from 15th May, 1901, or the subsequent date on which he may avail himself of it.

6*th May*, 1901.—No. 3029.—Mr. Haripad Mitra, L.C.E., Extra-Assistant Conservator of Forests, 1st grade, and Divisional Forest Officer, Hyderabad Sind Circle, is granted privilege leave of absence for one month and twenty-nine days in combination with furlough for one year, from 1st May, 1901, or the subsequent date on which he may avail himself of it.

8*th May*, 1901.—No. 3077.—His Excellency the Governor in Council is pleased to transfer Mr. Ardesar Nasarvanji Master, L.C.E., Extra-Assistant Conservator of Forests, 2nd grade, to the Sind Circle, *vice* Mr. Haripad Mitra, L.C.E., proceeding on leave or pending further orders, and to appoint Mr. Vishnu Mahadev Tilak, Extra-Assistant Conservator of Forests, 3rd grade, to act as Divisional Forest Officer, Sholapur, *vice* Mr. Master, pending further orders.

8th May, 1901.—No. 3104.—His Excellency the Governor in Council is pleased to appoint Mr. Mancherji Byramji Merchant to act as Extra-Assistant Conservator of Forests, 4th grade, and to do duty in the Central Thana Division, *vice* Mr. Vishnu Mahadev Tilak, transferred, pending further orders.

14th May 1901.—No. 3267.—Mr. G. M. Ryan, Deputy Conservator of Forests, 3rd grade, and Divisional Forest Officer, Central Thana, is granted privilege leave of absence for three months in combination with leave on urgent private affairs for three months, from or after 18th May, 1901.

14th May, 1901.—No. 3268.—His Excellency the Governor in Council is pleased to appoint Mr. G. E. Marjoribanks to act as Divisional Forest Officer, Central Thana, in addition to his own duties, *vice* Mr. G. M. Ryan, proceeding on leave, pending further orders.

15th May, 1901.—No. 3290.—Mr. G. R. Mane, Extra-Assistant Conservator of Forests, S. C., Kanara, passed with credit on the 27th March, 1901, an examination in subjects prescribed in No. VI of the Rules published in Government Notification No. 2, dated 3rd January, 1894, for the examination of officers of the Forest Department.

4.—BENGAL GAZETTE.

Chittagong.

6th May, 1901.—No. 87-T.R.—Mr. J. P. Gregson, Extra-Assistant Conservator of Forests, attached to the Chittagong Forest Division, is granted privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, with effect from the 7th May, 1901, or from such subsequent date as he may avail himself of it.

16th May, 1901.—No. 2316.—Consequent on the departure of Mr. B. B. Osmaston, F.C.H., Deputy Conservator of Forests, 3rd grade, on the afternoon of the 1st March, 1901, on the three months' privilege leave combined with five months' ordinary furlough granted him in Notification No. 1150-For., dated the 27th February, 1901, the following temporary promotions are ordered with effect from the above date :—

Mr. F. Trafford, Deputy Conservator of Forests, 4th grade, to officiate in the 3rd grade of Deputy Conservators.

Mr. E. R. Stevens, Assistant Conservator of Forests, 2nd grade, officiating in the 1st grade of Assistant Conservators, to officiate in the 4th grade of Deputy Conservators.

16th May, 1901.—No. 2317.—Consequent on the departure of Mr. W. M. Green, Deputy Conservator of Forests, 1st grade, on the afternoon of the 13th March, 1901, on the three months' privilege leave combined with five months' ordinary furlough granted him in Notification No. 1149-For., dated the 27th February, 1901, the following temporary promotions are ordered with effect from the above date :—

Mr. H. D. D. French, Deputy Conservator of Forests, 2nd grade, to officiate in the 1st grade of Deputy Conservators.

Mr. H. H. Haines, F.C.H., Deputy Conservator of Forests, 3rd grade, to officiate in the 2nd grade of Deputy Conservators.

Mr. E. P. Stebbing, Deputy Conservator of Forests, 4th grade (on deputation), to officiate in the 3rd grade of Deputy Conservators.

Sir Henry A. Farrington, *Bart*, Deputy Conservator of Forests, 4th grade, provisional substantive, to officiate in the 3rd grade of Deputy Conservators, *vice* Mr. Stebbing (seconded).

16th May, 1901.—No. 2318.—Consequent on the departure of Mr. H. H. Haines, F.C.H., Deputy Conservator of Forests, 3rd grade, officiating in the 2nd grade, on the afternoon of the 19th March, 1901, on the three months'

privilege leave combined with five months' ordinary furlough granted him in Notification No. 1151-For., dated the 27th February, 1901, the following temporary promotions are ordered with effect from the above date :—

Mr. W F. Lloyd, Deputy Conservator of Forests, 4th grade, officiating in the 3rd grade of Deputy Conservators, to officiate in the 2nd grade of Deputy Conservators.

Mr. J W. A Grieve, Assistant Conservator of Forests, 1st grade officiating in the 4th grade of Deputy Conservators, to officiate in the 3rd grade of Deputy Conservators.

16*th May*, 1901.—No. 2319.—Consequent on the departure of Mr. H. D. D. French, Deputy Conservator of Forests, 2nd grade, officiating in the 1st grade of Deputy Conservators, on the afternoon of the 20th March, 1901, on the one month and fifteen days' privilege leave combined with six months' ordinary furlough granted him in Notification No. 1492-For., dated the 16th March, 1901, the following temporary promotions are ordered with effect from the above date :—

Mr. C. G. Rogers, F.C.H., Deputy Conservator of Forests, 3rd grade, officiating in the 2nd grade of Deputy Conservators, to officiate in the 1st grade of Deputy Conservators.

Mr. F Trafford, Deputy Conservator of Forests, 4th grade, officiating in the 3rd grade of Deputy Conservators, to officiate in the 2nd grade of Deputy Conservators.

Mr. T. H. Monteath, Assistant Conservator of Forests, 1st grade, provisional substantive, officiating in the 4th grade of Deputy Conservators, to officiate in the 3rd grade of Deputy Conservators.

5 —North-Western Provinces Gazette.

1*st May*, 1901.—No. $\frac{2007}{II-761c.}$—Mr. W. H. Lovegrove, Deputy Conservator of Forests, Ganges Division, Central Forest Circle, furlough out of India, combined with such privilege leave as may be due to him for a total period of one year and seven months, with effect from 15th May, 1901.

1*st May*, 1901.—No. $\frac{2008}{II-761c.}$.—Mr. R. H. H. B. M. Dobree, Assistant Conservator of Forests, attached to the charge of the Ganges Division Central Forest Circle, *vice* Mr. W. H. Lovegrove, granted leave.

9*th May*, 1901.—No. $\frac{2115}{II-350c.}$.—Mr. E. L. Haslett, Extra-Assistant Conservator of Forests, attached to the Kumaun Forest Division Central Circle, furlough combined with such privilege leave as may be due to him, for a total period of seven months, with effect from the 1st June, 1901.

6.—Punjab Gazette.

19*th April*, 1901.—No $\frac{231}{\text{A. L. No. } 10}$.—Mr. A. L. McIntire, Deputy Conservator of Forests, and Mr. A. D. Blascheck, Assistant Conservator of Forests, respectively, made over and received charge of the Kulu Forest Division on the afternoon of 6th April, 1901, consequent on the appointment of the former to officiate as Conservator of Forests in Berar.

26*th April*, 1901.—No. $\frac{238}{\text{A. L. No. } 11}$.—The following changes have taken place in the list of Forest Officrs in the Associated Provinces with effect from the date specified against each :—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. S. L. Kenny ...	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	16th March, 1901.	Consequent on Mr. Bartlett proceeding on furlough for one year.
Mr. R. S. Hole ...	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	30th March, 1901.	Consequent on Mr. B. O. Coventry proceeding on deputation to the Forest School Dehra Dun.
Mr. C. P. Fisher ...	Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.	6th April, 1901.	Consequent on Mr Taylor proceeding on three months' privilege leave and six months' furlough.
Mr. A. M. Long ...	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.	Ditto ...	
Mr. D. P. Witt ...	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	Ditto	
Mr C. S. Smith ...	Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.	9th April, 1901.	Consequent on Mr. Hoghton proceeding on two moths and ten days' privilege leave followed by one year's furlough.
Mr. R. M. Williamson	Deputy Conservator, 4th grade.	Officating Deputy Conservator, 3rd grade.	Ditto ...	
Mr. A. J. Gibson ...	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	Ditto ...	

11*th May*, 1901.—No. $\frac{263}{\text{A L. No. 12.}}$—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. A. V. Monro	Provisional Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade	15th April, 1901	Consequent on Mr. McIntire acting as Conservator of Forests
Mr. C. O. Hanson	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade	Ditto ...	
Mr. A. P. Percival	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	Ditto ...	

13*th May*, 1901.—No. $\frac{267}{\text{A.L. No. 13.}}$—Mr. A. D. Blascheck, Assistant Conservator of Forests, who was attached to the Kangra Division,—*vide* Punjab Government Notification No. 65,—A.L., No. 1., dated 15th February, 1901,—was transferred to the Kulu Division on the forenoon of the 1st April, 1901.

7.—CENTRAL PROVINCES GAZETTE.

17*th April*, 1901.—No. 2.—Under the authority conferred by section 31 clause (1), of the Forest Department Code, the undermentioned stipendiary students who were deputed to the Imperial Forest School, Dehra Dun, under Rule 8 of the Admission Rules, in March, 1898, and who have duly obtained the Higher Standard certificate of the school, are appointed as Rangers of the 6th grade, with effect from the 1st April, 1901, and are posted to the Bhandara and Bilaspur Divisions respectively :—

Vishnu Wasudeo Sathe, Bhandara Division.

Muhammad Hanif Siddiqui, Bilaspur Division.

22*nd April*, 1901.—No. 1893.—Privilege leave for three months, under Article 291 of the Civil Service Regulations, in combination with furlough for one year under Article 371 of the Civil Service Regulations, is granted to Mr. Ramchandra Krishna, Extra-Assistant Conservator of Forests, Mandla, with effect from the 1st May, 1901, or the subsequent date on which he may avail himself of it.

23*rd April*, 1901.—No. 1894.—Mr. R. C. Thompson, Extra-Assistant Conservator of Forests, Direction Division, Northern Circle, is transferred to the Mandla Forest Division during the absence on leave of Mr. Ramchandra Krishna, or until further orders.

24*th April*, 1901.—No. 9.—Balmakund, Deputy Ranger, on Rs.35, Temporary Establishment, Hoshangabad Division, is promoted to Deputy Ranger, 1st grade, Permanent Establishment, *vice* Mehi Lall, deceased, but will draw only Rs.35 with effect from the 1st April, 1901.

25*th April*, 1901.—No. 1939.—Privilege leave for twenty-four days, from the 3rd to 26th February, 1901, both dates inclusive, under Articles 277 and 291 of the Civil Service Regulations, was granted to Mr. A. A. Dunbar-Brander, Assistant Conservator of Forests

1*st May*, 1901.—No. 2010.—Furlough for nine months, under Article 340 (*b*) of the Civil Service Regulations, is granted to Mr. G. F. Taylor, Deputy Conservator of Forests, 2nd grade, Nimar, with effect fron the 8th March, 1901.

Order No. 723,. dated the 16th February, 1901, is hereby cancelled.

2*nd May*, 1901.—No. 10.—Leave on medical certificate for three months, under Article 369 of the Civil Service Regulations, is granted to Deputy Ranger Raghunath Parshad, Permanent Establishment, Mandla Division, with effect from the 15th May 1901, or such subsequent date as he may be permitted to avail himself of it.

2*nd May*, 1901.—No. 11.—Privilege leave for one month, under Article 291 of the Civil Service Regulations, is granted to Ranger Ghanshyam Parshad, Permanent Establishment, Betul Division, with effect from the 15th May, 1901, or such subsequent date as he may be permitted to avail himself of it.

3*rd May*, 1901.—No. 3.—Privilege leave for three months, under Article 291 of the Civil Service Regulations, and Government of India, Finance and Commerce Department, Resolution No. 5217-P, dated the 16th October, 1900, is granted to Mr. E. A. Rooke, Forest Ranger, 3rd grade, (sub *pro tem.*), in the Chhindwara Forest Division, with effect from the 1st May, 1901, or such subsequnt date as he may avail himself of it.

6*th May*, 1901.—No. 2162.—Mr. J. D. St. Joseph, Forest Ranger, 2nd grade, who was granted extraordinary leave without pay for three years and three months, with effect from the 1st February 1898, is permitted to resign his appointment in these Provinces, with effect from the 1st May, 1901.

8.—BURMA GAZETTE.

17*th April*, 1901.—No. 6.—With reference to Revenue Department Notification No. 76 (Forests), dated the 22nd March, 1901, Mr. A. H. M. Lawson, Deputy Conservator of Forests, relieved Mr. C. L. Toussaint, Deputy Conservator of Forests, of the charge of the Prome Division on the forenoon of the 6th April, 1901.

20th April, 1901.—No. 106.—Under the provisions of Article 340 (*b*) of the Civil Service Regulations, furlough for eight months is granted to Mr. H. S. Ker-Edie, Deputy Conservator of Forests, with effect from the 10th May, 1901, or the subsequent date on which he may avail himself of it.

23rd April, 1901.—No. 2.—With reference to Revenue Department Notification No. 61 (Forests), dated the 19th March, 1901, Mr. F. H. Todd, Deputy Conservator of Forests, assumed charge of the Shwegyin Division on the afternoon of the 17th April, 1901, relieving Mr. R. S. Troup, Deputy Conservator of Forests.

26th April, 1901—No. 7.—With reference to Revenue Department Notification No. 61 and No. 88 (Forests), dated the 19th March and 4th April, 1901, respectively, Mr. R. E. Marsden, Assistant Conservator of Forests, relieved Mr. F. H. Todd, Assistant Conservator of Forests, of the charge of the Yamethin sub-division (Pyinmana Division), on the forenoon of 4th April, 1901.

26th April, 1901—No. 3.—With reference to Revenue Department Notification No. 428 (Forests), dated the 8th November, 1900, Mr. A. Rodgers, Assistant Conservator of Forests on girdling duty, left Toungoo and proceeded to Shwegyin on the morning of the 1st April 1901.

29th April, 1901.—No. 4.—With reference to Revenue Department Notification No, 61 (Forests), dated the 19th March 1901, Mr. R S. Troup, Deputy Conservator of Forests, assumed charge of the Ataran Division on the afternoon of the 24th April 1901, relieving Mr. J. Murray, Deputy Conservator of Forests.

1st May, 1901.—No. 289.—Mr. C. H. Hearsey, Forest Ranger, 3rd grade supernumerary, on demarcation duty in the South Tenasserim Forest Division, is placed in charge of the Mergui Range, *vice* Mr. A. M. Sawyer, Forest Ranger, on leave.

3rd May, 1901.—No. 115.—Under the provisions of Articles 291 and 340 of the Civil Service Regulations, and Government of India, Home Department Resolution No. 224-240, dated the 25th January, 1901, privilege leave for 14 days combined with furlough for five months and 16 days is granted to Mr. A. P. Grenfell, Deputy Conservator of Forests, with effect from the date on which he may avail himself of it

3rd May, 1901.—No. 116.—Mr. R. M. Kavanagh, Extra-Assistant Conservator of Forests, is appointed to the charge of the Myittha Forest Division, *vice* Mr Grenfell, proceeding on leave or until further orders.

3rd May, 1901.—No. 8.—Mr. R. M. Kavanagh, Extra-Assistant Conservator of Forests, on his return from leave granted in Revenue Department Notification No. 55 (Forests), dated the 9th March, 1901, resumed charge of his duties in the Myittha Division on the afternoon of the 24th April, 1901.

7th May, 1901.—No. 9.—With reference to Revenue Department Notification No. 116 (Forests), dated the 3rd May, 1901, Mr. A. P. Grenfell, Deputy Conservator of Forests, made over charge of the Myittha Forest Division to Mr. R. M Kavanagh, Extra-Assistant Conservator of Forests, on the afternoon of the 5th May, 1901, and proceeded on leave granted him in Revenue Department Notification No. 115 (Forests), dated the 3rd May, 1901.

9.—Assam Gazette.

29th April, 1901.—No. 3184-G.—The following transfers of Officers in the Forest Department are ordered :—

Mr. F. H. Cavendish, Assistant Conservator of Forests, from the Khasi and Jaintia Hills Division to the charge of the Kamrup Forest Division.

Mr. J. E Barrett, Deputy Conservator of Forests, from the Kamrup Forest Division to the charge of the Darrang Forest Division.

29*th April*, 1901.—No. 3185-G.—Mr. D. P. Copeland, Deputy Conservator of Forests, in charge of the Darrang Forest Division, is granted privilege leave for one month and twenty-one days, combined with furlough for six months, under Articles 291 and 340 (*b*) of the Civil Service Regulations, with effect from the date on which he may be relieved by Mr. J. E. Barrett.

10.—Hyderabad Residency Gazette.

20*th April* 1901.—No. 114.—Mr. Pandurang Narayen, Forest Ranger 1st grade, sub. *pro tem.*, has been appointed to officiate as an Extra-Assistant Conservator of Forests, 4th grade, with effect from the 18th March, 1901, and during the absence of Mr. B. Bhukan, Extra-Assistant Conservator of Forests, on furlough, or until further orders. He has been posted to the charge of the Buldana Division, with effect from the same date.

That part of *Residency Orders*, Notification No. 94, dated the 4th April, 1901, which notifies that Mr. Pandurang Narayen was placed in temporary charge of the Buldana Division is cancelled.

20*th April*, 1901.—No. 115.—With reference to *Residency Orders*, Notification No. 88, dated the 2nd April, 1901, it is hereby notified that Mr. C. H. Haldane, an Extra-Assistant Conservator of Forests in the Hyderabad Assigned Districts, availed himself of the three months' privilege leave granted to him on the forenoon of the 2nd April, 1901.

11.—Mysore Gazette.

17*th April*, 1901.—No. 651-Ft F. 89-95.—Under Article 171 of the Mysore Service Regulations, Mr. K. Shamiengar, Assistant Conservator of Forests, Mysore district, was granted casual leave of absence for three days, with effect from the 18th March, 1901.

17*th April*, 1901 —No. 654-Ft.-F. 90-95.—Under Article 171 of the Mysore Service Regulations, Mr. T. Abdul Karim, Deputy Conservator of Forests, Bangalore district, is granted casual leave of absence for five days, with effect from the 15th April 1901, the Deputy Commissioner, Bangalore district, being in charge of the current duties of the District Forest Office during Mr. Abdul Karim's absence on leave, or until further orders.

18*th April*, 1901.—No. 660-Ft.-F. 6-1900.—Mr. M. Muthannah, Rai Bahadur, is appointed a Deputy Conservator of Forests, with effect from the 9th April, 1901, and is posted as District Forest Officer, Mysore.

18*th April*, 1901.—No. 664-Ft.-F. 27-95.—Consequent on the posting of Rai Bahadur Mr. Muthannah, Deputy Conservator of Forests, as District Forest Officer, Mysore, the following transfers of Forest Officers are ordered:—

Mr. M. Venkatnarnappa, Assistant Conservator, to the charge of the Heggaddevankote Range, Mysore district.

Mr. H. Srinivasa Rao, Sub-Assistant Conservator, from the Heggaddevankote Range to the Gundlupet Range, Mysore district.

Mr. K. Shamiengar, Assistant Conservator of Forests, Chamrajnagar Range, to Kolar as District Forest Officer.

27*th Mpril* 1901 —No. 14423—Mis. 3702.—Mr. J. Cameron, F.L.S., Superintendent, Government Botanical Gardens and Museum, is granted privilege leave of absence for thirty-five days, from 27th April to 31st May, 1901, both days inclusive.

Mr B. Heerasingh, Assistant Conservator of Forests at Headquarters, will, in addition to his o wn duties, be in charge of the Government Gardens and Museum during the absence of Mr Cameron on leave, or until further orders.

2*nd May*, 1901.—No. 710-Ft.-F. 92-95 —Under Article 171 of the Mysore Service Regulations, Mr. Y Sitaramaiya, Assistant Conservator of Forests, Kadur district, was granted causal leave of absence for one day, *viz.*, on the 13th April, 1901.

6th May, 1901.--No. 717-Ft.. F. 123-95.—Under Article 172 of the Mysore Service Regulations, Mr. C. Appaiya, Assistant Conservator of Forests, Hassan district. was granted casual leave of absence for eight days, with effect from the 15th March 1901.

Mr. D. M. Narasinga Rao, Extra-Assistant Commissioner, held charge of the current duties of the District Forest Office during Mr. Appaiya's absence.

7th May, 1901.—No. 720 Ft.-F. 89-95.—Mr. T. Abdul Karim, District Forest Officer, Bangalore, is appointed to hold temporary charge of the office of District Forest Officer,. Kolar, in addition to his own duties.

8th May, 1901.—No. 724-Ft -F. 89-95.—Under Article 188 of the Mysore Service Regulations, Mr. K. Shamiengar, Assistant Conservator of Forests, under orders of transfer to Kolar, is granted privilege leave of absence for six weeks, with effect from the 23rd April, 1901.

11th May, 1901.—No. 734 Ft.-F. 104-95.—Under Article 188 of the Mysore Service Regulations, Mr. S. A. Bapu Rao. Deputy Conservator of Forests, Shimoga district, is granted privilege leave of absence for two months, with effect from the 1st June, 1901, or such other subsequent date as he may avail himself of the same.

Mr. J. J. Monteiro, Assistant Conservator of Forests, sub *pro tem*, in charge of Sorab Range, is appointed to act as District Forest Officer, Shimoga, during Mr. Bapu Rao's absence on leave, or until further orders.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

31*st May*, 1901.—No. 619—79-16F.—*Erratum.*—In the Notification of this Department No. 502F., dated the 26th ultimo, *for* "afternoon of the 9th April 1901" *read* "afternoon of the 8th April 1901"; and *for* "afternoon of the 15th April 1901" *read* "forenoon of the 15th April 1901."

2.—Madras Gazette.

25*th May*, 1901.—Leave.—The one month's privilege leave granted to K. Rama Row, Ranger, Ganjam district, by the District Forest Officer, is approved and sanctioned

30*th May*, 1901.—No. 264.

No.	Name and designation of Officer.	District.	Nature of charge.	Remarks.
1	Mr. W. Aitchison, Assistant Conservator of Forests, 2nd grade.	North Arcot ...	To work under the District Forest Officer.	

31*st May*, 1901.—Dismissal.—Mr. A. Srinivasa Chamberlain, Ranger, 6th grade, Trichinopoly district, is dismissed from his appointment from 8th July, 1900, *i.e.*, the date on which he was suspended.

1*st June*, 1901.—No. 262.

No.	Name of Officer.	Present Grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
With effect from the date of retirement of Mr. A. W. Peet, Conservator of Forests, 1st Grade.					
1	Mr. E.D.M. Hooper	Conservator of Forests, 2nd grade.	Conservator of Forests, 1st grade.	Permanent.	
2	,, H. A. Gass ...	Conservator of Forests, 3rd grade, and acting in the 2nd grade.	Conservator of Forests, 2nd grade.	Do.	
3	,, C. E. Brasier...	Deputy Conservator of Forests, 1st grade, and acting Conservator of Forests, 3rd grade.	Conservator of Forests, 3rd grade.	Do.	
4	,, H. J. A. Porter	Deputy Conservator of Forests, 2nd grade, and acting in the 1st grade.	Deputy Conservator of Forests, 1st grade.	Do.	
5	,, H. A. Gass ...	Conservator of Forests, 2nd grade.	Conservator of Forests, 1st grade.	Acting.	During the absence of Mr. E. D. M. Hooper, on leave.
6	,, C. E. Brasier ...	Conservator of Forests, 3rd grade.	Conservator of Forests, 2nd grade.	Do.	
7	,, H. J. A. Porter	Deputy Conservator of Forests, 1st grade.	Conservator of Forests, 3rd grade.	Do.	

1st June, 1901.—No. 263.—POSTINGS.

No.	Name of Officer.	Circle or District.	Nature of charge.	REMARKS.
1	Mr. E. D. M. Hooper ...	Central ...	Conservator of Forests.	With effect from the date of his return from leave.
2	,, C. E. Brasier ...	Northern	Do. ...	With effect from the date of Mr. Peet's retirement.
3	,, H. J. A. Porter ...	Central ...	Acting Conservator of Forests.	With effect from the date of Mr. Peet's retirement and during the absence of Mr. E. D. M. Hooper, on leave.
4	M.R.Ry. V.S Gurunatha Pillai Avargal.	Madura ...	Acting District Forest Officer.	During the employment of Mr. Porter on other duty, or until further orders.

2nd June, 1901 —No. 253.

No.	Name and designation of Officer.	District.	Nature of charge.	REMARKS.
1	Mr. C. J. Woutersz, Extra-Assistant Conservator of Forests.	Chingleput ...	Acting District Forest Officer.	From the date of Mr. Stanbrough's departure on leave.

7th June, 1901.—M. R. Ry. T. S. Subramania Aiyar, a passed student of the Forest School at Dehra Dun, with the Higher Standard certificate, to be Acting Ranger, 6th grade, sub *pro tem.*, in the Chingleput district.

7th June, 1901.—M. R. Ry. T. Subbaroyalu Naidu, Ranger, 4th grade, from the Chingleput district to the Nellore district, to join on relief.

8th June, 1901.—V. R. Venkataramiah, Ranger, Ganjam district, is granted three months' privilege leave from 5th July, 1901.

3.—BOMBAY GAZETTE.

17th May, 1901.—No. 617.—Messrs. L. S. Osmaston, Deputy Conservator of Forests, and G. S. Hinge, Extra-Assistant Conservator of Forests, respectively delivered over and received charge of the Sub-Division Forest Office, Nasik, on the forenoon of the 23rd April 1901.

22nd May, 1901.—No. 3491.—In supersession of Government Notification No. 1876, dated 19th March, 1901, Mr. E. G. Oliver, Deputy Conservator of Forests, 3rd grade, and Divisional Forest Officer, Belgaum, has been allowed privilege leave of absence for two months and ten days, in combination with furlough for fifteen months and twenty days, from 3rd April, 1901.

23rd May, 1901.—No. 481.—Mr. S. B. Ranade, Extra-Assistant Conservator of Forests, 3rd grade, delivered over, and Mr. V. D. P. Rebeiro, Divisional Forest Officer, Panch Mahâls, received, charge of the office of Sub-Division Forest Officer, Panch Mahâls, on the 20th May, 1901, in the afternoon.

3rd June, 1901.—No. 608.—Mr. Vishnu Madhav Tilak, Extra-Assistant Conservator of Forests, 3rd grade, was relieved of his charge as Sub-Division Forest Officer, Central Thâna, by the undersigned on the 20th May 1901, in the afternoon, and directed to proceed to Sholâpur, in the Central Circle.

The undersigned delivered over charge of the Central Thâna Sub-Division Office to Mr. Mancharji Byramji Merchant, acting Extra-Assistant

Conservator of Forests, 4th grade, in the forenoon of the 23rd May 1901.

6th June, 1901.—No. 648.—Mr. G. M. Ryan, Deputy Conservator of Forests, 3rd grade, was relieved of his charge as Divisional Forest Officer, Central Thána, by the undersigned on the 31st May, 1901, in the afternoon.

The undersiged delivered over charge of the Central Thána Divisional Forest Office to Mr. G. E. Marjoribanks, Assistant Conservator of Forests, 2nd grade, in the afternoon of the 3rd June, 1901.

7th June, 1901.—No. 3839.—Mr. J. Dodgson, Assistant Conservator of Forests, 1st grade, has been allowed by His Majesty's Secretary of State for India to return to duty within the period of his leave.

4.—Bengal Gazette.

31st May, 1901.—No. 460T.R.—In Notification No. 1915 (For.), dated the 4th April 1901, published in the *Calcutta Gazette* of the 10th idem. *for* the words "*provisional substantive*," wherever they occur, *read* "*substantive pro tempore*."

11th June, 1901.—No. 601T.R.—Sir H. A. Farrington, Provisionally Substantive Deputy Conservator of Forests, in charge, Jalpaiguri Forest Division, is granted privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, with effect from the first week of July, 1901, or such subsequent date as he may avail himself of it.

Jalpaiguri.

Babu Lalit Mohan Sen, Extra-Assistant Conservator of Forests, attached to the Jalpaiguri Forest Division, is placed in charge of that Division, during the absence, on leave, of Sir H. A. Farrington, or until further orders.

5.—N.-W. P. and Oudh Gazette.

29th May, 1901.—No. $\frac{2422}{11-781C.}$.—In supersession of Notification No. $\frac{2008}{11.-781C.}$, dated 1st May, 1901, Mr. R. H. B. M. Dobree, Assistant Conservator of Forests, attached to the Gonda Division, Oudh Forest Circle, to the Ganges Division, Central Forest Circle, in the same capacity.

29th May, 1901.—No $\frac{2423}{11-781C}$.—Mr. R. H. B. M Dobree, Assistant Conservator of Forests, attached to the Ganges Division, Central Forest Circle, to hold charge of that Division, *vice* Mr. W. H. Lovegrove, granted leave.

6.—Punjab Gazette.

31st May, 1901.—No. $\frac{292}{A.\ L.\ No.\ 14}$.—Mr. J. C. Carroll, Assistant Conservator of Forests, passed the following prescribed examinations held on the dates mentioned against them :—

1. Higher Standard in Hindustani ... 24th April, 1901.
2. Forest Law... ... ... 27th April, 1901.

31st May, 1901.—No. $\frac{296}{A.\ L.\ No.\ 15}$.—With reference to Punjab Government Notification No. $\frac{292}{A.\ L.\ No.\ 14}$, dated 31st May, 1901, His Honor the Lieutenant-Governor is pleased to make the following promotion to fill an existing vacancy :—

Mr. J. C. Carroll, Assistant Conservator of Forests, 2nd grade, to Provisional Assistant Conservator, 1st grade, with effect from 27th April, 1901.

3rd June, 1901.—No. $\frac{301}{\text{A. L. No } 16}$.—The following change has taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from.	Remarks.
Mr. J. C. Carroll...	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	19th May, 1901...	Consequent on Mr. McCrie proceeding on privilege leave for three months, from 19th April, 1901.

13th June, 1901.—No. 322.—Lala Devi Ditta, Probationary Extra-Assistant Conservator of Forests, passed the prescribed examinations in Land Revenue and Forest Law, held on the 27th April, 1901.

7.—Central Provinces Gazette.

13th May, 1901.—No. 2305.—Privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. D. O. Witt, Assistant Conservator of Forests, 1st grade, with effect from the 6th June, 1901, or the subsequent date on which he may avail himself of it.

13th May, 1901.—No. 2306.—Mr. R. C. Thompson, Extra-Assistant Conservator of Forests, 2nd grade, is directed to hold charge of the Mandla Forest Division, during the absence of Mr. D. O. Witt on leave, or until further orders.

15th May, 1901.—No. 15.—Privilege leave for one month and fifteen days, under Article 291 of the Civil Service Regulations, is granted to Mr. Gaurishankar, Forest Ranger, Permanent Establishment, Nimar Division, with effect from the 15th May, 1901, or such subsequent date as he may be permitted to avail himself of it.

16th May, 1901.—No. 2341.—Order No. 1894, dated the 22nd April, 1901, transferring Mr. R. C. Thompson, Extra-Assistant Conservator of Forests, from the Direction Division, Northern Circle, to the Mandla Division, is hereby cancelled.

23rd May, 1901.—No 2474.—Privilege leave for 23 days, under Articles 277 and 291 of the Civil Service Regulations, in combination with furlough on medical certificate for one year, under Article 343 of the Civil Service Regulations, is granted to Mr. H. E. Bartlett, Deputy Conservator of Forests, 4th grade, Narsinghpur, with effect from the afternoon of the 15th March, 1901.

23rd May, 1901.—No. 2475.—Mr. S. R. Parsons, Extra-Assistant Conservator, 3rd grade, is appointed to hold charge of the Narsinghpur Forest Division, durng the absence of Mr. H. E. Bartlett on leave, or until further orders.

27th May, 1901.—No. 1-23.—The following changes have taken place in the list of Forest Rangers in the Central Provinces. Order No. 16 of the

25th January, 1901, issued by the Conservator of Forests, Southern Circle, is hereby cancelled :—

Name.	Present Grade.	Grade to which promoted.	Remarks.
Faiz Bakhsh ...	1st grade, sub *pro tem.*	1st grade.	Consequent on the confirmation of Mr. S. R. Parsons, Extra-Assistant Conservator of Forests, in the 4th grade, and the promotion of Mr. Ganga Parshad to 4th grade Extra-Assistant Conservator of Forests, sub *pro tem*, with effect from the 6th October, 1899.
A. L. Chatterji ...	2nd grade ...	1st grade, sub *pro tem.*	
P. Shankernath ...	2nd grade, sub *pro tem.*	2nd grade.	
J. D. St. Joseph ...	3rd grade ...	2nd grade, sub *pro tem.*	
R. H. Cole ...	3rd grade ...	2nd grade, sub *pro tem.*	
Gaurishankar ...	3rd grade ...	2nd grade, sub *pro tem.*	
W. J. Anthony ...	3rd grade, sub *pro tem.*	3rd grade.	
D. V. Pranjpe ...	4th grade ...	3rd grade, sub *pro tem.*	
Vinayak C. Bhagwat ...	4th grade .	3rd grade, sub *pro tem.*	
Jairam Raghunath ...	4th grade, sub *pro tem.*	4th grade.	
Muhammad Sahib ...	5th grade ...	4th grade, sub *pro tem*	

27*th May*, 1901.—No. 2-24.—The following changes have taken place in the list of Forest Rangers in the Central Provinces. Order No. 17, dated the 25th January, 1901, issued by the Conservator of Forests, Southern Circle, is hereby cancelled :—

Name.	Present Grade.	Grade to which promoted.	Remarks.
Mr F. W. Wightman ...	1st grade, sub *pro tem.*	1st grade.	Consequent on the confirmation of Mr. A. Punnuswamy Mudliar as Extra-Assistant Conservator of Forests, 4th grade, with effect from the 23rd May, 1900.
D. N. Avasia ...	2nd grade ...	1st grade, sub *pro tem.*	
Mr. J. D. St. Joseph ...	2nd grade, sub *pro tem.*	2nd grade.	
Mr. F. J. Langhorne ...	3rd grade ...	2nd grade, sub *pro tem.*	
Mathura Prasad ...	3rd grade sub *pro tem.*	3rd grade.	
Mr. E. A. Rooke ...	4th grade ...	3rd grade, sub *pro tem.*	
D. G. Vishwanath ...	4th grade, sub *pro tem.*	4th grade.	

29*th May*, 1901.—No. 2567.—Privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. W. King, Deputy Conservator of Forests, 1st grade, Hoshangabad, with effect from the 20th June, 1901, or the subsequent date on which he may avail himself of it.

29*th May*, 1901.—No. 2568.—Mr. A. A. Dunbar-Brander, Assistant Conservator of Forests, 2nd grade, Jubbulpore, is appointed to hold charge of the Hoshangabad Forest Division during the absence of Mr. King on leave, or until further orders.

29*th May*, 1901.—No. 2573.—After making over charge of the Pranhita-Godavari Sub-Division, in accordance with this Administration's Notification No. 1103, dated the 14th March, 1901, Mr. A. P. Percival, Assistant Conservator of Forests, remained temporarily attached to the Direction Division, Southern Circle, from the afternoon of the 3rd to the forenoon of the 18th April, 1901.

4*th June*, 1901.—No. 2646.—Privilege leave for one month, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. N. C. McLeod, Extra-Assistant Conservator of Forests, Bilaspur, with effect from the 1st June, 1901, or the subsequent date on which he may avail himself of it.

4th June, 1901.—No. 2647.—Mr. B. Inamati Sham Rao, Extra-Assistant Conservator of Forests, 4th grade, sub *pro tem.*, is directed to hold charge of the Bilaspur Forest Division, during the absence of Mr. N. C. McLeod on leave, or until further orders.

8th June, 1901.—No 2741.—Mr. Shridhar Ganesh Pranjpe, Extra-Assistant Conservator of Forests, Betul, is transferred to the Southern Circle, and is directed to hold charge of the Bhandara Forest Division.

8th June, 1901.—No. 2742.—Mr. Ganga Parshad Khetri, Extra-Assistant Conservator of Forests, Betul, is directed to hold charge of the Betul Forest Division.

8.—Burma Gazette.

14th May, 1901.—No. 10.—With reference to Revenue Department Notification No. 106 (Forests), dated the 22nd April, 1901, Mr. H. S. Ker-Edie, Deputy Conservator of Forest, made over charge of the Upper Chindwin Division to Mr B. P. Kelly, Extra-Assistant Conservator of Forests, on the forenoon of the 13th May 1901, and proceeded on leave granted in the above notification.

21st May, 1901.—No. 137.—Under the provisions of Articles 291 and 370 of the Civil Service Regulations and Government of India Home Department Resolution No. 224-240, dated the 25th January, 1901, privilege leave for three months, combined with leave on private affairs for three months, is granted to Mr. R. R. O'Hara Extra Assistant Conservator of Forests, with effect from the date on which he availed himself of it.

21st May, 1901.—No. 138.—Mr. G. T. Wrafter, Extra-Assistant Conservator of Forests, is transferred from the charge of the Myanaung Sub-division, of the Henzada Thongwa Forest Division, to Port Blair.

28th May, 1901.—No. 142.—Under the provisions of Articles 291 and 340 of the Civil Service Regulations and Government of India Home Department Resolution No. 224-240, dated the 25th January, 1901, privilege leave for two months and two days, combined with furlough for three months and 28 days, is granted to Mr. A. P. Grenfell, Deputy Conservator of Forests, with effect from the date on which he availed himself of it.

This Department Notification No. 115 (Forests), dated the 3rd May, 1901, is hereby cancelled.

28th May, 1901.—No. 7.—With reference to Revenue Department Notification No. 137 (Forests), dated the 21st May, 1901, Mr. R. R. O'Hara, Extra-Assistant Conservator of Forests, availed himself of the privilege leave for three months, combined with leave on private affairs for three months, granted him in the above notification, on the afternoon of the 19th April, 1901.

1st June, 1901.—No. 8.—With reference to Revenue Department Notification No. 138 (Forests), dated the 21st May, 1901, Mr. G. T. Wrafter, Extra-Assistant Conservator of Forests, was relieved of his duties in the Myanaung Sub-division, of the Henzada-Thongwa Forest Division, on the after-noon of the 19th May, 1901, and proceeded on the same day to join his appointment in the Andamans.

12th June, 1901.—No. 159.—Mr. A. Rodger, Assistant Conservator of Forests, is transferred from girdling duty to the charge of the Shwegyin Forest Division.

No. 160.—(Forests)—Under the provisions of Articles 277, 291, and 282 (i) of the Civil Service Regulations, privilege leave for three months and fifteen days is granted to Mr. F. H. Todd, Assistant Conservator of Forests, with effect from the date on which he may be relieved of the charge of the Shwegyin Forest Division.

13*th June*, 1901.—No. 161.—Under the provisions of Article 371 of the Civil Service Regulations, furlough for one year is granted to Mr. C. V. Ryan, Extra-Assistant Conservator of Forests, with effect from the date on which he may avail himself of it.

13*th June*, 1901.—No. 162.—Under the provisions of Articles 291 and 282 (i) of the Civil Service Regulations, privilege leave for three months and fifteen days is granted to Mr. H. W. A. Watson, Assistant Conservator of Forests, with effect from the 21st June, 1901, or such subsequent date on which he may avail himself of it.

9.—ASSAM GAZETTE.

29*th May*, 1901.—No. 3903G.—Privilege leave of absence for two months and twenty-six days, under Article 291 of the Civil Service Regulations, is granted to Mr. F. H. Cavendish, Assistant Conservator of Forests, in charge of the Kamrup Forest Division, with effect from the 18th July, 1901, or the subsequent date on which he may avail himself of it.

29*th May*, 1901.—No. 3904G.—Mr. J. E. Barrett, Deputy Conservator of Forests, in charge of the Darrang Forest Division, is placed in charge of the Kamrup Forest Division, in addition to his own duties, during the absence on leave of Mr. F. H. Cavendish, or until further orders.

31*st May*, 1901.—No. 3985G.—With effect from the 2nd May, 1901, in consequence of the departure on leave of Mr. D. P. Copeland, Deputy Conservator of Forests, 1st grade, *provisionally substantive*,—

Mr. H. G. Young, Deputy Conservator of Forests, 2nd grade, *provisionally substantive*, to officiate as Deputy Conservator, 1st grade.

Mr. J. E. Barrett, Deputy Conservator of Forests, 3rd grade, *provisionally substantive*, to officiate as Deputy Conservator, 2nd grade.

Mr. W. F. Perrée, Deputy Conservator of Forests, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. F. H. Cavendish, Assistant Conservator of Forests, 1st grade, to officiate as Deputy Conservator, 4th grade.

6*th June*, 1901.—No. 4211G.—Privilege leave of absence for two months and twelve days, under Article 291 of the Civil Service Regulations, is granted to Mr. A. R. Dicks, Deputy Conservator of Forests, in charge of the Sibsagar Forest Division, with effect from the 30th July, 1901, or the subsequent date on which he may avail himself of it.

6*th June*, 1901.—No. 4212G.—Mr. H. G. Young, Deputy Conservator of Forests, in charge of the Lakhimpur Forest Division, is appointed to hold charge of the Sibsagar Forest Division, in addition to his own duties, during the absence on leave of Mr. A. R. Dicks, or until further orders.

10.—HYDERABAD RESIDENCY GAZETTE.

Nil.

11.—MYSORE GAZETTE.

27*th May*, 1901.—No. 787.—Ft. F. 6-1900.—Under Article 171 of the Mysore Service Regulations, Rai Bahadur Mr. M. Muthanna, Deputy Conservator of Forests, Mysore district, is granted casual leave of absence for five days, with effect from the 10th June, 1901, or such other date as he may avail himself of the same, the Deputy Commissioner being in charge of the District Forest Office during the absence of Mr. Muthanna, or until further orders.

31*st May*, 1901.—No. 796.—Ft. F. 92-95.—Under Article 172 of the Mysore Service Regulations, Mr. Y. Sitaramaiya, Assistant Conservator of Forests, Kadur district, is granted casual leave of absence for ten days

with effect from the 5th June, 1901, or such other date as he may avail himself of the same.

3*rd June*, 1901.—No. 810.—Ft. F. 62-95 —Under Article 171 of the Mysore Service Regulations, Mr. M. G. Rama Rao, Assistant Conservator of Forests, Tumkur district, is granted casual leave of absence for five days, with effect from the 7th June, 1901, or such other date as he may avail himself of the same, the District Treasury Officer being in charge of the District Forest Office during the absence of Mr. Rama Rao on leave, or until further orders.

5*th June*, 1901.—No. 823.—Ft. F. 19-95.—Under Article 172 of the Mysore Service Regulations, Mr. B. Ramaswamy Iyer, Assistant Conservator of Forests, Chitaldrug district, is granted casual leave of absence for fifteen days, with effect from the 3rd June, 1901, or such other date as he may avail himself of the same, Mr. D. K. Darasha, Treasury Assistant Commissioner, being in charge of the District Forest Office during the absence of Mr. Ramaswamy Iyer on leave, or until further orders.

10*th June*, 1901.—No. 847.—Ft. F. 89-95.—The six weeks' privilege leave of absence granted to Mr. K Shamaiyengar, Assistant Conservator of Forests, in Notification No. 724—Ft. F. 89 95, dated the 8th May, 1901, is hereby extended to a total period of three months.

PIONEER PRESS, No. 1057-19-7-1901—525.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

25th June, 1901.—No. 710—164-5-*F.*—Mr. A. Smythies, Conservator of Forests, 2nd grade, in charge of the Southern Circle, Central Provinces, is granted privilege leave for thirteen days, under Article 291 of the Civil Service Regulations, with effect from the 21st June, 1901, or such subsequent date as he may avail himself of it.

17th July, 1901.—No. 794.—164-9-*F.*—With reference to the Notification of this Department No. 710-F., dated the 25th ultimo, Mr. A. Smythies, Conservator of Forests, was on privilege leave from the 23rd June to the 7th July, 1901, both dates inclusive.

2.—Madras Gazette.

11th June, 1901.—The six months' leave on private affairs, under section 370 of the Civil Service Regulations, granted to Mr. D. J Evers, Ranger, 6th grade, Salem district, in this Office Service Order No. 82, dated 2nd May, 1901, is cancelled.

12th June, 1901.—The posting of M. R. Ry. T. S. Subramania Aiyar, Acting Ranger, 6th grade, sub *pro tem.*, to the Chingleput district is hereby cancelled, and he is posted to the Nellore district.

13th June, 1901.—The transfer of M. R. Ry. T. Subroyalu Naidu, Ranger, 4th grade, from the Chingleput district to the Nellore district is hereby cancelled.

Leave.—To M. R. Ry. N. Arumuga Mudaliar, Ranger, 3rd grade, Nellore district, on medical certificate, under Section 369 of the Civil Service Regulations, for two months from date of relief.

21st June, 1901.—To M. R Ry. K. R. Manikka Mudaliar, Forest Ranger, 6th grade, South Arcot district, under Section 291 of the Civil Service Regulations, for eighteen days from date of availing it.

29th June, 1901.—To Mir Jaffer Ali Kirmani Sahib, Ranger, 6th grade, Trichinopoly district, under Section 291 of the Civil Service Regulations, for three months from date of relief.

29th June, 1901.—To M. R. Ry. R. Srinivasa Raghavachari, Acting Ranger, 6th grade, Trichinopoly district, under Section 291 of the Civil Service Regulations, for five days from 24th June, 1901.

29th June, 1901.—The two months' sick leave under Section 369 of the Civil Service Regulations, granted to M. R. Ry. N. Arumuga Mudaliar, Ranger, 3rd grade, Nellore district, and notified in Part II., page 858, of the *Fort St. George Gazette*, dated 18th June, 1901, is hereby cancelled.

29th June, 1901.—To Mr. H. W. A. Gaudoin, Ranger, 6th grade. Cuddapah district, under Section 369 of the Civil Service Regulations, for one month and one day, from 25th May, 1901.

30th June, 1901.—No. 319.—Reversion.

Name of officer.	Present Grade.	Grade to which reverted.	Remarks.
Mr. J. L. MacC. O'Leary ...	Deputy Conservator of Forests, 4th grade.	Assistant Conservator of Forests, 1st grade.	Until further orders.

30*th June*, 1901.—No. 320.—Posting.

Name and designation of officer.	District.	Nature of charge.	Remarks.
Mr. J. L. MacC. O'Leary, Assistant Conservator of Forests, 1st grade.	Salem ...	To do duty under the District Forest Officer.	To join on relief.
Mr. F. A. Seager, Extra-Assistant Conservator of Forests, 2nd grade.	Trichinopoly *cum* Tanjore.	Acting District Forest Officer.	To join forthwith.

2*nd July*. 1901.—Subject to the Board of Revenue exempting him from passing an University examination, K. G. Venkatram Aiyar is appointed as 6th grade Ranger on Rs.50 on probation for eight months and is posted to the Anantapur district.

5*th July*, 1901.—Mr. G. L. Lasrado, Ranger, VI., North Malabar Division, is granted leave on medical certificate for three months, under Section 369 of the Civil Service Regulations, from the date of relief.

12*th July*, 1901.—The Board resolves to grant, under Section 291, Civil Service Regulations, privilege leave for twenty-one days to M. R Ry. T. M. Nallaswami Naidu Garu, Acting District Forest Officer, Kistna, with effect from the date of relief.

3.—Bombay Gazette.

13*th June*, 1901.—No. 1018.—Messrs. A. N. Master and V. M. Tilak, Extra-Assistant Conservators of Forests, respectively delivered over and received charge of the Divisional Forest Office, Sholapur, on the afternoon of the 25th May, 1901.

20*th June*, 1901.—No. 1983.—Mr. N. D. Satarawala, Extra-Assistant Conservator of Forests, who was on privilege leave from the 12th March, 1901, returned to duty in the Working Plans Division on the forenoon of the 10th June, 1901.

25*th June*, 1901.—No. 4377.—Mr. E. M. Hodgson, Assistant Conservator of Forests, 1st grade, has been allowed by His Majesty's Secretary of State for India to return to duty within the period of his leave.

10*th July*, 1901.—No. 4777.—His Excellency the Governor in Council is pleased to appoint Mr. J. Dodgson, on return to duty, to be Divisional Forest Officer, Kolaba.

16*th July*, 1901.—No. 4951.—His Excellency the Governor in Council is pleased to appoint Mr. H. Murray to act as Divisional Forest Officer, Central Thana, in addition to his own duties, pending further orders.

17*th July*, 1901.—No. 4983.—Mr. W. A. Wallinger, Divisional Forest Officer, Dharwar, passed an examination in Kanarese according to the Higher Standard on the 8th July, 1901.

4.—Bengal Gazette.

25*th June*, 1901.—No 3511A.—The Report of the Central Examination Committee having been received, the result of the first half-yearly Departmental Examination of Assistant Magistrates and other Officers held on the 6th May, 1901, and the two following days, is published for general information :—

III.

The following Forest Officers have passed in the subject or subjects mentioned opposite their names :—

Names.	Subjects in which passed.
1	2
1. Mr. J. L. Baker	Land Revenue systems, Forest Law, Procedure and Accounts, and Hindustani by the Lower Standard.
2. Mr. E. R. Comber	Land Revenue systems, and Procedure and Accounts.

5.—N. W. Provinces and Oudh Gazette.

13*th June*, 1901.—No. $\frac{2601}{II.-595C}$.—Mr. F. F. R. Channer, Assistant Conservator of Forests, in charge of the Bahraich Forest Division, is granted privilege leave for such period as may be due to him, combined with leave on urgent private affairs, for a total period of six months, with effect from the 2nd July, 1901.

13*th June*, 1901.—No. $\frac{2602}{II.-595C.}$.—Mr. P. H. Clutterbuck, Deputy Conservator of Forests, in charge of the Kheri Forest Division, to hold charge of the Bahraich Forest Division, in addition to his other duties, as a temporary measure.

17*th June*, 1901.—No. $\frac{2630}{II.-86A-9}$.—The following temporary promotions are notified for general information :—

Entry No.	With effect from	Consequent on	Name.	From	To
1	9th May, 1901	The departure of Mr. W. Shakespear on leave.	Mr. T. J. Campbell ...	Offg. Dy Conservator of Forests, 2nd grade.	Offg. Dy. Conservator of Forests, 1st grade.
			,, W. H. Lovegrove,	Offg. Dy. Conservator of Forests, 3rd grade.	Offg. Dy. Conservator of Forests, 2nd grade.
			,, F. A. Lecte ...	Offg. Dy. Conservator of Forests, 4th grade.	Offg. Dy. Conservator of Forests, 3rd grade.
			,, R. C. Milward ...	Offg. Assistant Conservator of Forests, 1st grade.	Offg. Dy. Conservator of Forests, 4th grade.
			,, R. H. B. M. Dobree	Assistant Conservator of Forests, 2nd grade.	Offg. Assistant Conservator of Forests, 1st grade.

17*th June*, 1901.—No. $\frac{2637}{II.-116C}$.—In supersession of Notification No. $\frac{1683}{II-116C}$, dated the 16th April, 1901, Mr. W. Shakespear, Deputy Conservator of Forests, Pilibhit Forest Division, Oudh Circle, privilege leave for six weeks, with effect from the 9th May, 1901.

12*th July*, 1901.—No. $\frac{3082}{\text{II.}-116\text{C}}$.—Mr. W. Shakespear, Deputy Conservator of Forests, privilege leave up to and inclusive of the 23rd July, 1901, in, continuation of that granted to him by Notification No. $\frac{2637}{\text{II}-116\text{C}}$, dated 17th June, 1901.

17*th July*, 1901.—No. $\frac{3199}{\text{II.}-116\text{C.}}$.—Mr. W. Shakespear, Deputy Conservator of Forests, on return from privilege leave, to the charge of the Gonda Forest Division in the Oudh Forest Circle.

6.—PUNJAB GAZETTE.

29*th June*, 1901.—No. 343.—His Honor the Lieutenant-Governor is pleased, under Section 45 of the Forest Code, to confirm in the 4th grade of Extra-Assistant Conservator of Forests, Pandit Thakur Das and Lala Sundar Das, Extra-Assistant Conservators of Forests, on probation in that grade.

29*th June*, 1901.—No. 356.—Pandit Gokal Das and Mr. Fazl-ud-din, Extra-Assistant Conservators of Forests, respectively made over and received charge of the Chenab Forest Division on the afternoon of the 15th June, 1901, consequent on the former's transfer to the Murree Range in the Rawalpindi Forest Division.

Mr. Fazl-ud-din will hold charge of the Chenab Division in addition to the Lahore Forest Division.

1*st July*, 1901.—No. $\frac{360}{\text{A. L. No. 17}}$.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified against each, and Notifications No. $\frac{238}{\text{A. L. No. 11}}$, dated 26th April, 1901, and No. $\frac{263}{\text{A. L. No. 12}}$, dated 11th of May, 1901, are hereby cancelled :—

Names.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. C. P. Fisher...	Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade	7th March 1901.	Consequent on Mr. G. F. Taylor proceeding on nine months furlough with effect from 7th March, 1901.
Mr. A. M. Long ...	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.		
Mr. S. L. Kenny...	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.		
Mr. C. M. McCrie	Officiating Deputy Conservator, 4th grade.	Provisional Deputy Conservator, 4th grade.	30th do.	Consequent on Mr. B. O. Coventry proceeding on deputation to the Forest School, Dehra Dun, with effect from 30th March, 1901.
Mr. R. S. Hole ...	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.		
Mr. A. M. Long ...	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.	2nd April 1901.	Consequent on Mr. Caccia reverting to the Associated List from deputation with effect from 2nd April, 1901.
Mr. C. M. McCrie	Provisional Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 4th grade.		
Mr. R. S. Hole ...	Officiating Deputy Conservator, 4th grade.	Assistant Conservator, 1st grade.		

Names.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. C. S. Smith ...	Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.	9th April, 1901.	Consequent on Mr. Hoghton proceeding on two months and ten days' privilege leave and one year's furlough with effect from 10th March, 1901.
Mr. A. M. Long ...	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.		
Mr. R. S. Hole ...	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.		
Mr. D. O. Witt ...	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	Do.	Consequent on Mr. Bartlett proceeding on 24 days' privilege leave and one year's furlough with effect from 16th March, 1901.
Mr. A. V. Monro ...	Provisional Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 2nd grade.	15th April, 1901.	Consequent on Mr. McIntire's acting as Conservator with effect from 15th April, 1901.
Mr. R. M. Williamson.	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.		
Mr. A. J. Gibson ...	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.		
Mr. C. O. Hanson	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.	3rd May, 1901.	Consequent on Mr. Caccia proceeding on three months' privilege leave in combination with four months' furlough with effect from 3rd April, 1901.
Mr. A. P. Percival	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.		

15*th July*, 1901.—No. 384.—The Hon'ble the Lieutenant-Governor is pleased to invest Mr. A. J. Gibson, Officiating Deputy Conservator of Forests, Rawalpindi Division, with the powers defined in Section 71 (*d*) of Act VII. of 1878 (The Indian Forest Act), to be exercised within the limits of the Rawalpindi Forest Division.

7.—Central Provinces Gazette.

11*th June*, 1901.—No. 31.—Privilege leave for two months, under Articles 291 and 294 of the Civil Service Regulations, is granted to Sheo Prashad, Deputy Ranger, Permanent Establishment, Narsinghpur Division, with effect from the 1st July, 1901.

12*th June*, 1901.—No. 5.—Mr. Yashavant Martand Wadiker, Forest Ranger, attached to the Raipur Forest Division, is granted two months' privilege leave with effect from the 1st August, 1901, or from the date on which he may be permitted to avail himself of it.

12*th June*, 1901.—No. 6.—Mr. Dhanjishah Nasarwanji Avasia, Forest Ranger, 1st grade, attached to the Chanda Forest Division, is granted one month's privilege leave with effect from the 8th July, 1901, or such subsequent date as he may be permitted to avail himself of it.

15*th June*, 1901.—No. 37.—The privilege leave for one month, under Article 291 of the Civil Service Regulations, granted to Ranger Ghanshyam Prashad Misra, Permanent Establishment, Betul Division, with effect from the 17th May, 1901, as per Order No. 11, dated the 2nd May, 1901, is extended by 15 days.

18*th June*, 1901.—No. 7.—Under the authority conferred by Section 31, clause (1), of the Forest Department Code, Mr. Laiq Singh, who attended the Imperial Forest School, Dehra Doon, under Rule 12 of the Admission Rules printed as Appendix II. to the Forest Department Code, and who has obtained a certificate by the Higher Standard of that school as a private student, is appointed as Ranger of the 6th grade with effect from the 17th June, 1901, and is posted to the Chanda Forest Division.

19*th June*, 1901.—No. 8.—Mr. Balkrishna Dinkar Ukidwe, Forest Ranger, 5th grade, attached to the Chhindwara Forest Division, is granted three months' privilege leave with effect from such date as he may be permitted to avail himself of the same.

20*th June*, 1901.—No. 40.—Under the authority conferred by Article 31, clause (1), of the Forest Department Code, Bakhshish Singh, a private student of the Imperial Forest School, Dehra Dun, who has duly obtained the Higher Standard Certificate of the School, is appointed on probation as Ranger, 6th grade, with effect from the 12th June, 1901, and is posted to the Mandla Division.

22*nd June*, 1901.—No. 2946.—Privilege leave for one month, under the concession granted in Government of India, Finance and Commerce Department, Resolution No. 5217-P., dated the 6th October, 1900, is granted to Mr. C. Somers-Smith, Deputy Conservator of Forests, Saugor, with effect from the 15th July, 1901, or the subsequent date on which he may avail himself of it.

Amrit Lal Chatterji, Ranger, 1st grade, is directed to hold charge of the current duties of the office of Forest Divisional Officer, Saugor, during the absence of Mr. C. Somers-Smith on leave.

25*th June*, 1901.—No. 3000.—Privilege leave for one day, in extension of 15 days' privilege leave granted him by Order No. 1354, dated the 27th March, 1901, is granted to Mr. A. Ponnaswamy Mudaliar, Extra-Assistant Conservator of Forests, 4th grade.

3*rd July*, 1901.—No. 9.—By the orders of the Hon'ble the Chief Commissioner, conveyed in his Under-Secretary's letter No 3004, dated the 25th ultimo, Mr. K. Rama Rao, Forest Ranger, 3rd grade, is promoted to 2nd grade of Rangers on Rs.125 per mensem (sub *pro tem.*), with effect from the 1st April, 1901, and placed in his correct position immediately above Gowri Shanker, Ranger.

Consequent on the restoration of Mr. K. Rama Rao, Ranger, to his proper place in the 2nd grade of Rangers, Mr. F. J. Langhorne, Forest Ranger, 2nd grade, sub *pro tem.*, reverted to his substantive appointment of Ranger, 3rd grade, on Rs.100 per mensem, with effect from the 1st April, 1901.

18*th July*, 1901.—No. 3464.—Mr. A. P. Percival, Assistant Conservator of Forests, was placed in charge of the current duties of the office of the Conservator of Forests, Southern Circle, Central Provinces, from the afternoon of the 22nd June, 1901, to the forenoon of the 8th instant, during the absence of Mr. A. Smythies on privilege leave.

18*th July*, 1901.—No. 3465.—On return from the furlough granted him by Orders No. 1229, dated the 21st March, 1900, and No. 1356, dated the 27th March, 1901, Mr. F. S. Barker, Deputy Conservator of Forests, is posted to the charge of the Nagpur-Wardha Division.

18*th July*, 1901.—No. 3466.—On being relieved by Mr. F. S. Barker, Mr. A. P. Percival, Assistant Conservator of Forests, is attached temporarily to the Direction Division, Southern Circle, retaining charge of the current duties of the Conservator's office.

18*th July*, 1901.—No. 3467.—Mr. A. P. Percival, Assistant Conservator of Forests, Direction Division, is transferred to the Chanda Forest Division.

18*th July*, 1901.—No. 3469.—On return from the privilege leave granted him by Order No. 1102, dated the 14th March, 1901, Mr. C. M. McCrie, Assistant Conservator of Forests, is posted to the charge of the Chhindwara Forest Division.

18*th July*, 1901.—No 3470.—On being relieved by Mr. C. M. McCrie, Mr. J. J. Hobday, Extra-Assistant Conservator of Forests, is directed to hold charge of the Sambalpur Forest Division.

18*th July*, 1901.—No. 3471.—On being relieved by Mr. J. J. Hobday, Mr. Narayan Parshad Bajpai, Extra-Assistant Conservator of Forests, Sambalpur, is transferred to the Raipur Forest Division as Working Plans Inspector.

8.—Burma Gazette.

16*th June*, 1901.—No. 163.—Mr. A. M. Burn-Murdoch, Deputy Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of furlough for four months.

16*th June*, 1901.—No. 164.—In supersession of this Department Notification No. 106 (Forests), dated the 22nd April, 1901, and under the provisions of Articles 291, 340 (*b*) and 264A of the Civil Service Regulations, Mr. H. S. Ker-Edie, Deputy Conservator of Forests, is granted privilege leave for two months and six days, and furlough for five months and 24 days in continuation thereof with effect from the 13th May, 1901.

24*th June*, 1901.—No. 5.—With reference to Revenue Department Notification No. 160 (Forests), dated the 12th June, 1901, Mr. A. Rodger, Assistant Conservator of Forests, assumed charge of the Shwegyin Division on the afternoon of the 20th June, 1901, relieving Mr. F. H. Todd, Deputy Conservator of Forests.

25*th June*, 1901.—No. 185.—Mr. C. W. A. Bruce, Deputy Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of furlough for two months and seven days.

27*th June*, 1901.—No. 187.—Under the provisions of Article 291 of the Civil Service Regulations privilege leave for three months is granted to Mr. R. S. Troup, Officiating Deputy Conservator of Forests, with effect from the 15th July, 1901, or the subsequent date, not later than the 15th August, 1901, on which he may avail himself of it.

27*th June*, 1901.—No 188.—Under the provisions of Articles 291, 340 (*b*), and 264A of the Civil Service Regulations, Mr. H. Carter, Deputy Conservator of Forests, is granted privilege leave to the amount due under Article 283 of the Civil Service Regulations and furlough in continuation thereof for a total period of twelve months, with effect from the 26th July, 1901, or the subsequent date on which he may avail himself of the privilege leave.

27*th June*, 1901.—No. 189.—The following transfers are ordered in the Forest Department :—

Mr. J. Copeland, Deputy Conservator of Forests, from Tharrawaddy to the charge of the Pyinmana Forest Division, *vice* Mr. Carter, proceeding on leave.

Mr. G. F. R. Blackwell, Deputy Conservator of Forests, from Henzada to the charge of the Tharrawaddy Forest Division, *vice* Mr. Copeland, transferred

Mr. E. B. Powell, Extra-Assistant Conservator of Forests, from the Myadaung Sub-division to the charge of the Henzada-Thôngwa Forest Division, *vice* Mr. Blackwell, transferred.

29*th June*, 1901.—No. 6.—With reference to Revenue Department Notification No. 162 (Forests), dated the 13th June, 1901, Mr. H. W. A. Watson, Assistant Conservator of Forests, availed himself of the privilege leave granted to him with effect from the 24th instant.

10*th July*, 1901.—No. 7.—With reference to Revenue Department Notification No. 161 (Forests), dated the 13th June, 1901, Mr. C. V. Ryan, Extra-Assistant Conservator of Forests, availed himself of the leave granted to him on the afternoon of the 2nd July, 1901.

11*th July*, 1901.—No. 204.—Mr. A. S. Rencontre, Extra-Assistant Conservator of Forests, is transferred from Mandalay to the Toungoo Forest Division, with headquarters at Toungoo.

9.—Assam Gazette.

Nil.

10.—Hyderabad Residency Gazette.

8*th July*, 1901.—No. 235.—Mr. R. M. Williamson, Deputy Conservator of Forests, Ellichpur Division, held charge of the current duties of the office of Conservator of Forests, Hyderabad Assigned Districts, in addition to his own duties, from the 9th to the 14th April, 1901, inclusive.

11.—Mysore Gazette.

17*th June*, 1901.—No. 853.—Ft. F. 1-96.—The following temporary promotion is ordered, with effect from the 3rd May, 1901, to fill up an existing vacancy :—

Mr. P. E. Benson, Sub-Assistant Conservator of Forests, to Assistant Conservator of Forests, 3rd grade, sub *pro tem.*

Pioneer Press, No. 1169 - 1-9-1901—525.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

26th July 1901.—No. 810.—107-4-F.—Mr. E. P. Dansey, Conservator of Forests, 1st grade, on furlough, is permitted to retire from the service of Government, with effect from the 3rd June 1901.

From the same date the following appointments are made :—

(i) Mr. A. E. Wild, Conservator, 2nd (officiating 1st) grade, Bengal, to be Conservator, 1st grade.

(ii) Mr. E. E. Fernandez, Conservator, 3rd grade, on furlough, to be Conservator, 2nd grade.

(iii) Mr. C. G. D. Fordyce, Deputy Conservator, Bengal, and officiating Conservator, 3rd grade, Assam, is confirmed in that grade and promoted to officiate in the 2nd grade of Conservators.

2.—Madras Gazette.

24th July 1901.—*Extension of Leave.*—The one month's privilege leave granted to K. Rama Row, Ranger, Ganjam district, in this office service order No. 95 of 1901, dated 25th May 1901, is extended by two months on medical certificate.

2nd August 1901.—*Departmental Examinations.*—The following candidates have passed the Departmental Examinations held in July 1901 in the subjects noted against their names :—

Name.	Designation.	Subjects passed.
N. Venkatram Aiyar ...	Clerk, District Forest Office, North Arcot.	Forest Code and Accounts.
P. Seeniah	Forester, Cuddapah district ...	Forest Act and Rules and Code and Accounts.
T. R. Chengalroya Mudaliar	Ditto ...	Forest Code and Accounts.

3rd August 1901.—No. 343.—Mr. S. C. Moss, Extra-Assistant Conservator of Forests, Salem, is granted privilege leave for six weeks, from or after the 5th September next, under Section 291 of the Civil Service Regulations.

3rd August 1901.—No. 345.—Mr. J. S. Scot, District Forest Officer, Cuddapah, has been granted by the Right Honourable the Secretary of State for India leave on medical certificate for three months in continuation of the privilege leave for three months notified at page 759, Part I of the *Fort St. George Gazette*, dated 30th April 1901.

5th August 1901.—C. Venkatanarayanaiya, Forester, Godavari district, has passed in Forest Act and Rules in the Departmental Examination held in July 1901.

4th August 1901.—To M. R. Ry. P. V. Alagiriswami Naidu, Ranger, 6th grade, Trichinopoly district, under Section 291 of the Civil Service Regulations, for two months from date of relief.

10th August 1901.—No. 351.—The privilege leave for twenty-one days granted by the Board of Revenue to M. R. Ry. T. M. Nallaswami Naidu Garu, Acting District Forest Officer, Kistna, in notification at page 943 of Part II of the *Fort St. George Gazette*, dated 16th July 1901, is extended by seventeen days.

3.—Bombay Gazette.

19*th July* 1901.—No. 2768.—Messrs. G. R. Mane and B. G. Deshpande, Extra-Assistant Conservators, respectively delivered over and received charge of the Bijapur Forest Division on the forenoon of 8th July 1901.

23*rd July* 1901.—No. 5139.—Mr. Balvant Ganesh Deshpande, Extra-Assistant Conservator of Forests, 2nd grade, and Divisional Forest Officer, Bijapur, was granted leave on medical certificate for three months with effect from 8th April 1901.

23*rd July* 1901.—No. 5152.—His Excellency the Governor in Council is pleased to transfer Mr. Gopal Manjunath Bhatkal, Extra-Assistant Conservator of Forests, 4th grade, and Sub-Divisional Forest Officer, N. D., Kanara, to the Central Circle, and to place him under the orders of the Conservator of Forests, Central Circle.

24*th July* 1901.—No. 2897.—Mr. G. R. Mane, Extra-Assistant Conservator of Forests, reported himself for duty to the Divisional Forest Officer, N. D., Kanara. on the afternoon of 15th July 1901.

Mr. G. M. Bhatkal, Extra-Assistant Conservator of Forests, handed over charge of his duties in N. D., Kanara, to Mr. G. R. Mane, on the 18th idem, in the forenoon.

29*th July* 1901.—No. 5300.—In modification of Government Notification No. 3029, dated 6th May 1901, Mr. Haripad Mitra, L.C.E., Extra-Assistant Conservator of Forests, 1st grade, and Divisional Forest Officer, Hyderabad, Sind Circle, is granted privilege leave of absence for two months and three days in combination with furlough for one year from 9th June 1901.

30*th July* 1901.—No 3015.—Mr. G. R. Takle, Extra-Assistant Conservator of Forests, delivered over and Mr. J. Dodgson, Acting Deputy Conservator of Forests, received charge of the Kolaba Forest Division, on the afternoon of 25th July 1901.

5*th August* 1901.—No. 5508.—Mr. R. S. Pearson, Assistant Conservator of Forests, 1st grade, and Divisional Forest Officer, West Khandesh, is granted privilege leave of absence for three months from or after 17th August 1901.

2. His Excellency the Governor in Council is pleased to appoint Mr. A. G. Edie, Divisional Forest Officer, East Khandesh, to hold charge of the office of Divisional Forest Officer, West Khandesh, in addition to his own duties, during the absence on leave of Mr. R. S. Pearson or pending further orders.

5*th August* 1901.—No. 5509.—His Excellency the Governor in Council is pleased to promote—

Mr. Ganpat Ramji Mane to the 3rd grade of Extra-Assistant Conservator of Forests *vice* Mr. Savlyaram Balvant Ranade, L.C.E., reduced, and

Mr. Krishnaji Balvant Gokhale, L.C.E., to the 4th grade of Extra-Assistant Conservator of Forests *vice* Mr Ganpat Ramji Mane, and to place him under the orders of the Conservator of Forests, Southern Circle.

12*th August* 1901.—No. 1451.—Mr. G. E. Marjoribanks, Assistant Conservator of Forests, delivered over and Mr. H. Murray, Deputy Conservator of Forests, received charge of the Central Thana Division on the 3rd August 1901, in the afternoon.

12*th August* 1901.—No. 1882.—Mr. G. M. Bhatkal, Extra-Assistant Conservator of Forests, 4th grade, reported himself for duty on the 9th August 1901 in the forenoon, and is temporarily attached to the office of the Conservator of Forests, C. C.

14th August 1901.—No. 5773.—Mr. D. A. Thomson, Deputy Conservator of Forests, 4th grade, has been allowed by His Majesty's Secretary of State for India to return to duty within the period of his leave.

4.—Bengal Gazette.

22nd July 1901.—No. 2773.—Mr. E. E. Slane, Extra-Assistant Conservator of Forests, 2nd grade, is promoted to the 1st grade of Extra-Assistant Conservators, with effect from the 1st January 1901.

5.—N.-W. P. and Oudh Gazette.

24th July 1901.—No. $\frac{3267}{\text{II}-349\text{c}}$.—Mr. F. A. Leete, Officiating Deputy Conservator of Forests and Working-Plans Officer, Kheri Forest Division, privilege leave for three months, with effect from the 23rd July 1901.

9th August 1901.—No. $\frac{3530}{\text{II}-36\text{c}}$.—Babu Nand Mal, Extra-Assistant Conservator of Forests, attached to the Garhwal Forest Division, to the charge of the Ranikhet Sub-Division of the Naini Tal Forest Division.

6.—Punjab Gazette.

23rd July 1901.—No. $\frac{396}{\text{A. L. No. 18}}$.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified against each:—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. A. V. Monro ..	Officiating Deputy Conservator, 2nd grade.	Provisional Deputy Conservator, 3rd grade.	28th June 1901	Consequent on Mr. Barker's return from extraordinary leave.
Mr. C. O. Hanson...	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.		
Mr. J. C. Carroll ...	Officiating Deputy Conservator, 4th grade.	Provisional Assistant Conservator, 1st grade.		
Mr. A.M.F. Caccia	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.	3rd July 1901	Consequent on the expiry of his three months' privilege leave and commencement of four months' furlough.
Mr. J. C. Carroll ...	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	6th July 1901	Consequent on Mr. D. O. Witt proceeding on three months' privilege leave with effect from 6th June 1901.

26th July 1901.—No. 401.—Pandit Gokal Das, Extra-Assistant Conservator of Forests, who was transferred from the Chenab Division, *vide* Punjab Government Notification No. 356, dated 29th June 1901, has been attached to the Rawalpindi Forest Division with effect from the forenoon of the 19th June 1901.

Lala Devi Ditta, Probationary Extra-Assistant Conservator of Forests, made over charge of his duties in the Rawalpindi Forest Division to Pandit Gokal Das on the afternoon of the 23rd June 1901, and has been attached to the Chamba Forest Division with effect from the forenoon of the 1st July 1901.

5th August 1901.—No. $\frac{417}{\text{A. L. No. 19}}$.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified against each :—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. J. C. Carroll...	Officiating Deputy Conservator, 4th grade.	Provisional Assistant Conservator, 1st grade.	18th July 1901	Consequent on Mr. McCrie's return from privilege leave.
Mr. F. S. Barker ...	Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 1st grade.	20th July 1901	Consequent on Mr. W. King proceeding on three months' privilege leave from 20th June 1901.
Mr. A. V. Monro ...	Provincial Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.		
Mr. C. O. Hanson...	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.		
Mr. J. C. Carroll ...	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.		

7.—Central Provinces Gazette.

9th July 1901.—No. 49.—Privilege leave for three months, under Article 291 of the Civil Service Regulations, is granted to Mr. A. L. Chatterji, Forest Ranger, 1st grade, Permanent Establishment, Saugor Division, with effect from such date as he may be permitted to avail himself of it.

6th July 1901.—No. 44.—Ashraf Khan, Deputy Ranger, 2nd grade on Rs.30, Permanent Establishment, Damoh Division, is promoted to, Rs.35 on the Temporary Establishment, and will count his service towards pension under Article 410 of the Civil Service Regulations.

This promotion will take effect from 1st July 1901, and will cease from 1st March 1902, from which date the post will be abolished and Ashraf Khan will revert to his original grade of Rs.30.

9th July 1901.—No. $\frac{3}{46}$.—The following changes have taken place in the list of Forest Rangers in the Central Provinces with effect from the 6th December 1900 :—

Name.	Present grade.	Grade to which promoted.	Remarks.
Madho Rao ..	4th grade ...	3rd grade, sub. *pro tem.*	Consequent on the appointment of Mr. R. N. Thompson, Extra-Assistant Conservator on probation, in Assam.
Dhondu Narayan ...	5th grade ...	4thg rade, sub. *pro tem.*	
Ardeshir D. Bhoti ...	6th grade ...	5th grade, sub. *pro tem*	

9th July 1901.—No. $\frac{4}{47}$.—The following changes have taken place in the list of Forest Rangers in the Central Provinces with effect from the 1st May 1901 :—

Name.	Present grade.	Grade to which promoted.	Remarks.
Mr. R. H. Cole ...	2nd grade, sub. *pro tem.*	2nd grade ...	Consequent on Mr. J. D. St. Joseph resigning his appointment.
Dinker Vishnu Pranjpe ...	3rd grade, sub. *pro tem.*	3rd grade.	
Govind Gangadhar Supre	4th grade, sub. *pro tem.*	4th grade.	
Sakha Ram Vinayak B. ...	5th grade, sub. *pro tem.*	5th grade.	

No. $\frac{5}{48}$.—The following changes have taken place in the list of Forest Rangers in the Central Provinces with effect from the 1st May 1901 :—

Name.	Present grade.	Grade to which promoted.	Remarks.
Balkrishna Akedim ...	5th grade ...	4th grade, sub. *pro tem.*	To fill two existing vacancies.
Ghulam Nabi Khan ...	5th grade ...	4th grade, sub. *pro tem.*	
Muhammad Ismail ...	5th grade, sub. *pro tem.*	5th grade.	
Ilahidad Khan ...	5th grade, sub. *pro tem.*	5th grade.	
Kazim Husein Khan ...	6th grade ...	5th grade, sub. *pro tem.*	
Prabhaker Narayan Joshi	6th grade ...	5th grade, sub. *pro tem.*	

8.—Burma Gazette.

9th July 1901.—No. 8.—Mr. D. A. Allan, Forest Ranger, 3rd grade, transferred from the Ruby Mines to the Mandalay Division, was relieved of his duties in the Ruby Mines Division on the forenoon of the 20th June 1901, and was placed in charge of the Maymyo Range, Mandalay Division, on the afternoon of the 30th June 1901.

13th July 1901.—No. 206.—On his return from leave Mr. J. W. Ryan, Extra-Assistant Conservator of Forests, is appointed to the charge of the Rubber Plantation at Mergui.

13th July 1901.—No. 211.—Mr. W. F. L. Tottenham, Deputy Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of furlough for two months on medical certificate.

13th July 1901.—No. 213.—Under the provisions of Article 340 (*b*) of the Civil Service Regulations furlough for six months is granted to Mr. H. Jackson, Deputy Conservator of Forests, with effect from the date on which he may avail himself of it.

13th July 1901.—No. 214.—Mr. C. W. Doveton, Officiating Deputy Conservator of Forests, is transferred from the charge of No. II Working-Plans Division, Pyinmana, to the charge of the Lower Chindwin Division, *vice* Mr. H. Jackson, proceeding on leave.

15th July 1901.—No. 9.—With reference to Revenue Department Notifications Nos. 176 and 177 (Forests), dated the 20th June 1901, Mr. F. Linnell, Deputy Conservator of Forests, was relieved of the charge of the Ruby Mines Division, by Mr. G. Cubitt, Deputy Conservator of Forests, on the afternoon of the 2nd July 1901.

23*rd July* 1901.—No. 9.—With reference to Revenue Department Notification No. 189 (Forests), dated the 27th June 1901, Mr. E. B. Powell, Extra-Assistant Conservator of Forests, assumed charge of the Henzada-Thongwa Division on the afternoon of the 18th July 1901, relieving Mr. G. F. R. Blackwell, Deputy Conservator of Forests.

23*rd July* 1901.—No. 10.—With reference to Revenue Department Notification No. 189 (Forests), dated the 27th June 1901, Mr. G. F. R. Blackwell, Deputy Conservator of Forests, assumed charge of the Tharrawaddy Division on the afternoon of the 22nd July 1901, relieving Mr. J. Copeland, Deputy Conservator of Forests.

24*th July* 1901.—No. 12.—With reference to Revenue Department Notification No. 189 (Forests), dated the 27th June 1901, Mr. E. B. Powell, Extra-Assistant Conservator of Forests, made over charge of the Myadaung Sub-Division to Mr. J. Messer, Deputy Conservator of Forests, on the afternoon of the 8th July 1901.

25*th July* 1901.—No. 231.—On his arrival in Burma Mr. C. H. Haldane, Extra-Assistant Conservator of Forests, is posted for duty to the Thayetmyo Forest Division.

26*th July* 1901.—No. 10.—With reference to Revenue Department Notification No. 204 (Forests), dated the 11th July 1901, Mr. A. S. Rencontre, Extra-Assistant Conservator of Forests, was relieved of his duties in the Mandalay Division, on the afternoon of the 22nd July 1901.

26*th July* 1901.—No. 233.—Mr. A. F. Gradon, Deputy Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of furlough for four days.

26*th July* 1901.—No. 234 — Mr A. F. Gradon, Deputy Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

27*th July* 1901.—No. 11.—With reference to Revenue Department Notification No. 213, dated the 17th July 1901, Mr. H. Jackson, Deputy Conservator of Forests, made over, and Mr. C. W. Doveton, Deputy Conservator of Forests, received, charge of the Lower Chindwin Division on the afternoon of the 24th July 1901.

29*th July* 1901.—No. 11.—With reference to Revenue Department Notification Nos. 188 and 189 (Forests), dated the 27th June 1901, Mr. H. Carter, Deputy Conservator of Forests, was relieved of the charge of the Pyinmana Division by Mr. J. Copeland, Deputy Conservator of Forests, on the afternoon of the 26th July 1901.

31*st July* 1901.—No. 235 —Mr. C. E. Muriel, Deputy Conservator of Forsets, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

31*st July* 1901.—No. 236.—Mr. A. M. Burn-Murdoch, Deputy Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

2*nd August* 1901.—No. 239.—The following alterations in rank are ordered in the Forest Department :—

(1) With effect from the 2nd July 1900, the date on which Mr. A .F. Gradon, Deputy Conservator, 3rd grade, proceeded on furlough and reverted to the Burma list :

Mr. C. W A. Bruce (on leave), Deputy Conservator, 3rd grade, substantive provisional, to revert to his substantive appointment in the 4th grade of Deputy Conservators.

Mr. A. H. M. Lawson, Deputy Conservator, 4th grade, substantive provisional (officiating 3rd grade), to be Assistant Conservator

1st grade, and to continue to officiate as Deputy Conservator, 3rd grade.

Mr. J. J. Rorie, Assistant Conservator, 1st grade, substantive provisional (Officiating Deputy Conservator, 4th grade), to be Assistant Conservator, 2nd grade, and to continue to officiate as Deputy Conservator, 4th grade.

(2) With effect from the 15th July 1900, consequent on the return from deputation and departure on furlough of Mr. W. F. L. Tottenham, Deputy Conservator, 3rd grade.

Mr. W. T. T. McHarg, Deputy Conservator, 3rd grade, substantive provisional (on leave), to revert to his substantive appointment in the 4th grade of Deputy Conservators.

Mr. C. B. Smales, Deputy Conservator, 4th grade, substantive provisional (officiating 3rd grade), to be Assistant Conservator, 1st grade, and to continue to officiate as Deputy Conservator, 3rd grade.

Mr. H. W. A. Watson, Assistant Conservator, 1st grade, substantive provisional (Officiating Deputy Conservator, 4th grade), to be Assistant Conservator, 2nd grade, and to continue to officiate as Deputy Conservator, 4th grade.

(3) With effect from the 24th July 1900, consequent on the departure on privilege leave of Mr. H. Jackson, Deputy Conservator, 3rd (officiating 2nd) grade:

Mr. A. P. Grenfell, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. R. S. Troup, Assistant Conservator, 1st grade, substantive provisional (Officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

(4) With effect from the 4th August 1900, consequent on the return from furlough of Mr. F. J. Branthwaite, Deputy Conservator, 3rd grade:

Mr. A. P. Grenfell, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive appointment.

Mr. R. S. Troup, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

(5) With effect from the 16th October 1900, consequent on the return from privilege leave of Mr. G. E. S. Cubitt, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade):

Mr. G. K. Parker, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

(6) With effect from the 5th November 1900, the date on which Messrs. Rodger and Lawrence, Assistant Conservators, 2nd grade, passed the prescribed examinations:

Mr. A. Rodger, Assistant Conservator, 2nd grade, to officiate as Deputy Conservator, 4th grade.

Mr. A. Lawrence, Assistant Conservator, 2nd grade, to officiate as Deputy Conservator, 4th grade.

(7) With effect from the 7th November 1900, consequent on the return from privilege leave of Mr. H. Jackson, Deputy Conservator, 3rd grade:

Mr. H. N. Thompson, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive appointment.

Mr. G. E. S. Cubitt, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

(8) With effect from the 12th November 1900, consequent on the return from leave of Mr. C. L. Toussaint, Deputy Conservator, 3rd grade :

Mr. C. L. Toussaint, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. F. J. Branthwaite, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive appointment.

Mr. A. Ross, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

(9) With effect from the 16th November 1900, consequent on the return from leave of Mr. W. T. T. McHarg, Deputy Conservator, 3rd grade :

Mr. C. W. Doveton, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

(10) With effect from the 31st December 1900, consequent on the departure on privilege leave of Mr. J. Messer, Deputy Conservator, 4th (officiating 3rd) grade :

Mr. C. W. Doveton, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

(11) With effect from the 20th February 1901, consequent on the return from leave of Mr. J. Messer, Deputy Conservator, 4th grade :

Mr. C. W. Doveton, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

(12) With effect from the 24th February 1901, consequent on the return from leave of Mr. J. Copeland, Deputy Conservator, 2nd grade :

Mr. J. Copeland, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.

Mr. H. Calthrop, Deputy Conservator, 2nd (officiating 1st) grade, to revert to his substantive appointment.

Mr. H. Carter, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive appointment.

Mr. A. H. M. Lawson, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

(13) With effect from the 26th February 1901, consequent on the appointment of Mr. T. A. Hauxwell, Deputy Conservator, 1st grade, to officiate as Conservator :

Mr. H. Calthrop, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.

Mr. H. Carter, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. A. H. M. Lawson, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

(14) With effect from the 5th March 1901, consequent on the confirmation of Mr. A. Reuther, Deputy Conservator, 1st grade, as Conservator :

Mr. A. Weston, Deputy Conservator, 1st grade, substantive provisional, to be confirmed in his appointment.

Mr. J. Murray, Deputy Conservator, 2nd grade (officiating 1st grade), to be Deputy Conservator, 1st grade, substantive provisional.

Mr. C. E. Muriel, Deputy Conservator. 2nd grade, substantive provisional, to be confirmed in his appointment.

Mr. A. F. Gradon, Deputy Conservator. 3rd grade (on leave), to be Deputy Conservator, 2nd grade, substantive provisional.

Mr. G. R. Long, Deputy Conservator, 3rd grade, substantive provisional, to be confirmed in his appointment.

Mr. W. T. T. McHarg, Deputy Conservator, 4th (officiating 3rd) grade, to be Deputy Conservator, 3rd grade, substantive provisional.

Mr. F. Linnell, Deputy Conservator, 4th grade, substantive provisional (officiating 3rd grade), to be confirmed in his appointment and to continue to officiate in the 3rd grade of Deputy Conservators.

Mr. C. B. Smalea, Assistant Conservator, 1st grade (officiating Deputy Conservator, 3rd grade), to be Deputy Conservator, 4th grade, substantive provisional, and to continue to officiate as Deputy Conservator, 3rd grade.

Mr. R. S. Troup, Assistant Conservator, 1st grade, substantive provisional (Officiating Deputy Conservator, 4th grade), to be confirmed in his appointment and to continue to officiate as Deputy Conservator, 4th grade.

Mr. H. W. A. Watson, Assistant Conservator, 2nd grade (Officiating Deputy Conservator, 4th grade), to be Assistant Conservator, 1st grade, substantive provisional, and to continue to officiate as Deputy Conservator, 4th grade.

(15) With effect from the 17th March 1901, consequent on the departure of Mr. A. H. M. Lawson, Officiating Deputy Conservator, 3rd grade, on privilege leave :

Mr. G. E. S. Cubitt, Assistant Conservator of Forests, 1st grade (Officiating Deputy Conservator, 4th grade), to Officiate as Deputy Conservator, 3rd grade.

(16) With effect from the 1st April 1901, consequent on the appointment of Mr. A. Weston, Deputy Conservator, 1st grade, as Officiating Conservator :

Mr. H. Jackson, Deputy Conservator, 3rd (officiating 2nd) grade, to officiate as Deputy Conservator,, 1st grade.

Mr. F. J. Branthwaite, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. G. K. Parker, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

(17) With effect from the 6th April 1901, consequent on the return from privilege leave of Mr. A. H. M. Lawson, Officiating Deputy Conservator, 3rd grade :

Mr. G. K. Parker. Assistant Conservator, 1st grade (Officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

(18) With effect from the 6th May 1901, consequent on the departure on privilege leave for two months and two days combined with furlough of Mr. A. P. Grenfell, Deputy Conservator, 3rd grade :

Mr. G. K. Parker, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

(19) With effect from the 13th May 1901, consequent on departure on privilege leave for two months and seven days combined with furlough of Mr. H. S. Ker Edie, Deputy Conservator, 4th grade.

Mr. R. S. Troup, Assistant Conservator, 1st grade (Officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

Items 9 to 15 of this department Notification No. 15, dated the 17th January 1901, are hereby superseded.

5th August 1901.—No. 240.—Mr. H. C. Walker, Assistant Conservator of Forests, 4th grade, is transferred from Prome and is posted to the charge of the Tungyin Division.

6th August 1901.—No. 11.—With reference to Revenue Department Notification No. 231 (Forests), dated the 25th July 1901, Mr. C. H. Haldane, Extra-Assistant Conservator of Forests, joined the Thayetmyo Division on the forenoon of the 29th July 1901.

7th August 1901.—No. 8.—With reference to Revenue Department Notification No. 187 (Forests), dated the 27th June 1901, Mr R. S. Troup, Officiating Deputy Conservator of Forests, Ataran Division, availed himself of the three months' privilege leave granted to him from the afternoon of the 26th July 1901.

7th August 1901.—No. 9.—With reference to Revenue Department Notification No. 187 (Forests), dated the 27th June 1901, Mr. D. H. Allan, Extra-Assistant Conservator of Forests, assumed charge of the Ataran Division on the afternoon of the 29th July 1901, relieving Mr. G. K. Parker, Officiating Deputy Conservator of Forests.

7th August 1901.—No. 10.—With reference to Revenue Department Notification No. 187 (Forests), dated the 27th June 1901, Mr. G. K. Parker, Officiating Deputy Conservator of Forests, assumed charge of the Ataran Division on the afternoon of the 26th July 1901, relieving Mr. R. S. Troup, Officiating Deputy Conservator of Forests.

7th August 1901.—No. 253.—(CORRIGENDUNI).—In this department Notification No. 218 (Forests), dated the 19th July 1901, *for* "2nd July 1901" *read* "1st July 1901."

7th August 1901.—No. 254.—Mr. A. E. Ross, Assistant Conservator of Forests, has been granted by his Majesty's Secretary of State for India an extension of leave on medical certificate for two months.

7th August 1901.—No. 255.—Mr. E. S. Carr, Deputy Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of furlough for six days.

7th August 1901.—Mr. E. S. Carr, Deputy Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

7th August 1901.—No. 257.—Mr. S. F. L. Cappel, Deputy Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of leave on medical certificate for two and a-half months.

7th August 1901.—No. 260.—Under the provisions of Articles 291, 369 and 264A of the Civil Service Regulations, Mr. J. L. Hefferman, Extra-Assistant Conservator of Forests, is granted privilege leave for two months and four days and leave on medical certificate in continuation thereof for five months and 26 days with effect from the date on which he may avail himself of the privilege leave.

7th August 1901.—No. 261.—Mr. L. C. Davis, Assistant Conservator of Forests, attached to the Tharrawaddy Division, is posted to the charge of the North Tharrawaddy Sub-Division.

9.—Assam Gazette.

6th August 1901.—No. 5965G.—The following Notification by the Government of India in the Department of Revenue and Agriculture is republished :—

No. 810*F.*—107-4 (*Forests*), *dated Simla, the 26th July* 1901.—Mr. E P. Dansey, Conservator of Forests, 1st grade, on furlough, is permitted to retire from the service of Government with effect from the 3rd June 1901.

From the same date the following appointments are made :—

* * * * * *

(iii) Mr. C. G. D. Fordyce, Deputy Conservator, Bengal, and Officiating Conservator, 3rd grade, Assam, is confirmed in that grade and promoted to officiate in the 2nd grade of Conservators.

10.—Hyderabad Residency Gazette.

25th July 1901.—No. 266.—Mr. Pandurang Narayan, Officiating Extra-Assistant Conservator of Forests, in charge of the Buldana Forest Division, has been granted privilege leave for three months, with effect from the 1st July 1901.

11.—Mysore Gazette.

29th July 1901.—No. 53—374.—Under Article 172 of the Mysore Service Regulations, Mr. H. Srinivasa Rao, Sub-Assistant Conservator of Forests, Mysore district, is granted casual leave of absence for twelve days, with effect from the 14th August 1901 or such other date as he may avail himself of the same. Mr. A. G. R. Theobald, Sub-Assistant Conservator, will be in charge of the Heggaddevankote Range, in addition to his own duties, during the absence of Mr. Srinivasa Rao on leave, or until further orders.

2nd August 1901.—No. 60—437.—Mr. G. E. Ricketts, Assistant Conservator of Forests, whose services were temporarily placed at the disposal of the Jeypur State under Government Notification No. 5519—Ft. F. 60-95, dated the 1st February 1900, will, on his return, resume charge of the office of District Forest Officer, Kadur.

Mr. Y. Sitaramaiya, District Forest Officer, Kadur, is posted to the Chitaldrug district as District Forest Officer. To join on being relieved by Mr. G. E. Ricketts.

5th August 1901.—No. 73—493.—Mr. B. Ramaswami Iyer, District Forest Officer, Chitaldrug, on relief by Mr. Y. Sitaramaiya, will, pending further orders, be employed on forest settlement work in the Chitaldrug and Kadur districts.

8th August 1901.—No. 80—540.—Mr. P. E. Benson, Assistant Conservator of Forests, 3rd grade, sub *pro tem.*, is posted to the Mysore district for duty under the District Forest Officer.

Pioneer Press, No. 1300—1-10-1901—525.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

4th September 1901.—No. 948—204-4-F.—Mr. F. S. Barker, Deputy Conservator of Forests, 2nd grade, Central Provinces, is reduced in rank to the 1st grade of Assistant Conservators, with effect from the 4th September 1901, and is transferred to Assam.

12th September 1901.—No. 969—57-34-F.—The services of Mr. C. S. Rogers, Extra-Assistant Conservator of Forests, Burma, have been placed temporarily at the disposal of His Majesty's Colonial Office for employment in Trinidad, with effect from the 24th March 1901.

2.—Madras Gazette.

11th August 1901.—*Promotion.*—A. Srinivasa Hebbar, Forest Ranger, 6th grade, is promoted to Forest Ranger, 5th grade, with effect from 1st July 1901 (*vide* Board's Proceedings, Forest No. 472, Miscellaneous, dated 25th July 1901).

14th August 1901.—No. 357.—Promotions.

No.	Name of Officer.	Present Grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, etc.
With effect from the date of Mr. O'Leary's reversion to the First Grade of Assistant Conservators of Forests and until further orders.					
1	Mr. J. S. Scot ...	Assistant Conservator of Forests, 1st grade.	Deputy Conservator of Forests, 4th grade.	Sub *pro tem.*	
With effect from 1st July 1901, the date of retirement of Mr. A. W. Peet.					
1	Mr. J. S. Battie ...	Deputy Conservator of Forests, 3rd grade, and acting in the 2nd grade.	Deputy Conservator of Forestss, 2nd grade.	Permanent.	
2	,, G. F. F. Foulkes...	Deputy Conservator of Forests, 4th grade, and acting in the 3rd grade.	Deputy Conservator of Forests, 3rd grade.	Do.	
3	,, H. Tireman ...	Assistant Conservator of Forests, 1st grade, and acting Deputy Conservator of Forests, 4th grade.	Deputy Conservator of Forests, 4th grade.	Do.	
4	,, A. W. Lushington	Deputy Conservator of Forests 2nd grade.	Deputy Conservator of Forests, 1st grade.	Acting ...	*Vice* Mr. Porter acting as Conservator of Forests.
5	,, P. M. Lushington	Deputy Conservator of Forests, 3rd grade.	Deputy Conservator of Forests, 2nd grade.	Do. —	During the absence of Mr. T. P. Peake on leave.
6	,, H. A. Latham ...	Deputy Conservator of Forests, 4th grade.	Deputy Conservator of Forests, 3rd grade.	Do. ...	During the deputation of Mr. R. McIntosh as Instructor at the Imperial Forest School, Dehra Dun, or until further orders
7	,, C. B. Dawson ...	Assistant Conservator of Forests, 1st grade.	Deputy Conservator of Forests, 4th grade.	Do. ...	

No.	Name of Officer.	Present Grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy etc.
	During the absence of Mr. A. W. C. Stanbrough on leave or until further orders.				
1	Mr. F. A. Lodge ...	Deputy Conservator of Forests, 2nd grade.	Deputy Conservator of Forests, 1st grade.	Acting.	
2	,, C. D. McArthy ...	Deputy Conservator of Forests, 3rd grade.	Deputy Conservator of Forests, 2nd grade.	Do.	
3	,, S. Cox ...	Deputy Conservator of Forests, 4th grade.	Deputy Conservator of Forests, 3rd grade.	Do.	

23*rd August* 1901.—*Transfer.*—M. R. Ry. T. Bapu Row, Extra-Assistant Conservator, 4th grade, from the North Arcot district to the Cuddapah district; to join forthwith.

28*th August* 1901.—*Leave.*—To M. R. Ry. T. Arumuga Mudaliyar, Ranger, 3rd grade, North Arcot district, on medical certificate, under section 369 of the Civil Service Regulations, for three months from 22nd August 1901.

Transfers.—M. R. Ry. T. Subroyalu Naidu, Ranger, 4th grade, from the Chingleput district to direction to do duty under the Working Plans Officer, Central Circle; to join on relief by Ranger R. Sama Row.

M. R. Ry. R. Sama Row, Ranger, 5th grade, from the Cuddapah district to the Chingleput district, on relief by M. R. Ry. T. Bapu Row.

28*th August* 1901.—*Leave on Medical Certificate*—To M. R. Ry. A. N. Venkatachellam Chetty, Ranger, 5th grade, Nellore district, under section 369 of the Civil Service Regulations, from 11th to 16th April 1901, both days inclusive.

1*st September* 1901.—*Leave.*—Mr. M. S. Noronha, Ranger, III, the Nilgiris, is granted privilege leave on medical certificate, under section 291 of the Civil Service Regulations, for three months, from 23rd August 1901.

3.—Bombay Gazette.

17*th August* 1901.—No. 3478.—Mr. Gopal Manjunath Bhatkal, Extra-Assistant Conservator of Forests, on his relief by Mr. G. R. Mane at Haliyal, in the Northern Division of Kanara, reported himself for duty in the Southern Division of Kanara on the forenoon of 23rd July 1901, and, on his transfer to the Central Circle, was relieved of his duties in this Circle on the 1st instant, in the afternoon.

4*th September* 1901.—No. 2166.—Messrs. Ralph S. Pearson and A. G. Edie, acting Deputy Conservators of Forests, 4th grade, respectively delivered over and received charge of the Divisional Forest Office, West Khandesh, on the afternoon of the 16th August 1901.

13*th September* 1901.—No. 1840.—Mr. G. E. Marjoribanks, Assistant Conservator of Forests and Divisional Forest Officer, North Thana, is allowed one month's privilege leave from the 11th of September 1901.

Mr. G. E. Marjoribanks, Divisional Forest Officer, North Thana, handed over and Mr. H. Murray received charge of the North Thana Division on the afternoon of the 10th instant.

18*th September* 1901.—No. 6559.—Mr. T. B. Fry, Conservator of Forests, 3rd grade, has been allowed by His Majesty's Secretary of State, for India to return to duty within the period of his leave.

4.—Bengal Gazette.

27*th August* 1901.—No 3407.—With effect from the 3rd June 1901, the following promotions are made in consequence of the appointment of Mr. C. G. D. Fordyce to be Conservator of Forests :—

Mr. R J. Heinig, Deputy Conservator of Forests, 2nd grade, and Officiating Deputy Conservator, 1st grade, is confirmed in the latter grade.

„ C. G. Rogers, F.C.H., Deputy Conservator of Forests, 3rd grade, and Officiating Deputy Conservator, 1st grade, is promoted to the 2nd grade of Deputy Conservators.

„ W. F. Lloyd, Deputy Conservator of Forests, 4th grade, and Officiating Deputy Conservator of Forests, 2nd grade, is promoted to the 3rd grade of Conservators.

Sir Henry Anthony Farrington, Deputy Conservator of Forests, 4th grade, sub *pro tem.*, and Officiating Deputy Conservator of Forests, 3rd grade, is confirmed in the 4th grade of Deputy Conservators.

Mr. J. W. A. Grieve, Assistant Conservator of Forests, 1st grade, and Officiating Deputy Conservator of Forests, 3rd grade, to be Deputy Conservator of Forests, 4th grade, sub *pro tem.*

„ T. H. Monteath, Assistant Conservator of Forests, 1st grade, sub *pro tem.*, and Officiating Deputy Conservator of Forests, 3rd grade, is confirmed in the 1st grade of Assistant Conservators.

„ E. R. Stevens, Assistant Conservator of Forests, 2nd grade, and Officiating Deputy Conservator of Forests, 4th grade, is promoted to be Assistant Conservator of Forests, 1st grade, sub *pro tem.*

5.—N.-W. P. and Oudh Gazette.

31*st August* 1901.—No. $\frac{3907}{11-86-A-9}$.—The following temporary promotions and reversions are notified for general information :—

Entry No.	With effect from	Consequent on	Name.	From	To
1	2nd June 1901.	The departure of Mr. W. Lovegrove, on leave.	Mr. P. H. Clutterbuck.	Officiating Deputy Conservator of Forests, 3rd grade.	Officiating Deputy Conservator of Forests, 2nd grade.
			Mr. J. C. Tulloch.	Officiating Deputy Conservator of Forests, 4th grade.	Officiating Deputy Conservator of Forests, 3rd grade.

Entry No	With effect from	Consequent on	Name.	From	To
			Mr. F. F. R. Channer.	Officiating Assistant Conservator of Forests, 1st grade.	Officiating Deputy Conservator of Forests, 4th grade.
2	2nd July 1901.	The departure of Mr. F. F. R. Channer on leave.	Mr. R. H. B. M. Dobree.	Officiating Assistant Conservator of Forests, 1st grade.	Officiating Deputy Conservator of Forests, 4th grade.
3	25th July 1901.	The departure of Mr. F. A. Leete on leave.	Mr. H. G. Billson.	Officiating Deputy Conservator of Forests, 4th grade.	Officiating Deputy Conservator of Forests, 3rd grade.
4	1st August 1901.	The return of Mr. W. Shakespear from leave.	Mr. F. J. Campbell.	Officiating Deputy Conservator of Forests, 1st grade.	Officiating Deputy Conservator of Forests, 2nd grade.
			Mr. P. H. Clutterbuck.	Officiating Deputy Conservator of Forests, 2nd grade.	Officiating Deputy Conservator of Forests, 3rd grade.
			Mr. H. G. Billson.	Officiating Deputy Conservator of Forests, 3rd grade.	Officiating Deputy Conservator of Forests, 4th grade.

11*th September* 1901.—No. $\frac{4068}{\text{II—622-B—1}}$.—The undermentioned officer has been granted by His Majesty's Secretary of State for India Extension of leave :—

Name.	Service.	Appointment.	Period and nature of leave.
Mr. F. B. Bryant ...	Imperial Forest Service.	Deputy Conservator of Forests.	Furlough extended to 18th January 1902.

6.—Punjab Gazette.

17*th August* 1901.—No. 450.—*Erratum.*—In the Notification of the Government of the Punjab in the Forest Department, No. $\frac{360}{\text{A. L. No. 17}}$, dated the 1st of July 1901, *for* "Mr. A. V. Monro, Provisional Deputy Conservator, 4th grade, Officiating Deputy Conservator, 2nd grade," *read* "Mr. A. V. Monro, Provisional Deputy Conservator, 3rd grade, Officiating Deputy Conservator, 2nd grade."

19*th August* 1901.—No. $\frac{453}{\text{A. L. No. 20}}$, Erratum to *Punjab Gazette* Notification in the Forest Department, No. $\frac{360}{\text{A. L. No. 17,}}$, dated 1st July 1901 :—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. R. S. Hole ...	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	8th April 1901.	Consequent on Mr. Bartlett proceeding on twenty-three days privilege leave and one year's furlough with effect from 16th March 1901.
Mr. D. O. Witt ...	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	9th April 1901.	Consequent on Mr. Hoghton proceeding on two months and ten days' privilege leave and one year's furlough from 10th March 1901.

7th *September* 1901.—No. 484—A. L. No. 21.—Mr. A. L. McIntire, Deputy Conservator of Forests, on return from Berar took overcharge of the Kulu Forest Division on the afternoon of the 14th August 1901, relieving Mr. A. D. Blascheck, Assistant Conservator of Forests, transferred to the Kangra Division.

14th *September* 1901.—No. 505—A. L. No. 22.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified against each :—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. A. E. Lowrie ..	Officiating Deputy Conservator, 1st grade.	Provisional Deputy Conservator, 2nd grade.	9th August 1901.	Consequent on Mr. McIntire's return from Acting Conservator of Forests in Berar.
Mr. A. V. Monro ...	Officiating Deputy Conservator, 2nd grade.	Provisional Deputy Conservator, 3rd grade.		
Mr. C. O. Hanson...	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.		
Mr. A.P. Percival...	Officiating Deputy Conservator, 4th grade.	Provisional Assistant Conservator, 1st grade.		
Mr. A. L. McIntire	Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 1st grade.	9th August 1901.	Consequent on Mr. King proceeding on three months' privilege leave from 20th June 1901.
Mr. A. V. Monro ...	Provisional Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.	20th August 1901.	Consequent on Mr. Somers. Smith proceeding on one month and ten days' privilege leave from the afternoon of 20th July 1901.
Mr. C.O. Hanson...	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.		
Mr. A.P. Percival...	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.		

16*th September* 1901.—No. 509—A. L. No. 23.—The last entry in Notification No. 396—A. L. No. 18, dated 26th July 1901, regarding the promotion of Mr. J. C. Carroll from Provisional Assistant Conservator, 1st grade, to Officiating Deputy Conservator, 4th grade, is hereby cancelled.

23*rd September* 1901.—No. 515—A. L. No. 24.—Mr. A. D. Blascheck, Assistant Conservator of Forests, has been attached to the Kangra Forest Division with effect from the afternoon of the 19th August 1901, for the preparation of the Working Plan for the Kangra Forests.

24*th September* 1901.—No. 520—A. L. No. 25.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified against each.

Notification No. 417—A. L. No. 19, dated 5th August 1901, is hereby cancelled :—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. A. P. Percival...	Officiating Deputy Conservator, 4th grade.	Provisional Assistant Conservator, 1st grade.	18th July 1901	Consequent on Mr. McCrie's return from privilege leave.
Mr. A. E. Lowrie...	Provisional Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 1st grade.	20th July 1901	Consequent on Mr. King proceeding on three months' privilege leave from 20th June 1901.
Mr. A. V. Monro ...	Provisional Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.		
Mr. C. O. Hanson...	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.		
Mr. A. P. Percival...	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.		

7.—Central Provinces Gazette.

14*th August* 1901.—No. 56.—Privilege leave for one month, under Article 291 of the Civil Service Regulations, is granted to Ranger Mr. Phirozshah Katpitia, Permanent Establishment, Nimar Division, with effect from the 1st September 1901.

21*st August* 1901.—No. 10.—Mr. F. W. Wightman, Forest Ranger, 1st grade, attached to the Chanda Division, is granted eight days' privilege leave with effect from the 2nd instant.

22*nd August* 1901.—No. 4280.—Privilege leave for ten days, in extension of the privilege leave for one month, granted him by Order No. 2946, dated the 22nd June 1901, is granted to Mr. C. Somers-Smith Deputy Conservator of Forests, Saugor.

23*rd August* 1901.—No. 11.—Mr. K. Rama Rao, Forest Ranger, 2nd grade, attached to the Balaghat Forest Division, is granted two months' privilege leave with effect from the 7th instant.

24*th August* 1901.—No. 57.—Baboo Lal, Deputy Ranger, 2nd grade, is permitted to resign his appointment with effect from date on which he is relieved of his duty.

28*th August* 1901.—No. 59.—The leave on medical certificate for three months, under Article 369 of the Civil Service Regulations, granted to Deputy Ranger Raghunath Parshad, Permanent Establishment, Mandla Division, by Departmental Order No. 10, dated the 2nd May 1901, with

effect from the 26th May 1901, is extended by two months' extraordinary leave, without pay, under Article 372 of the Civil Service Regulations.

5th September 1901.—4511.—Mr. D. O. Witt, Assistant Conservator, 1st grade, in charge of the Mandla Forest Division, is transferred to the Direction Division, Northern Circle.

5th September 1901.—Mr. R. C. Thompson, Extra-Assistant Conservator, 2nd grade, is directed to hold charge of the Mandla Forest Division.

5th September 1901.—No. 4512.—Privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. D. O. Witt, Assistant Conservator of Forests, 1st grade, with effect from the afternoon of the 8th August 1901.

Orders Nos—2305 and 2306, dated the 13th May 1901, are hereby cancelled.

5th September, No. 4513.—Consequent on the deputation of Mr. R. C. Thompson, Extra-Assistant Conservator, 2nd grade, for employment under the Government of Siam, Mr. S. R. Parsons, Extra-Assistant Conservator, Narsinghpur Division, is directed to hold charge of the Mandla Division.

Chintaman Vishwanath, Ranger, 4th grade, is directed to hold charge of the current duties of the office of Forest Divisional Officer, Narsinghpur, during the absence of Mr. S. R. Parsons until further orders.

8.—Burma Gazette.

13th August 1901.—No. 263.—Mr. H. L. P. Walsh, Assistant Conservator of Forests, is transferred from the Upper Chindwin division to the charge of the Kyaukse subdivision, of the Mandalay division, *vice* Mr. Rorie transferred.

13th August 1901.—No 264.—Mr. J. J. Rorie, Officiating Deputy Conservator of Forests, on relief by Mr. Walsh, is transferred from the Kyaukse sub-division, of the Mandalay division, to the charge of the Upper Chindwin division, in place of Mr. B. P. Kelly.

13th August 1901.—No. 265.—Mr. B. P. Kelly, Extra-Assistant Conservator, of Forests, on relief by Mr. Rorie, is posted to the charge of the Revenue sub-division, Upper Chindwin division.

13th August 1901.—No. 271.—The following promotions are ordered in the Provincial Forest Service with effect from the date of this notification :—

Mr. R. M. Kavanagh, Extra-Assistant Conservator, 1st grade, to be Extra Deputy Conservator, 4th grade.

Mr. F. Ryan, Extra-Assistant Conservator, 1st grade, to be Extra Deputy Conservator, 4th grade.

Mr. C. W. B. Anderson, Extra-Assistant Conservator, 2nd grade, on deputation to the Andamans to be Extra-Assistant Conservator, 1st grade.

Mr. C. H. Haldane, Extra-Assistant Conservator, 2nd grade, to be Extra-Assistant Conservator, 1st grade.

Mr. E. B. Powell, Extra-Assistant Conservator, 2nd grade, to be Extra-Assistant Conservator, 1st grade.

Mr. D. H. Allan, Extra-Assistant Conservator, 2nd grade, to be Extra-Assistant Conservator, 1st grade.

Mr. J. W. Ryan, Extra-Assistant Conservator, 3rd grade, to be Extra-Assistant Conservator, 2nd grade.

Maung Yaing, Extra-Assistant Conservator, 3rd grade, to be Extra-Assistant Conservator, 2nd grade.

Mr. R. L. Pocock, Extra-Assistant Conservator, 3rd grade, to be Extra-Assistant Conservator, 2nd grade.

Mr. W. H. Craddock, Extra-Assistant Conservator, 3rd grade, to be Extra-Assistant Conservator, 2nd grade.

Mr. C. E. Allen, Extra-Assistant Conservator, 3rd grade, to be Extra-Assistant Conservator, 2nd grade.

Mr. T. W. Froster, Extra-Assistant Conservator, 4th grade, to be Extra-Assistant Conservator, 3rd grade.

Maung Tha Ka Do, Extra-Assistant Conservator, 4th grade, to be Extra-Assistant Conservator, 3rd grade.

Mr. J. L. Hefferman, Extra-Assistant Conservator, 4th grade, to be Extra-Assistant Conservator, 3rd grade.

Mr. S. A. Wood, Extra-Assistant Conservator, 4th grade, seconded for foreign service under the Siamese Government, to be Extra-Assistant Conservator, 3rd grade.

Mr. R. R. O'Hara, Extra-Assistant Conservator, 4th grade, to be Extra-Assistant Conservator, 3rd grade.

Mr. G. T. Wrafter, Extra-Assistant Conservator, 4th grade, on deputation to the Andamans, to be Extra-Assistant Conservator, 3rd grade.

Mr. C. V. Ryan ; Extra-Assistant Conservator, 4th grade, to be Extra-Assistant Conservator, 3rd grade, provisionally substantive, while Mr. S. A. Wood remains seconded.

13*th August* 1901.—No. 272.—The following promotion is ordered from the Subordinate Forest Service to the Provincial Forest Service, with effect from the date of this notification :—

Mr. W. R. French, Ranger, 1st grade, to be Extra-Assistant Conservator, 4th grade, provisionally substantive, while Mr. S. A. Wood remains seconded.

13*th August* 1901.—No. 12.—With reference to Revenue Department Notifications Nos. 260 and 261 (Forests), dated the 8th August 1901, Mr. L. C. Davis, Assistant Conservator of Forests, assumed charge of the North Tharrawaddy sub-divison on the forenoon of the 7th August 1901, relieving Mr. J. L. Hefferman, Extra-Assistant Conservator of Forests.

14*th August* 1901.—No. 497.—The following promotions are ordered in the Subordinate Forest Service with effect from the date of the notification :—

Maung Tha Gywe, Ranger, 2nd grade, to be Ranger, 1st grade, provisionally substantive, so long as Mr. W. R. French remains in the Provincial Forest Service.

Maung San E. Ranger, 3rd grade, to be Ranger, 2nd grade, provisionally substantive, so long as Mr. W. R. French remains in the Provincial Forest Service.

Maung Tha Din, Supernumerary Ranger, 3rd grade, to be provisionally substantive in the 3rd grade of Rangers, while Mr. W. R. French remains in the Provincial Forest Service.

14*th August* 1901.—No. 13.—With reference to Revenue Department Notification No. 240 (Forests), dated the 5th August 1901, Mr. A. H. M. Lawson, Deputy Conservator of Forests, relieved Mr. H. C. Walker, Assistant Conservator of Forests, of the charge of the Paungde sub-division (Prome division) on the afternoon of the 9th August 1901.

14*th August* 1901.—No. 12.—With reference to Revenue Department notification No. 215 (Forests), dated the 17th July 1901, Mr. C. W. Doveton, Deputy Conservator of Forests, relinquished charge of his duties in the

Working Plans Division No. 2 (Pyinmana division), on the forenoon of the 19th July 1901.

21*st August* 1901.—No. 283 (*Forests*).—Mr. S. Eardley-Wilmot, Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

No. 284 (*Forests*).—Mr. S. Carr, Deputy Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

22*nd August* 1901.—No. 13.—Mr. W. R. French, Extra-Assistant Conservator of Forests, was relieved of his duties in the Mogaung Range on the 20th July 1901, by Maung Ba O, Ranger, 3rd grade, and took over charge of the Myadaung sub-division, Katha division, from Mr. J. Messer, Deputy Conservator of Forests, on the 23rd July 1901.

23*rd August* 1901.—No. 12.—With reference to Revenue Department Notification No. 240 (Forests), dated the 5th August 1901, Mr. H. C. Walker, Assistant Conservator of Forests, assumed charge of the Thaungyin division on the forenoon of the 19th August 1901, relieving Mr. G. K. Parker, Officiating Deputy Conservator of Forests.

24*th August* 1901.—No. 285.—In supersession of this Department Notification No. 213 (Forests), dated the 17th July 1901, and under the provisions of Articles 291, 340 (*b*), and 264A of the Civil Service Regulations Mr. H. Jackson, Deputy Conservator of Forests, is granted privilege leave for 12 days and furlough in continuation thereof for five months and 18 days with effect from the 24th July 1901.

27*th August* 1901.—No. 286.—Under the provisions of section 372 of the Civil Service Regulations Mr. J. W. Ryan, Extra-Assistant Conservator of Forests, is granted an extension of furlough for twenty-six days.

27*th August* 1901.—No. 287.—Mr. J. W. Ryan, Extra-Assistant Conservator of Forests, was placed on special duty at Madras in connection with the recruitment of coolies for the Mergui Rubber plantation, with effect from the 18th July last.

28*th August* 1901.—No. 13.—With reference to Revenue Department Notification No. 206 (Forests), dated the 13th July 1901, Mr. J. W. Ryan, Extra-Assistant Conservator of Forests, assumed charge of the Rubber Plantation at Mergui on the forenoon of the 19th August 1901, relieving Mr. W. A. Hearsey, Extra-Assistant Conservator of Forests.

30*th August* 1901.—No. 290.—The following promotions are ordered in the Provincial Forest Service, provisionally substantive, while Mr. C. W. B. Anderson remains in the Andamans Commission, with effect from the date of this notification :—

Mr. J. W. Ryan, Extra-Assistant Conservator, 2nd grade, to be Extra-Assistant Conservator, 1st grade.

Mr. T. W. Forster, Extra-Assistant Conservator, 3rd grade, to be Extra-Assistant Conservator, 2nd grade.

Mr. P. E. Plunkett, Extra-Assistant Conservator, 4th grade, to be Extra-Assistant Conservator, 3rd grade.

30*th August* 1901.—No 291.—The following promotion is ordered with effect from this date from the Subordinate Forest Service to the Provincial Forest Service, provisionally substantive, while Mr. C. W. B. Anderson remains in the Andamans Commission :—

Mr. W. J. G. Cooper, Ranger, 2nd grade, to be Extra-Assistant Conservator, 4th grade.

30th August 1901.—No 535.—The following promotions are ordered in the Subordinate Forest Service, provisionally substantive, while Mr. W. J. G. Cooper remains in the Provincial Forest Service :—

Maung Kyaing, Ranger, 3rd grade, to Ranger, 2nd grade.

Maung Po Ta, Supernumerary Ranger, 3rd grade, to be Ranger, 3rd grade.

3rd September 1901.—No. 294.—Mr. W. F. L. Tottenham, Deputy Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

10th September 1901.—No. 302.—Under the Provisions of Article 282 (i) of the Civil Service Regulations, Mr. R. S. Troup, officiating Deputy Conservator of Forests, is granted an extension of leave for 15 days.

10th September 1901.—No 311.—Mr. C. H. Haldane, Extra-Assistant Conservator of Forests, is posted to the charge of the Thayetmyo Forest division, *vice* Mr. C. L. Toussaint, deceased, as a temporary measure until the return of Mr. E. S. Carr from leave.

10th September 1901.—No. 312.—Mr. E. S. Carr, Deputy Conservator of Forests, on return from leave is posted to the charge of the Thayetmyo Forest division, *vice* Mr. C. L. Toussaint, deceased.

10th September 1901.—No. 313.—Mr. C. E. Muriel, Deputy Conservator of Forests, on return from leave is posted to the charge of the Minbu Forest division, *vice* Mr. S. E. F. Jenkins.

10th Sentember 1901.—No. 318.—Under the provisions of Article 282 (ii) of the Civil Service Regulations, Mr. F. Linnell, Deputy Conservator of Forests, is permitted to overstay by 15 days the privilege leave granted to him in this Department Notification No. 177 (Forests), dated the 20th June 1901.

9.—Assam Gazette.

28th August 1901.—No. 6476G.—The following Notification by the Government of India in the Department of Revenue and Agriculture is republished :—

Notification No. 899-F.—79-18 (*Forests*), *dated* 20*th August* 1901.

16th September 1901.—No. 6848-G.—The following Notification by the Government of India in the Department of Revenue and Agriculture is republished :—

Notification No. 943-*F.* -204-4 *(Forests), dated 4th September* 1901.

16th September 1901.—No. 6849-G.—Mr. F. S. Barker, Assistant Conservator of Forests, is attached to the Goalpara, Forest Division.

10.—Hyderabad Residency Gazette.

5th August 1901.—No. 273.—Mr. S. L. Kenny, Officiating Deputy Conservator of Forests, attached to the Ellichpur Forest Division, was, on return from privilege leave, appointed to the charge of the Basim Forest Division, with effect from the forenoon of the 13th March 1901.

7th August 1901.—No. 276.—Consequent on the abolition of the Akola Forest Division as a separate charge and the reconstitution of the Forets Divisional charges as notified in *Residency Orders* Notification No. 199, dated the 4th June 1901, the following transfers have been ordered by the Resident among Forest Officers in Berar :—

Mr. L. K. Martin, Extra-Assistant Conservator, to be in charge of the Buldana Forest Division as newly constituted.

Mr. W. J. Peake, Extra-Assistant Conservator, attached to the Ellichpur Forest Division, to be in charge of the Amraoti Forest Division.

Rai Bahadur Mansukh Rai, Extra-Assistant Conservator, in charge of the Amraoti Forest Division, to be in charge of the Direction Division, where he will be employed in connection with the preparation of Working Plans.

Rai Bahadur Mansukh Rai, Extra-Assistant Conservator of Forests, in charge of the Direction Division, is placed in charge of the Basim Division, in addition to his own duties, as a special and temporary arrangement.

7th August 1901.—No. 277.—Mr Pandurang Narayen, Officiating Extra-Assistant Conservator of Forests, will, on return from privilege leave, be attached to the Ellichpur Forest Division.

12th August 1901.—No. 281.—Mr. S. L. Kenny, Officiating Deputy Conservator of Forests and Divisional Forest Officer, Basim, has been granted four months' special leave under Article 548, Civil Service Regulations, with effect from the 20th August 1901, or the subsequent date on which he may avail himself of it.

Mr. C. H. Haldane, Extra-Assistant Conservator of Forests, in charge of the Basim Forest Division, was transferred, with effect from the same hour and date, to the Direction Division for employment on special duty connected with the settlement of free-grazing areas and the revision of Working Plans.

11.—Mysore Gazette.

17th August 1901—No. 123—700.—In continuation of Notification No. 80—540, dated the 8th August 1901, Mr. P. E. Benson, Assistant Conservator of Forests, 3rd grade, is posted to the Hunsur Range, *vice* Mr. A. G. R. Theobald, Sub-Assistant Conservator of Forests.

19th August 1901.—No. 130—728.—Mr. A. G. R. Theobald, Sub-Assistant Conservator of Forests, Hunsur Range, Mysore district, is granted privilege leave for three months, with effect from the 1st September 1901, on his retirement from service.

3rd September 1901.—No. 207—979.—The casual leave of absence for fifteen days granted under Article 172 of the Mysore Service Regulations to Mr. B. Ramaswamy Iyer, Assistant Conservator of Forests, Chitaldrug district, in Notification No. 823—Ft. F. 19-95, dated the 5th June 1901, is extended by one day, and the whole leave, *viz.*, sixteen days, is commuted to privilege leave under Article 188 of the said Regulations.

5th September 1901.—No. 214—1011.—The two months' privilege leave of absence granted to Mr. S. A. Bapu Rao, Deputy Conservator of Forests, Shimoga district, in Notification No. 734—Ft. F. 104-95, dated the 11th May 1901, is hereby extended by three days.

Pioneer Press, No. 1435—17-11-1901—525.

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

27*th September* 1901.—No. 1003—152-9-*F.*—The services of the undermentioned officers have been placed temporarily at the disposal of the Foreign Department for employment in Siam.

(i) Mr. W. F. L. Tottenham, Deputy Conservator of Forests, 3rd grade, Burma, with effect from the 2nd April 1897.

(ii) Mr. D. O. Witt, Officiating Deputy Conservator, 4th grade, Central Provinces, with effect from the date of his return from the privilege leave granted him by the Honourable the Chief Commissioner of the Central Provinces in Notification No. 4512, dated 5th September 1901.

(iii) Mr. R. C. Thompson, Extra-Assistant Conservator, 2nd grade, Central Provinces, with effect from the 23rd August 1901.

(iv) Mr. S. A. Wood, Extra-Assistant Conservator, 3rd grade, Burma, with effect from the 14th March 1897.

27*th September* 1901.—No. 1008—208-6-*F.*—Mr. A. Weston, Officiating Conservator, 3rd grade, in charge of the Northern Forest Circle, Upper Burma, reverted to his substantive appointment of Deputy Conservator, 1st grade, with effect from the afternoon of the 2nd September 1901, when he was relieved of that charge by Mr. A. M. Reuther, Conservator.

Mr. Reuther continued to hold charge of the two Forest Circles in Upper Burma until the forenoon of the 14th September 1901, when he was relieved of charge of the Northern Circle by Mr. H. Slade, Deputy Conservator, 1st grade, who is appointed to officiate as Conservator, 3rd grade, from the same date.

3*rd October* 1901.—No. 1039—221-3-*F.*—Mr. F. B. Manson, Conservator of the 3rd (officiating 2nd) grade, in charge of the Tenasserim Forest Circle, Burma, is granted privilege leave for one month and eleven days, combined with furlough for one year, one month and nineteen days, with effect from the 1st October 1901, or such subsequent date as he may be permitted to avail himself of it.

4*th October* 1901.—No. 1047—212-5-*F.*—Privilege leave for one month, under Article 336 (*b*) of the Civil Service Regulations, is granted to Mr. E. A. Down, Deputy Conservator of Forests, Baluchistan, with effect from the 24th August 1901.

11*th October* 1901.—No. 1074.—205-4-*F.*—The services of Mr. A. W. Blunt, Deputy Conservator of Forests, 3rd grade, Central Provinces, are placed temporarily at the disposal of the Foreign Department for employment in the Rewah State, with effect from the 1st November 1901, or subsequent date.

2.—Madras Gazette.

17*th September* 1901.—*Departmental Test.*—The following Subordinates have passed the Departmental Test in parts noted against each of section 69 of the Forest Code at the examination held on the 25th July 1901 :—

Name and designation.	In parts (*a*) or (*b*).
S. F. Lobo, Forester, III	.. (*b*).
P. Subba Row, Forester, III ..	.. (*a*) and (*b*).
K. Gopalakrishna Row, Probationary Forester, III,	(*b*).
C. Narayanan, Forester, III ..	.. (*a*).
R. V Subramania Mudali, Forester. III	.. (*b*).
G. Savarimuthu Mudali, Forester, III ..	.. (*b*).

20th September 1901.—*Reduction.*—M. Callanan, Forest Ranger, Nellore district, from the 2nd to the 3rd grade from 1st October 1901.

3.—Bombay Gazette.

30th September 1901.—No. 2455.—Messrs. C. S. McKenzie, Assistant Conservator of Forests, and R. C. Wroughton, Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, Working Plans, Central Circle, on the 24th September 1901, in the afternoon.

30th September 1901.—No 6834 —Mr. W. A. Talbot, Acting Conservator of Forests, Southern Circle, is allowed privilege leave of absence for one month and seventeen days in combination with special leave on urgent private affairs for four months and thirteen days from the date of relief by Mr. T. B. Fry.

1st October 1901.—No 6859.—Mr. H. Murray, Deputy Conservator of Forests, 2nd grade, has been appointed to hold charge of the office of Divisional Forest Officer, North Thana, in addition to his own duties, during the absence of Mr. G. E. Marjoribanks on one month's privilege leave or pending further orders.

4.—Bengal Gazette.

5th October 1901.—No. 3629.—Consequent on the return of Mr. C C. Hatt, Deputy Conservator of Forests, 4th grade, on the forenoon of 9th September 1901, from furlough granted him in Bengal Government Notification No. 1619 Forests, dated the 27th March 1900, the following changes are made with effect from that date :—

Mr. C. C. Hatt, Deputy Conservator of Forests, 4th grade, is promoted to officiate in the 2nd grade of Deputy Conservators.

Mr. F. Trafford, Deputy Conservator of Forests, 4th grade, and officiating in the 2nd grade, to revert to Officiating Deputy Conservator, 3rd grade.

5.—N.-W. Provinces and Oudh Gazette.—*Nil.*

6.—Punjab Gazette.

3rd October 1901.—No. 541.—*A. L.* No. 26.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified against each :—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. J. C. Carroll ...	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.	24th Aug. 1901	Consequent on Mr. S. L. Kenny proceeding on four months' special leave.
Mr. A. V. Monro ...	Officiating Deputy Conservator, 2nd grade.	Provisional Deputy Conservator, 3rd grade.	31st Aug. 1901	Consequent on Mr. Somers-Smith's return from privilege leave for 1 month and 10 days.
Mr. C. O. Hanson...	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.		
Mr. J. C. Carroll ...	Officiating Deputy Conservator, 4th grade.	Provisional Assistant Conservator, 1st grade.		

3rd October 1901.—No. 545.—*A. L.* No. 27.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified against each :—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. H. A. Hoghton	Provisional Deputy Conservator, 2nd grade.	Deputy Conservator, 2nd grade.	4th Septr. 1901.	Consequent on Mr. F. S. Barker's reduction to Assistant Conservator, 1st grade, and transfer to Assam with effect from 4th September 1901.
Mr G. S. Hart ...	Officiating Deputy Conservator, 2nd grade.	Provisional Deputy Conservator, 2nd grade.		
Mr. A. V. Monro...	Provisional Deputy Conservator, 3rd grade.	Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade.		
Mr. A. M. F. Caccia	Deputy Conservator, 4th grade.	Provisional Deputy Conservator, 3rd grade.		
Mr. C. O. Hanson...	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.		
Mr. B. O. Coventry	Provisional Deputy Conservator, 4th grade.	Deputy Conservator, 4th grade.		
Mr. W. Mayes ...	Officiating Deputy Conservator, 4th grade.	Provisional Deputy Conservator, 4th grade.		
Mr. C.M. McCrie ..	Officiating Deputy Conservator, 4th grade.	Provisional Deputy Conservator, 4th grade.		
Mr. D. O. Witt ...	Provisional Assistant Conservator, 1st grade, and Officiating Deputy Conservator, 4th grade	Assistant Conservator, 1st grade, and Officiating Deputy Conservator, 4th grade.		
Mr. J C. Carroll ...	Provisional Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.		

7th October 1901.—No. 549.—*Leave.*—Pandit Gokal Das, Extra-Assistant Conservator of Forests, attached to the Rawalpindi Forest Division, has been granted six months' leave on medical certificate with effect from the afternoon of the 8th August 1901.

7.—Central Provinces Gazette.

13th September 1901.—No. 63.—The privilege leave for two months (under Articles 291 and 294 of the Civil Service Regulations) granted to Deputy Ranger Shiv Parshad, Permanent Establishment, Narsinghpur Division, by Departmental Order No. 39, dated the 18th June 1901 (with effect from the 14th July 1901) is extended by one month.

13th September 1901.—No. 12.—The unexpired portion of one day of the privilege leave granted to Ranger Dhanjisha Nasarvanji Avasia in the Chanda Division, by Departmental Order No. 6, dated the 12th June 1901, is hereby cancelled.

20th September 1901.—No 64.—The privilege leave for three months, under Article 291 of the Civil Service Regulations, granted to Mr. A. L. Chatterji, Forest Ranger, Permanent Establishment, Saugor Division, by Departmental Order No. 49, dated the 9th July 1901, is cancelled at his own request.

23rd September 1901.—No. 65—Leave on medical certificate for twenty-one days, under Article 369 of the Civil Service Regulations, is granted to Manna Tiwari, Deputy Ranger, Permanent Establishment, Mandla Division, with effect from the 1st to the 21st August 1901.

23rd September 1901.—No. 66.—Privilege leave for twenty-six days, under Article 291 of the Civil Service Regulations, is granted to Dhondu Narayan, Ranger, Permanent Establishment, Hoshangabad Division, with effect from the 28th July to the 22nd August 1901, both dates inclusive.

30th September 1901.—No. 4880—Mr. Narayan Parshad Bajpai, Extra-Assistant Conservator of Forests, Raipur, is directed to hold charge of the Nagpur-Wardha Division until further orders.

1st October 1901.—No. 13.—The two months' privilege leave granted to Mr. K. Rama Rao, Forest Ranger, 2nd grade in the Balaghat Division. by Departmental Order No. 11, dated the 23rd August 1901, is extended by eleven days.

7th October 1901.—No 5186,—Mr. A. P. Percival, Assistant Conservator of Forests, Chanda, is directed to hold charge of the Balaghat Forest Division, during the absence of Mr. A. W. Blunt, Deputy Conservator of Forests, on deputation, or until further orders.

8.—BURMA GAZETTE.

13th September 1901.—No. 13—With reference to Revenue Department Notification No. 263 (Forests), dated 13th August 1901, Mr. J. J. Rorie, Deputy Conservator of Forests, was relieved of the charge of the Kyaukse subdivision (Mandalay division) by Mr. H. L. P. Walsh, Assistant Conservator of Forests, on the afternoon of the 9th September 1901.

14th September 1901.—No. 14—With reference to Revenue Department Notification No. 263 (Forests), dated the 13th August 1901, Mr. H. L. P. Walsh, Assistant Conservator of Forests, relinquished charge of his duties in the Upper Chindwin division on the afternoon of the 31st August 1901.

16th September 1901.—No. 322.—This department Notification No, 296 (Forests), dated the 5th September 1901, is cancelled.

16th September 1901.—No. 323.—(ADDENDUM).—In this Department Notification No. 271 (Forests), dated the 14th August 1901, make the following additional entry between the names of Messrs. C W. B Anderson and C. H. Haldane :—

Mr. C. S. Rogers Extra Assistant Conservator, 2nd grade, on deputation to Trinidad, to be Extra Assistant Conservator, 1st grade.

Make the following entry against the names of Messrs D. H. Allan and C E Allan :—

Substantive provisional while Mr. C. S. Rogers remains seconded.

Make the following entry against the name of Mr. T. T. Wrafter :—

Substantive provisional while Mr. S. A. Wood remains seconded.

In the entry against Mr. C. V. Ryan *for* "Mr. S. A. Wood" *substitute* "Mr. C. S. Rogers"

20th September 1901.—No. 328—Mr. S E. F Jenkins, Extra Assistant Conservator of Forests, on relief by Mr. C. E. Muriel, is posted to the charge of the Magwe subdivision.

20th September 1901—No. 14.—Mr. P E. Plunkett, Extra Assistant Conservator of Forests availed himself of the three months' privilege leave granted to him on the forenoon of the 13th September 1901.

20th September 1901.—No. 15—With reference to Revenue Department Notification No 309 (Forests), dated the 11th September 1901, Mr. A. Weston, Deputy Conservator of Forests, assumed charge of the Ataran Division, relieving Mr. D. H. Allan, Extra Assistant Conservator of Forests, on the forenoon of the 13th September 1901.

21st September 1901—No. 14—With reference to Revenue Department Notification No. 311 (Forests), dated the 11th September 1901, Mr. C H. Haldane, Extra Assistant Conservator of Forests assumed charge of the Thayetmyo Forest Division on the forenoon of the 29th August 1901.

27th September 1901.—No. 340—The following alterations in rank are ordered in the Forest Department :—

(1) With effect from the 3rd July 1901 consequent on the departure on privilege leave of Mr. F. Linnell, officiating Deputy Conservator, 3rd grade :

Mr. J. J. Rorie, Assistant Conservator, 2nd grade (officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade

(2) With effect from the 25th July 1901, consequent on the departure on privilege leave, combined with furlough, of Mr H Jackson, Deputy Conservator, 3rd grade :

Mr. G. F. R. Blackwell, Deputy Conservator, 3rd grade (officiating Deputy Conservator, 2nd grade), to officiate as Deputy Conservator, 1st grade.

Mr. H. N. Thompson, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

(3) With effect from the 27th July 1901, consequent on the departure on privilege leave of Mr. R. S. Troup, officiating Deputy Conservator, 3rd grade, and the departure on privilege leave, combined with furlough, of Mr. H. Carter, Deputy Conservator, 3rd grade :—

Mr. W. T. T. McHarg, Deputy Conservator, 3rd grade, substantive provisional, to officiate as Deputy Conservator, 2nd grade.

Mr. A. Rodger, Assistant Conservator, 2nd grade (officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

(4) With effect from the 2nd September 1900, consequent on the return from deputation of Mr. H. Slade :—

Mr. J. C. Murray, Deputy Conservator, 1st grade, substantive provisional, to be Deputy Conservator, 2nd grade, and to officiate as Deputy Conservator, 1st grade.

Mr. G. F. R Blackwell, Deputy Conservator. 3rd grade (officiating Deputy Conservator, 1st grade), to officiate as Deputy Conservator, 2nd grade.

Mr. A. F. Gradon, Deputy Conservator, 2nd grade, substantive provisional, to be Deputy Conservator, 3rd grade.

Mr. W. T. T. McHarg, Deputy Conservator, 3rd grade, substantive provisional (officiating Deputy Conservator, 2nd grade), to be Deputy Conservator, 4th grade, and to officiate as Deputy Conservator, 2nd grade.

Mr. C. B. Smales, Deputy Conservator, 4th grade, substantive provisional, to be Assistant Conservator, 1st grade, and to officiate as Deputy Conservator, 3rd grade.

Mr. H. W. A. Watson, Assistant Conservator, 1st grade, substantive provisional, to be Assistant Conservator, 2nd grade, and to officiate as Deputy Conservator, 3rd grade.

Mr. A. Lawrence, Assistant Conservator, 2nd grade, to officiate as Deputy Conservator, 4th grade

27th September 1901.—No. 342.—Mr. H W. A. Watson, Assistant Conservator of Forests, on return from leave, is posted to the charge of the Working Plans division (Shwegyin) of the Tenasserim circle.

27th September 1901.—No. 343.—Mr. A. E. Ross, Assistant Conservator of Forests, on return from leave. is posted to the charge of the Thaungyin Forest division, *vice* Mr. H. C. Walker, transferred.

27th September 1901.—No. 344.—Mr. H. C. Walker, Assistant Conservator of Forests, on relief by Mr. A E Ross, is transferred from the Thaungyin Forest division to the charge of the South Tharrawaddy Forest subdivision, *vice* Mr. C. E. Allen, transferred.

27th September 1901.—No. 345.—Mr. C E. Allen, Extra Assistant Conservator of Forests, on relief by Mr. H. C. Walker, is attached to the Thayetmyo Forest division for Working Plans duty.

No. 346.—Mr. C. W. A. Bruce, Deputy Conservator of Forests, on return from leave, is posted to the charge of the Ruby Mines Forest division, *vice* Mr. Cubitt, transferred.

No. 347.—Mr. G. E. S. Cubitt, Assistant Conservator of Forests, on relief by Mr. C. W. A. Bruce, is attached to the Pyinmana Forest division for Working Plans duty.

No 348—Mr. F. Linnell, Deputy Conservator of Forests, on return from leave, is attached to the Pyinmana Forest division for Working Plans duty.

3rd October 1901.—No. 15.—With reference to Revenue Department Notification No. 312 (Forests), dated the 11th September 1901, Mr. E. S. Carr, Deputy Conservator of Forests, assumed charge of the Thayetmyo division on the afternoon of the 26th September 1901, relieving Mr. C. H. Haldane, Extra Assistant Conservator of Forests.

9th October 1901.—No. 361 (Forests)—Mr. A. P. Grenfell, Deputy Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of furlough for 46 days.

11th October 1901.—No. 368 (Corrigendum),—In this department Notification No. 340 (Forests), dated the 27th September 1901, event No. 4, *for* "2nd September 1900" *read* "12th September 1901."

9.—ASSAM GAZETTE.

4th October 1901.—No. 7172G.—Privilege leave of absence for one month, under Article 291 of the Civil Service Regulations, is granted to Babu Jnanada Charan Sen, Extra Assistant Conservator of Forests, attached to the Goalpara Forest Division, with effect from the date on which he may avail himself of it.

10.—HYDERABAD RESIDENCY GAZETTE.—*Nil.*

11.—MYSORE GAZETTE.—*Nil.*

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NOTE

ON THE

COLLECTION AND PRESERVATION

OF

ENTOMOLOGICAL SPECIMENS,

WITH A DESCRIPTION OF THE METHODS TO BE EMPLOYED IN THE

STUDY OF LIFE HISTORIES OF INSECTS.

BY

E. P. STEBBING.

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PREFACE.

I have been led to draw up the present note as, from the numerous enquiries I have received on the subject, I conceive it will be of some use to those interested in this branch of Zoology.

I have also the hope that it will enable those who send specimens away for purposes of identification to pack them in such a manner as to ensure their reaching their destination in a satisfactory condition.

I have to thank my friend Major Alcock, I.M.S., LL.D., &c., Superintendent of the Indian Museum, Calcutta, for having very kindly perused the note before it went to press and suggested a few alterations which his vast experience enabled him to make.

DEHRA DUN;
March 1901.

E. P. STEBBING.

Note on the Collection and Preservation of Entomological Specimens, with a description of the Methods to be employed in the Study of Life Histories of Insects.

GENERAL REMARKS.

During the past few years I have been often asked how insects should be killed and preserved, and how packed when it is required to send them away for identification purposes. The question has also been put 'How shall we study the life histories of insect pests?' This latter query has often come to me from Forest Rangers and others who spend a large portion of their time moving about in camp. I propose giving here information which will, I trust, enable those, who wish to work at this important branch of Zoology, to do so with profit to themselves and to the advancement of our knowledge of the subject. To the practical Forest Officer the study of the millions of insect enemies which annually commit depredations in his forests should be one not only of interest to himself, but also of the very first importance in carrying out successfully the work entrusted to his care. It is no more possible for us to prescribe remedies, or to even say whether such are practicable or otherwise, until we know the life history of a pest, than it is possible for a medical man to physic his patient until he has diagnosed the complaint from which he is suffering. The opinion is held by many that perfectly healthy trees in a forest are never killed by insects. Under normal conditions this may be

admitted. That a giant of the forest, one that has resisted the storms of a century, should succumb to the attacks of an insect, countless millions of which would be required to equal it in bulk, seems almost absurd; yet it is nevertheless true, though not, as a rule, quite so literally as it reads. Most of our forest trees support an immense insect population, but it does not necessarily follow that they will show ill-effects from it. Given a perfectly healthy tree, it will bring to maturity a host of feeders upon its foliage, upon the smaller shoots, in the injured or broken twigs or branches, in its fruit, and even in its woody tissue. Comparatively few borers or other insects are able to maintain themselves in the growing wood of large healthy trees, and when these occur in moderate numbers they inflict only such wounds as are easily healed, corresponding to mere scratches in the human skin. Under some conditions these insects increase abnormally, and then thousands of acres of timber may be killed off. As the bleeding from many small scratches may drain the human body of blood when they are kept constantly open, so the boring of thousands of beetles, insignificant individually, may weaken even the forest giant; and when this occurs, when there is no longer a healthy, resistant tissue, then another host of other species steps in, adds to the injury, and paves the way for yet further armies, leaving only a dead stick with bare branches, sooner or later prostrated by a storm and then slowly reduced to dust by yet other agencies, insectile, fungous, or microbic in character. It is the alteration in the normal conditions of a virgin forest which the Forest Officer, on making his appearance, brings about that

renders them more susceptible to insect attacks and makes the study of their life histories of such importance. It is the certain conviction that in proportion as scientific forestry progresses in India and more and more of our woods are treated on true sylvicultural lines, so will the attacks of devastating insects make themselves more and more felt, that leads me to endeavour to obtain as many recruits as possible in the study of this very important, but much neglected, branch of Forest Science.

Collecting Apparatus.

It will be first needful to consider what implements are necessary to enable us to prosecute our campaign with success. An examination of Entomological Catalogues presents to us a diversity of apparatus, much of which is far above the purchasing means of the average collector, whilst being at the same time far from necessary. The collecting materials essentially required may be of the simplest. Pill boxes, small glass tubes and a stout glass pickle-or jam-jar should accompany the collector in the field, and in addition, if it is required to collect *Lepidoptera* (butterflies and moths), a stout net.

*Pill boxes.**

Pill boxes should be preferably glass-topped. They can be obtained in nests consisting of four boxes, one fitting within the other. Small beetles and minute moths (*Microlepidoptera*) may be put into pill boxes and killed after reaching home.

*Glass tubes.**

These may be specially made tubes, but in their absence quinine or other small medicine bottles will

* Pill boxes and glass tubes will be supplied to officers really intending to work at the subject on application to me at the Imperial Forest School, Dehra Dun.

serve equally well. Larvæ and grubs of all kinds, both leaf-feeding and wood-boring, should on collection be at once placed in a small glass tube,* filled with alcohol (methylated spirits or diluted whisky) or better still with formalin. They should be placed *in separate tubes if they are taken from different trees or localities.* At the same time a small slip of paper must be put into the tube, on which should be written in *pencil* locality of capture, date, elevation and plant from which taken. The spirit will not deface the pencil writing, although it might if it were written in ink. This point should be remembered.

The glass jar.

The glass jar should have a wide mouth. In it place two or three pieces of cyanide of potassium, which should be covered with cotton or wool (cotton from the semul (*Bombax malabaricum*) tree is excellent) about half filling the bottle. Over this a thin circular piece of card-board, cut to fit the inside of the bottle, is next placed and pressed down so as to lightly touch the cotton. The card-board should be pierced with fine pin holes. The card-board is required in order to prevent the insects from getting lost amongst the cotton. A stout cork should fit the mouth of the jar. Imagoes of all the different orders of insects, *Orthoptera, Coleoptera, Lepidoptera,* etc., should be killed in this bottle. The cyanide

* Of course larvæ and grubs will be kept alive when their life histories are to be studied. At the same time a few might be put into spirits at once in case anything happened to the rest.

of potassium must be changed every three months or so, as it deliquesces, thus losing its force. It must be remembered that it is a strong poison. Instead of the cyanide, a piece of wool soaked in chloroform or benzine will do, but this requires repeated changing since the vapour rapidly evaporates. The benzine has the additional advantage of removing greasy stains from the wings of moths.

Another very good way to kill insects is to place a drop or two of the essential oil of almonds on to a piece of sponge and place this in the jar or in an old tobacco tin. Strong fumes of prussic acid are given off and soon kill any insect placed in it.

The net.

A good useful stout net can be easily made by obtaining from the bazaar or forest a thin piece of cane or bamboo, bending it into a hoop-shape, and tying the ends together so as to form a short handle. This gives us the frame. A piece of muslin, also obtainable in the bazaar, should be sewn round the hoop and then the sides stitched together so as to form a bag. This will enable the collector to catch flying insects.

Preservative materials.

Having obtained our insects, it is next necessary to preserve them. Alcohol (methylated spirits, dilute whisky, arrack or rum) or formalin should be used. If formalin is made use of, it should be diluted with at least 15 times its bulk of water. Insects do not lose their colour in this, but it is liable to render them

brittle. All insects may be put into one of these solutions, save butterflies, moths and hairy *Hymenoptera* and *Diptera*. "Hard" insects (*e.g.*, beetles and most *Orthoptera*) need not always be preserved in spirit: sawdust impregnated with creosote or turpentine or carbolic acid is a very good preservative for them. Camphor may also be used, or better still napthaline: pieces should be placed within the box in which the insects are kept. If it is required to keep insects in store-boxes or in a cabinet as a collection, they should be painted over either with benzine or turpentine, oil of cloves or creosote. This will preserve them from other insects and from mould.

Transportation of insects.

For travelling all hard-bodied insects should be put into bottles with any of the above mentioned liquid-preservative materials. The greatest care should be taken to guard against the breaking of the bottles in transit. Parcels are continually received containing when opened only a broken bottle or two with a few shrivelled up and useless specimens scattered about. In a tropical climate like India it is of the very first importance that bottles should be completely filled with the preservative liquor and hermetically sealed. This latter can be effectively done by covering the cork and the top of the jar entirely with bees-wax or dough. This helps to prevent the quick evaporation of the liquor, which always takes place at a rapid rate in hot climates. It should be remembered that *sealing wax should not be used if the bottle contains spirit*, as the spirit oozing through the cork dissolves the sealing-wax and makes an awful mess.

The bottle should be placed in a stout box filled with either cotton, wool, torn up pieces of paper, or best of all sawdust. It should be borne in mind that if any portion of the bottle touches the side of the box, the chances are that it will reach its destination broken. Hard-bodied insects are better sent simply packed in dry sawdust which has been disinfected with creosote or carbolic acid.

Lepidoptera and other soft-bodied insects may be well preserved by placing them in square pieces of paper folded in a triangular form with the edges over-lapping. Put up in this way, many can be packed away in tin boxes and will bear transportation to any distance.

In sending live larvæ by post, they should be enclosed with leaves and a little moss in small tin boxes. The tin boxes should *not* be perforated to give the larvæ air. In forwarding specimens in alcohol, the box should be light but strong. No bottles or specimens of any kind should be sent without being first properly labelled, so that the nature of their contents can be at once seen. A forwarding letter should in each instance be sent separately, giving full data with reference to the specimens sent.

Rearing insects to enable their life histories to be studied.

General.

In order to study the life histories of insects it becomes necessary to examine the various stages of their metamorphosis, and this can only be done by watching them carefully at close quarters. The best stages to

collect for this purpose are the eggs or larvæ. These should be put into a box, and a supply of the food-material on which the larvæ feed put into it. Two points must be remembered: the food, if leaves, etc., should be kept fresh, and the box must be well ventilated. Various things may be used as cages. Tumblers covered with gauze, paste-board boxes pierced with holes and fitted with covers, or large glass jars are all of them utilizable. The bottom of such vessels should be covered with damp sand in which the food-plant of the larvæ may be stuck and kept fresh for several days. Larger and more airy boxes, a foot square, with the sides of gauze and fitted with a door through which a bottle of water in which to put the food-plant may be introduced, are good cages. Such could be easily made locally.

More than one specimen of an insect may be bred at the same time in any cage, provided they have different habits and appearances, *i.e.*, a wood-boring beetle and a leaf-feeding Lepidopterous larva could be reared in the same cage, since there is no danger of confusing these insects.

Breeding traps in the forest.

In addition to breeding insects at home, it is also possible to study the life history of some insects in the forest itself. A good plan is to fell a tree in different localities to which it is possible to pay a visit once a month. The bark should be left on. Careful watching will show that the young uppermost branches are soon attacked by small, white beetle larvæ (*Ptinidæ*, *Buprestidæ*, *Scolytidæ*, *Cerambycidæ*), the development of

which can be watched during the periodical visits paid to the tree. Later on the larger wood-boring larvæ will be found at work on the trunk and main branches, making flat galleries beneath the bark to commence with, and finally boring down into the wood (*Buprestidæ*, *Cerambycidæ*, *Sessiidæ*, *Cossidæ*, etc.). Some of these larvæ may live for several years boring into the wood, and a good plan would be to cut the tree into sections, slightly removed from one another and mark down in each one particular class of larvæ, *i.e.*, it would be possible to distinguish the Cerambycid larvæ from the Buprestid, both from the Sessiid and the three from the Cossid, and so on. In each section of the tree one particular class would be watched. In rearing gall insects, the twig containing the galls may be enclosed in a rough bag of muslin. Officers who have a lot of camping to get through will find that by some such plan as the above they will be able to do something towards the study of the life histories of destructive wood-borers.

Recording observations.

We now come to the very important point of recording observations made. The greatest care should be taken to see that the dates of all changes noted with reference to the insect being watched are carefully recorded. Information on the following points would be required:—

I.—Species of tree felled or from which specimens were taken. Name of forest and locality, with elevation, and if the tree was felled, date of felling. Also state whether the tree was

alive and vigorous when felled or otherwise. Also on what part the insects were feeding—wood, leaf, or fruit!

II.—Date of egg-laying whenever observed. Method of laying the eggs, with description of the number, size and markings. A few eggs or egg-capsules should be always preserved.

III.—Date of appearance of larva, length of time passed in the larval stage, and nature of food and damage done by it. Also whether it is solitary or gregarious in habit, and whether a day or night feeder. The number of moultings or changes of skin passed through by the larva should be mentioned, with a description of the caterpillar in each stage of its growth. A few larvæ should always be preserved in spirit.

IV.—Date of changing of larva into the pupal stage, and length of time passed in this stage. Also description of the pupa. It should be stated whether the pupa is enclosed in a cocoon or not. If it is, the nature of the cocoon should be stated. It should also be noted whether, if the larva hibernates during the winter months, it does so as a larva enclosed in a cocoon, or whether as soon as it has formed the cocoon it changes into the pupal state and hibernates as a pupa. A few pupæ should always be preserved in spirit.

V.—Date of appearance of the imago. Description of both the female and male insects. Also a note as to the damage done by them and the time, method, and position of laying the eggs.

If the insect is reared at home, the dates of obtaining the eggs or larvæ or pupæ, as the case may be, should be given, and the dates of the appearance of the other stages in the metamorphosis.

Dates of periods passed in the various stages, descriptions as far as possible, and nature of damage done, with the locality and elevation, are exceedingly important when life histories are being dealt with, and such should always be given.

In addition, the following points should be borne in mind :—

i.—In the case of the greater number of our insects it is absolutely necessary that the imago stage should be obtained, otherwise identification is impossible. Beyond being able to place larvæ sent by themselves into their orders, groups and perhaps families, no further identification is possible and thus sent alone they are of very little use.

ii.—In the furtherance of the study of Economic Entomology it is of very little use sending insects 'found flying about' in the forest or in cultivated land unless some further definite observations have been obtained about

them. Economic Entomology means the study of the life histories of insects with a view to endeavouring to counteract the damage done by their attacks. Thus, in the first instance it is necessary to know that an insect is an aggressor and to be able to give the nature of its attacks or at any rate to state definitely that it does a particular damage.

As different insects require slightly different treatment, I will now, in conclusion, give a few notes on the rearing of insects of some of the more important orders.

Collection and preservation of Lepidoptera.

A knowledge of the order *Lepidoptera* is of importance to the forester, since it contains larvæ which defoliate trees on a large scale, and at the same time others which do serious damage by boring into timber. When larvæ are kept in order to enable the subsequent stages in their life histories to be ascertained, great care should be taken to keep a supply of fresh food always in the box in which they are enclosed. In changing to the pupal stage some larvæ will spin a cocoon amongst the leaves of the plant or will attach it to the sides of the box. Others, on the other hand, require earth to pupate in, and this earth should be placed at the bottom of the box, failing which it is probable that no imagoes will be obtained. Other larvæ may require chips of wood, etc., to hide beneath; many Noctuid larvæ, some of which defoliate on a considerable scale, require this, as they often feed at night only. In searching for the larvæ which are defoliating your trees this characteristic should be remembered. Any sickly larvæ should

be at once removed from the box and destroyed. In all cases larvæ should be carefully described, and at each fresh moult a new description and, if possible, a drawing of it should be made. A little practice will enable the most average draftsman to turn out a workable sketch of a caterpillar.

The management of wood-boring larvæ will be described under *Coleoptera*.

As soon as the imagoes come out and their wings are fully developed, if eggs are not required from them, they should be killed in the cyanide bottle.

They can then be ticketed and packed away in the triangular paper forms already described.

Collection and preservation of Coleoptera.

The rearing of wood-boring larvæ will be here considered. Amongst such we may mention the larvæ of *Cerambycidæ*, *Curenlionidæ*, *Buprestidæ* (all *Coleoptera*) and of *Sessiidæ*, *Cossidæ*, etc. (the latter two *Lepidoptera*).

Large boxes should be used, so that large pieces of wood containing the larvæ may be placed in them. Care must be taken that only specimens of the same species are confined in the same box. They may be treated as follows :—Take a piece of wood four cubic inches in size, split it in two and make on the inside a cavity just large enough to receive the grub and allow it to move easily in it, then fasten the two halves together with a strong rubber band. Slightly moisten the wood in the box twice a week, and if the larvæ escapes by

boring a hole through the wood, replace it in the central cavity by filling the hole with a plug. Tin or glass-sided boxes should be used, as the borer will bore through a wooden or card-board box. The bottom of the box should be covered with saw dust. Certain larvæ such as Elaterid and some Noctuid ones, require earth in the box, but it should not be put unless required. If earth is put in, it should be thoroughly baked first to destroy all noxious insects, etc., which might prove destructive to your grubs. The larvæ and pupæ should be kept in darkness.

Rearing of bark and bast-feeding beetles.—Such insects, especially *Ptinidæ*, *Scolytidæ*, small *Cerambycidæ* and *Buprestidæ*, etc., may be reared by cutting out with the saw or axe pieces of the infested tree with the bark on about 6 inches square and one inch thick. The castings and sawdust, together with the larvæ, should be placed under the bark. Several pieces of bark tied together with the bast sides opposite will sometimes answer the purpose, but the better way is to leave the larvæ in the wood until they are nearly full-grown; then, in general, the transformations are completed in about two weeks.

Collection and preservation of Hemiptera.

The soft-bodied species of aphis or plant-lice (*Coccidæ*, *Aphidæ*, etc.) should be preserved in dilute alcohol or very dilute formalin. When collected from a stem, they should be at once put into this. If it is possible, they should, however, be sent alive *in situ* on the twig or leaf they are infesting to be identified. If the journey is not more than two or three days, this

should be always done. The chief essential is to prevent them drying up. The best way of all, if only the insects themselves are being sent, is to enclose them in ordinary quills stopped by plugs of cork or pellets of bees-wax. The substance of the quill is sufficiently porous to prevent mildew on the one hand and a rapid evaporation on the other. In this way small insects may be sent through the post and in a far better condition than can be secured in any tin boxes, even though they be filled with leaves. If a slip of some succulent leaf be rolled round each quill to retain moisture, a bundle will conveniently pass through the post.

Coccidæ proper may be killed in the cyanide bottle and then dried like herbarium specimens, but without pressure in the case of convex fleshy forms. These dried specimens can be packed in paper slips or cardboard boxes.

Hemiptera-heteroptera (true bugs) may be sent either in bottles of spirit or packed in sawdust as dried specimens.

Collection and preservation of Orthoptera.

Orthoptera can be easily preserved in strong alcohol. If preserved dry, they can be killed in the cyanide bottle without losing their colours, as they do if they remain long in alcohol. In sending dry *Orthoptera* they should be best packed in sawdust, moss or soft tissue-paper, as their bodies and legs are rather liable to fall off.

Crickets, grasshoppers, locusts.—Damage is done by these insects in forest nurseries by biting off young seedlings close to the ground and feeding on the parts

so nipped off. The eggs are often laid in holes in the ground, and these may be searched for and the insect bred from them. In the case of crickets, their presence is evidenced by the appearance of circular holes, one to two inches or more in depth, in which they live. They spend their lives in these, moulting several times before arriving at full growth and sallying forth mostly at night and feeding voraciously on the young seedlings, committing a lot of wanton damage by cutting off innumerable seedlings, only portions of which are consumed. Their life histories can be easily studied by digging up one or two every week through the months during which they are feeding and developing into the perfect insect. They have of course no pupal stage, as the *Orthoptera* have an incomplete metamorphosis.

Collection and preservation of Hymenoptera.

All the *Hymenoptera* which are not hairy may be preserved in alcohol. Hairy specimens may be put into the paper triangle forms above-mentioned, or sent in a box full of loose disinfected sawdust. Small *Ichneumon* flies should be sent in small pill boxes or match boxes.

Note.—Stress is laid on the sending of larvæ and pupæ *alive* as much as possible. Major Alcock tells me of a case of a *Mantis* remaining alive in an air-tight tobacco tin for more than a week, without food, and even living on happily for weeks afterwards, laying plenty of eggs.

Another point to be remembered is that collectors often make the mistake of piercing tins with holes to let in air. It is much better to use a larger tin and have no holes.

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