

R E P O R T

FROM THE

SELECT COMMITTEE

ON

FORESTRY;

TOGETHER WITH THE

PROCEEDINGS OF THE COMMITTEE,

MINUTES OF EVIDENCE,

AND APPENDIX.

தி. இளங்கோவன்
செப்பிடுபவர் பெயர்
ஜூன் 1996
செப்பிடுவதற்காக எடுத்த
கொள்வப்பட்ட நாளி
ஜூன் 1996
செப்பிட்டு முடித்த நாளி
சரிபார்க்கக் கூடிய
மு. அ. ச. உத்தியோகர்
உதவியுடைய உத்தியோகம்

Ordered, by The House of Commons, to be Printed,
24 July 1885.

LONDON:
PRINTED BY HENRY HANSARD AND SON,
PRINTERS TO THE HOUSE OF COMMONS.

To be purchased, either directly or through any Bookseller, from any of the following Agents, viz.
Messrs. HANSARD, 13, Great Queen-street, W.C., and 32, Abingdon-street, Westminster;
Messrs. EYRE and SPOTTISWOODE, East Harding-street, Fleet-street, and
Sale Office, House of Lords;
Messrs. ADAM and CHARLES BLACK, of Edinburgh;
Messrs. ALEXANDER THOM and Co., or Messrs. HODGES, FIGGIS, and Co., of Dublin.

XXV. D
83.

R

[ii]

B 60856

M85

Ordered,—[Friday, 15th May 1885]:—THAT a Select Committee be appointed to consider whether, by the establishment of a Forest School, or otherwise, our Woodlands could be rendered more remunerative.

Committee nominated—[Wednesday, 8th July 1885]—of—

Mr. William Corbet.	Colonel Nolan.
Dr. Farquharson.	Mr. Parnell.
Mr. Fremantle.	Mr. Plunket.
Mr. William Henry Gladstone.	Mr. Portman.
Sir G. Macpherson Grant.	Mr. Round.
Sir John Kennaway.	Mr. Seely, jun.
Sir Edmund Lechmere.	Mr. Moore Stevens.
Sir John Lubbock.	Mr. Villiers Stuart.
Dr. Lyons.	Mr. Northcote.
Sir Herbert Maxwell.	

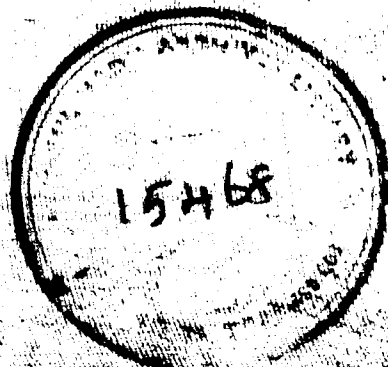
THAT Five be the Quorum of the Committee.

THAT the Committee have power to send for Persons, Papers, and Records.

Ordered,—[Thursday, 16th July 1885]:—THAT Mr. Northcote be discharged from the Committee.

THAT Colonel King-Harman be added to the Committee.

REPORT	p. iii
PROCEEDINGS OF THE COMMITTEE	p. iv
MINUTES OF EVIDENCE	p. 1
APPENDIX	p. 48



[iii]

R E P O R T.

THE SELECT COMMITTEE appointed to consider whether, by the Establishment of a FOREST SCHOOL, or otherwise, our WOODLANDS could be rendered more REMUNERATIVE;—HAVE agreed to the following REPORT:—

YOUR Committee are of opinion that at this late period of the Session it will not be in their power to conclude their investigation; they have therefore agreed to Report the Evidence already taken to the House, and to recommend that a Committee on the same subject should be appointed in the next Session of Parliament.

24 July 1885.

PROCEEDINGS OF THE COMMITTEE.

Tuesday, 14th July 1885.

MEMBERS PRESENT:

Mr. William Corbet.
Dr. Farquharson.
Sir Edmund Lechmere.
Sir John Lubbock.
Dr. Lyons.
Sir Herbert Maxwell.
Mr. Fremantle.

Mr. Plunket.
Mr. Portman.
Mr. Seely, jun.
Mr. Moore Stevens.
Mr. Villiers Stuart.
Mr. Round.

Sir JOHN LUBBOCK was called to the Chair.

The Committee deliberated.

[Adjourned till Tuesday next, at Twelve o'clock.]

Tuesday, 21st July 1885.

MEMBERS PRESENT:

Sir JOHN LUBBOCK in the Chair.

Dr. Lyons.
Mr. Portman.
Colonel King-Harman.
Colonel Nolan.
Sir John Kennaway.
Mr. William Henry Gladstone.
Mr. Villiers Stuart.

Sir Edmund Lechmere.
Dr. Farquharson.
Mr. Seely, jun.
Mr. Round.
Mr. Plunket.
Mr. William Corbet.

Mr. William G. Pedder and Colonel James Michael, C.S.I., were examined.

[Adjourned till Friday next, at Twelve o'clock.]

Friday, 24th July 1885.

MEMBERS PRESENT:

Sir JOHN LUBBOCK in the Chair.

Dr. Lyons.
Mr. Seely, jun.
Dr. Farquharson.
Mr. Fremantle.
Mr. Plunket.

Mr. Villiers Stuart.
Sir Edmund Lechmere.
Colonel Nolan.
Colonel King-Harman.
Mr. Round.

Dr. Hugh Cleghorn, Colonel G. Pearson, Mr. W. T. Thiselton Dyer, and Mr. Julian Rogers, were examined.

DRAFT REPORT, proposed by the *Chairman*, read the first time, as follows:

"Your Committee are of opinion that at this late period of the Session it will not be in their power to conclude their investigation; they have therefore agreed to Report the Evidence already taken to the House, and to recommend that a Committee on the same subject should be appointed in the next Session of Parliament."

DRAFT REPORT, proposed by the *Chairman*, read a second time, and *agreed to*.*Ordered*, To Report, together with the Minutes of the Evidence, and an Appendix.

EXPENSES OF WITNESSES.

NAME OF WITNESS.	PROFESSION or CONDITION.	From whence Summoned.	Number of Days absent from Home, under Orders of Committee.	Allowance during Absence from Home.	Expenses of Journey to London and Back.	TOTAL Expenses allowed to Witness.
Colonel James Michael-	C. S. I. - - -	Southampton -	1	£. s. d. 1 1 -	£. s. d. 1 5 -	£. s. d. 2 6 -
Mr. Hugh Cleghorn -	M. D. - - -	St. Andrew's, N.B. -	3	3 3 -	5 - -	8 3 -
Colonel G. Pearson -	Colonel - - -	Kington - - -	2	2 2 -	2 15 -	4 17 -
TOTAL - - £.				6 6 -	9 - -	15 6 -

LIST OF WITNESSES.

Tuesday, 21st July 1885.

	PAGE.
Mr. William G. Pedder - - - - -	1
Colonel James Michael, C.S.I. - - - - -	13

Friday, 24th July 1885.

Dr. Hugh Cleghorn, M.D., F.R.S.E. - - - - -	19
Colonel Pearson - - - - -	27
Mr. W. T. Thiselton Dyer, C.M.G., F.R.S. - - - - -	37
Mr. Julian C. Rogers - - - - -	43

MINUTES OF EVIDENCE.

Tuesday, 21st July 1885.

MEMBERS PRESENT:

Mr. William Corbet.	Dr. Lyons.
Dr. Farquharson.	Colonel Nolan.
Mr. William Henry Gladstone.	Mr. Plunket.
Sir John Kennaway.	Mr. Portman.
Colonel King-Harman.	Mr. Round.
Sir Edmund Lechmere.	Mr. Seely (Junior).
Sir John Lubbock.	Mr. Villiers Stuart.

SIR JOHN LUBBOCK, IN THE CHAIR.

Mr. WILLIAM G. PEDDER, called in ; and Examined.

Chairman.

Chairman—continued.

1. You are the head of the Revenue Department of the India Office?—Yes, I am.

2. As such you have under you the management of the Forest Department?—Yes; the forest papers from India pass through my hands.

3. You have been for many years in India?—Yes; as a district officer, a divisional commissioner, and a secretary to the Bombay Government, I had a good deal to do with forests, in the west of India especially.

4. When was the Indian Forest Department first organised?—Up to 30 or 40 years ago there was neither any special forest law in India, nor was there any properly organised department. The forests were managed by the district officers by means of the ordinary establishment, and under the ordinary laws applicable to unoccupied lands belonging to the Government; but there were at the same time certain local laws descended from the times of native rule, such as those which made teak a royalty which were applicable to forests. The commencement of the forest organisation was in 1846, when a department was organised in the Bombay Presidency under the late Dr. Gibson, principally in view of the necessity of providing and securing supplies of teak timber for the dock-yards.

5. Then about the year 1863, I think, further steps were taken to secure the scientific training of Indian forest officials?—Yes. I might perhaps mention that in 1847 a similar step was taken in the Madras Presidency, and that was followed by the establishment of similar departments in O.135.

other provinces. Dr. Brandis, a trained German forest officer, was employed in British Burmah, and afterwards in Bengal, in the organisation of a Forest Department in those provinces; and in 1864 he was appointed to the office of Inspector General of Forests to the Government of India, from which date the systematic conservancy of the forests may be said to have begun.

6. It is rather a difficult matter to state what the revenue derived from forests was before that time; I have understood that it was about 50,000 l.?—Yes.

7. I think within a year or two it rose to 150,000 l.?—Until about the year 1857 the forest revenue was treated entirely as a branch of land revenue. In 1859, I think, the forest receipts and charges are first separately shown upon the accounts systematically. In that year the gross revenue was 182,000 l., the charges were 32,000 l., and the net revenue was 150,000 l.; that was in 1858-59.

8. I believe that last year the gross revenue had risen to nearly 1,000,000 l., and the net revenue to nearly 400,000 l.?—Yes; the year 1883 is the last year for which I have complete figures, and the gross forest revenue was 938,000 l., the charges were 567,000 l., and the net revenue 371,000 l.

9. Therefore the net revenue has increased in that period by more than 200,000 l. a year?—Yes.

10. You attribute that, I suppose, to a considerable extent to the improved education of the forest officials?—Undoubtedly; but I should like

21 July 1885.]

Mr. PEDDER.

[Continued.]

Chairman—continued.

like to say that I do not lay much stress upon the increase of revenue, because as a matter of fact, the financial results of the Forest Department have hardly yet become apparent at all.

11. You mean that the improvement which has taken place in the forests is a much more important element than the mere increase of net revenue?—It is a very much more important element. The forests were in course of being so completely destroyed in the various parts of India that the principal duty of the Forest Department has been rather to conserve them.

12. And beyond the fact that there has been a considerable increase in the revenue, you say the increase in the capital value of the forests is much larger?—It is much larger in proportion.

13. I believe you have paid some little attention to our English woodlands?—I know but little about them, but still I know something about the English woodlands, and also those in the south of Scotland.

14. Is it your opinion that, by the improvement of the education of our forest officials, we might produce somewhat similar improvements in England to those which have resulted in India?—I think so, as far as it is possible for a layman to judge. But I have some remarks of Dr. Brandis upon the subject which, perhaps, might interest the Committee.

15. It is the case, is it not, that almost every other important country has one or more forest schools?—In Germany and France that is the case.

16. And in Russia, Italy, and Switzerland?—Yes; but I have no particular acquaintance with those schools; those in France and Germany I know something of.

17. When you first organised your schools, I think the forest officers were sent partly to France and partly to Germany for their forest training?—Yes.

18. Of late years they have gone to Nancy entirely, have they not?—Yes. Originally the Forest Department was composed of men selected by the Indian Government acquainted with forests and with the forest tribes, and who had a taste for the subject, from the Civil, Military, Medical, and Naval Departments. I ought to mention that the Indian Government and the Indian forests are very much indebted to these gentlemen, who began by pointing out the necessity of the conservation of the forests in India and by organising the Department.

19. I believe you thought there might be some improvements effected in training the forest officials, and you requested the French Government to send over an experienced officer to examine and report upon the state of the English woodlands, did you not?—Yes; for the last 10 years our forest officers have been trained at the Ecole Forestière at Nancy.

20. And the authorities sent over Professor Boppe?—Yes, they did.

21. He made a tour of inspection of some of our forests, did he not?—Yes; accompanied by Colonel Pearson, then forest officer at Nancy, and accompanied by some of the students.

22. He made a report, did he not?—Yes.

23. Can you put that report in?—Yes (*handing the report in*).

Chairman—continued.

24. Without going into the report at present, which the Committee will be able to read for themselves, he indicated an opinion, did he not, that our woodlands, in his judgment, might be more beneficially managed, and that a forest school could be advantageously set up in this country?—What we asked M. Boppe to report upon was, whether the woodlands in England and Scotland were managed so scientifically and well as to be available as a training ground for the Indian forest students. To that he replied, in effect, that they were not so managed, and that he was decidedly of opinion that at present young men under training for the Indian forest service could not receive proper professional education in the English or Scotch forests; from which I conclude that he conceived, as indeed he says pretty clearly, that the English and Scotch forests in general are not scientifically managed.

25. He indicated his opinion that it would be desirable to organise a forest school?—Yes; incidentally he mentioned that it would be very desirable.

26. In consequence of your experience, and upon that report, did you introduce recently some alterations in the training of your forest school?—No, it was not in consequence of that report. The difficulty of maintaining the training at Nancy was, that we found the young men who went there were not sufficiently familiar with the French language to follow the lectures or to do themselves justice in the examinations, which they had to pass as well as the French students.

27. At any rate you are about now to make some changes in the system of training?—Yes, a change has been decided upon.

28. Will you kindly mention to the Committee what the nature of those changes has been, and what your present system is?—Young officers, to the number of from five to seven or eight a year, are to be selected, subject to a physical test, by a competitive examination held by the Civil Service Commissioners. Perhaps I had better put in the rules for that examination, as they would show the subjects in which the men are examined. The young officers selected in this examination are to be sent for two years to go through a course at the Royal Indian Engineering College at Cooper's Hill, and there they will receive instruction in the following subjects: mathematics, applied mathematics, geometrical drawing, free-hand drawing, surveying, descriptive engineering, inorganic chemistry, geology, French, physics (laboratory work), going through the same lectures and the same course of study as the engineering students. Besides that, it is arranged that they shall receive special instruction in forest subjects, in botany and in forestry; the two principal branches of which are silviculture and what the French call *aménagement*, the working plans of forests. It is also under consideration what instruction they shall receive in certain collateral subjects; that is to say, in biology, specially with regard to the insect life which haunts forests, organic chemistry, political economy, and forest law and jurisprudence, but the arrangements for that instruction have not yet been completed. The forestry will be taught at Cooper's Hill, as much as possible, with the aid of practical instruction derived from the neighbouring

21 July 1885.]

Mr. PEDDER.

[Continued.]

Chairman—continued.

neighbouring woodlands, such as Windsor Forest; and at the end of their first year's course, in the summer, the students are to take a six weeks' course of practical instruction in the French forests in connection with the school at Nancy, and another tour at the end of their second year's course before proceeding to India.

29. How long will that training take?—It will take two years.

30. Is that training open to others besides those who may be going out in connection with the Indian Forest Service?—I believe it will be; the school is open to all students who wish to study civil engineering, telegraph engineering, and now forestry.

31. You have not yet determined whether to confine it to students for the Forestry Department?—We have received no applications, but I have no doubt that any young men whose parents will pay the fees will be able to avail themselves of the instruction given in forestry.

32. What are the fees for the course?—The whole cost, exclusively of pocket money at the college, is 180 l. a year.

33. What does that include?—Lodging, boarding, and the college lectures; in point of fact, all the expenses except pocket money.

34. At what age are the students generally taken?—The applicants for examination must be above 17 and under 21 years of age; but I do not suppose there would be any difficulty in any young man under 22 years of age entering the college, supposing he was not intended for the Indian Forest Service.

35. Of course, fees so high as these would only be adapted to the higher grades of the forest service?—The training is intended entirely for the superior grades, namely, those of Conservator, Deputy Conservator, and Assistant Conservator. There is a special school in India for the instruction of the inferior grades.

36. The training of the the inferior forest officers is, I believe, entirely carried on in India itself?—Yes; the inferior forest officers have hitherto been appointed directly by the Government from young men, almost entirely natives, who receive their instruction in the Department itself, being taught by the superior officers. But in 1879 the Governor of the North West Provinces established a school at Dehra Dun, in the North West Provinces, which, I believe, was two years ago taken over by the Government of India and made Imperial.

37. Are all the forest officials trained at Dehra Dun now?—By no means all of them; there are at present of the class of forest rangers, who are a class of working men next below the Sub-assistant Conservators, altogether about 200 in India, but there are only about 40 undergoing instruction at Dehra Dun; but by degrees it is hoped that nearly all of them will undergo this training. There are two classes, forest rangers and foresters.

38. All those who are undergoing training receive it at Dehra Dun?—Yes. In the Madras and Bombay Presidencies certain facilities have been granted to those desiring to obtain instruction in forestry. There are one or two of the Government Schools at Madras and the Agricultural School at Bombay, the School of Arts and

0.135.

Chairman—continued.

Engineering, as it is called, at Poona, at which they have a class for forestry.

39. In fact your training of the superior and inferior officials is quite distinct?—Yes, it is quite distinct.

40. Has that been mainly owing to the fact that it was convenient to select natives for the lower posts, or do you think it desirable in itself to keep the two grades separate from one another?—Of course, for many reasons, one of which is the reason of economy, it is necessary that the working grades of the Department should be filled chiefly by natives. On the other hand, it is desirable that the upper grades of the Department, which demand more scientific knowledge than natives generally can pretend to, should be filled by Europeans; and, as a fact, the upper grades are filled almost entirely now by officers appointed by the Secretary of State after competitive examination in England.

41. Are there any other remarks, or is there any other information you would wish to give the Committee, with regard to the Indian Forest Service?—It might, perhaps, be interesting to the Committee to know that from 1867, when the system began, to 1885, 511 men competed in India for the Forest Service, of whom 110 have been appointed.

Mr. Portman.

42. Were they all Englishmen or Scotchmen?—They were, I think, all Englishmen, Scotchmen, or Irishmen, except that I think there have been one or two men Eurasians, East Indians.

43. Would the natives take a responsible position?—There are some natives who take a responsible position; there are some sub-assistant conservators. The intermediate grade between the assistant conservators and the actual working men or foresters is that of forest rangers, and some are very good men. I should like also, with regard to the honourable Chairman's question regarding the financial results, to mention some other results. I should say that I think the real work which has been effected by the Forest Department of India is more that of conservation than of producing revenue at present. Thirty years ago there was hardly any attempt at the conservation of forests. We, officers of the Government, generally believed that, as there had been always vast forests in India, so there always would be; that they did not require any particular conservation; but that natural reproduction was quite sufficient for them; that they would grow again by themselves. We did not at the time appreciate the enormous destruction caused to the Indian forests by the spread of cultivation, which has almost doubled itself in many parts of India, besides the immense demand of the railways for wood, and the great demand arising in large cities, such as Bombay and Calcutta, on their being brought into easy communication with the forests by railways and harbours, in which there is an immense demand for timber, especially for firewood. The result has been very extraordinary. Some 15 or 20 years ago, when the Government forests of the Konkan, upon the west coast of India, were first brought under conservation, they were being rapidly destroyed, and it was necessary to stop the great drain of wood; the wood merchants thereupon, finding that

A 2

21 July 1885.]

Mr. PEDDER.

[Continued.]

Mr. Portman—continued.

that was the case, found another source of supply in the small native state of Jinjira, the Hubshis country, which is an independent state. Gingera is a small state about 40 miles long, and from 15 to 100 miles wide, which, except the rice land, was entirely covered with forests at that time. When I went there about seven years afterwards, as political agent, I found that three-fourths of the forest had been entirely destroyed, and that the remainder of it it was just possible to save.

Mr. Villiers Stuart.

44. Was that forest destroyed within your recollection?—It was destroyed within my recollection, within seven years, entirely by the demands of the City of Bombay. All the hills had been entirely covered with a thick primeval wood which had never been cut at all.

45. That would be about 1,000 square miles? No, for the State is much intersected by creeks, it is 400 odd miles really. Then in 1858, as I mentioned, hardly any forest was properly conserved, and now the area of British India, exclusive of native states, being about 865,000 square miles, about 48,000 square miles have been brought under regular and systematic conservation as reserved Government forests, and about 27,000 square miles more receive a certain amount of conservation as protected, district, or village forests; that is to say, about 75,000 square miles, or 9 per cent. of the area of the whole country, has now been reserved as woodland, and saved from certain and speedy destruction, which I think is a remarkable fact, and very creditable to the Indian Forest Department. Besides that, a number of the native states, such as Travancore and Cochin in the south, and some of the small states in the Bombay Presidency, have themselves established a forest department, and have begun to conserve their forests.

Chairman.

46. With regard to the school at Dehra Dun, could you give the Committee any particulars as to the system of instruction carried on there?—Yes, I think I can. There are, speaking generally, two classes of instruction at Dehra Dun, namely, in English and in the vernacular. The English is intended for the forest rangers, who are the higher grade of the subordinate officers, and who can be promoted to be sub-assistant conservators.

Colonel King-Harman.

47. They are natives, are they not?—They are nearly all native; there are a few Eurasians. The candidates for this class must have passed the entrance examination at one of the Indian universities. The course lasts 18 months, and they receive instruction in forestry; that is to say, silviculture and the working plans, in forest botany, the elements of physics, chemistry, and vegetable physiology, mineralogy and geology, mathematics, especially surveying, roadmaking, and building, and in forest law. The forest instruction as far as possible is practical, and is taught in the woodlands, in the forests which appertain to the forest school. The forest school is in the centre of one of the forest circles in the north-west.

Chairman.

48. How long does that course last?—The course lasts 18 months.

49. What is the fee in that case?—There is no fee; it is entirely paid by the Government. Most of the students are men who hold appointments in the Forest Department, and they are allowed to draw their pay during the time they reside at the college.

50. Then I suppose it is confined to those who are employed in the Government Forest Department?—Or who desire to enter the Government Forest Department. The Government can send promising young men, whom they wish to bring into the Forest Department, to go through the course, and they do so rather largely.

51. But private owners of woodland would not be able to send their sons there, would they?—If they desired to do so, they would be permitted, I daresay, to do so; but I do not know any case in which that has occurred.

52. Would you put in the particulars of the instruction given at Dehra Dun?—I think I can give the last report (*handing in the same*). I may mention that the second class, the vernacular class, is intended for foresters, that is to say, the second grade of the working establishment, who are not supposed to know any English. They are there taught a few elementary notions regarding the growth and the reproduction of plants, the influences of soil and climate, a little practical surveying, with the construction of roads and bridges, and so on; and then in the forest they get practical instruction in sowing and planting, the selection of trees, protection against fire and insects, &c., pruning, thinning, felling, logging, seasoning, the preservation and removal of timber, the manufacture of charcoal, the collection of forest produce, such as gums, fruits, seeds, fodder, and so on, and the measurement of standing and fallen timber; in fact, all the practical work of forestry.

53. Can you put in any particulars showing the expense of the Department schools, so that the Committee might be able to form an opinion what fees would be required in order to cover the expenses, in case it was determined to establish such a school and to charge fees in this country?—The actual expense of the school at present is about 3,000 £. a year; but then it must be remembered that several of the officers who are employed in instruction in the school are also officers in the Forest Division, and their pay is charged against the Forest Division. The total expense of the school appears to be about 40,000 rupees a year.

Colonel Nolan.

54. Is that allowing for the fact that the salaries of the officers are charged against the Forest Department?—Yes, I think it is. Last year there were 46 men in both classes at Dehra Dun, including two or three officers of superior grades, who had come to the school for the study of special subjects.

Chairman.

55. You think the actual expense of the school to the Government might be fairly put at about 4,000 £. a year?—Yes, I think it might be fairly put at 4,000 £. a year.

56. You have had, I think, of late years several applications from the Colonies and other quarters

to

21 July 1885.]

Mr. PEDDER.

[Continued.]

Chairman—continued.

to supply competent forest officials?—Yes, we have had a number of applications.

57. I understand you have not been able to find any Englishmen who are properly qualified, whom you could recommend; and you have been obliged to recommend French and Germans in those cases?—We have not been asked to provide Englishmen not connected with the Government service for the Colonies; the Colonies have asked us to lend them Englishmen connected with the Forest Department of the Indian Service of the upper grade.

58. Have you been able to do so?—Yes; we lent an officer to the Cape who has since, I think, left the Indian Service and taken service permanently at the Cape. We lent an officer for some time to Cyprus. We recently made arrangements by which an officer will assist in the West Indies; and there have been several such cases.

59. But, in the case of Cyprus, I thought a French gentleman was appointed to manage the woodlands there?—No, I think not; he may, very possibly, have been appointed to succeed the Indian forest officer, Mr. Dobbs, who has now gone back to the service in India, but I am not sure about that. I think Mr. Dobbs was in Cyprus about three years.

60. Did not Colonel Pearson, in his letter of November 1881, observe that he had been applied to several times by the Colonial Office for assistance to procure forest officers, and that he was obliged to recommend foreigners for those appointments?—Yes; but that was in Colonel Pearson's private capacity as the officer living at Nancy, and being well acquainted with forest matters.

61. Do I understand that whenever you have been applied to you have been able practically to find officials?—No, I do not think we have; in two or three cases we have been obliged to decline, because the Government of India have complained considerably of their men being employed out of India.

62. In some cases you have been able to supply applicants with qualified officials, and in others you have been obliged to decline?—Yes; I should explain that the men whom we have lent have been generally men upon one or two years' leave from India.

63. So that they were not permanent appointments but principally for the purpose of reporting or organising?—Yes; generally for the purpose of organising a department.

64. Are there any other facts that you would wish to lay before the Committee?—I think not, except to say that the superior staff of the Forest Department in India now number about 150 in all the provinces, and that they require a recruitment from England of about six per annum upon the average.

Dr. Lyons.

65. You spoke of the forests being destroyed prior to the Indian Government taking them up. Would you mention briefly the principal causes of that destruction; were they not trespass, claims to free wood, and what you have not mentioned, but what I am sure you are fully cognisant of, the occurrence of great forest fires?—In the first place, there was an extension of cultivation, by which the people who wanted land had applied

0.135.

Dr. Lyons—continued.

for land to be granted to them, subject to the payment of revenue. I think, speaking roundly, that the area of land actually cultivated in the Bombay Presidency proper has extended from about 12,000,000 or 13,000,000 acres in 1850 to about 22,000,000 acres now, and the increase has been about the same in the Madras Presidency. A great deal of that land was land which really might, probably with advantage, have been reserved as forest.

66. Then the natives have had rights from time immemorial of entering a forest to cut wood, have they not, in many districts?—In many instances they have what they claim as the "right," but what the Government consider as the "privilege," of cutting wood for firewood and manure, and of grazing a number of cattle in the forests, and so on; but I should say that the great destruction of actual existing forests, which are still forests, has been caused by two circumstances; one is the immense demand for wood for the railways. When the railways were first made there was an immense demand for sleepers, and contracts were given to go, without any proper control, into the Government forests and cut timber. The contractor went in and cut everything straight down leaving nothing by which the forest could reproduce itself.

67. They destroyed a great deal more than they wanted, as they did in America?—Very likely they did; but wherever they went they cut straight down, not leaving enough for reproduction.

68. Does not the indiscriminate cutting of timber by unskilled hands cause an enormous destruction to the standing timber. For every tree cut, it is stated in the American report, 20 trees are sacrificed by dragging the felled tree out regardless of the young growing trees?—It is so very often.

69. Forest fires cause an enormous destruction, too, do they not?—They cause an enormous destruction of timber, but the principal injury they do is in preventing natural reproduction, as they sweep the young growth.

70. You have adopted many ways of dealing with this terrible accident of forest fires, have you not?—Yes.

71. You have cut roads, 300 feet wide, what you call fire traces?—Yes.

72. That has had considerable effect in a beneficial direction, has it not?—Yes; it confines the injury to the exact block in which the fire breaks out.

73. It was all these sources of accidents combined, leading to the great destruction of forests, which then led observant men to recommend to the Government a system for the protection of forests and the conservation of them; was not that so?—Yes.

74. Could you give the Committee the present mileage or acreage of the Indian forests reserved by the Government, and the old area?—I mentioned just now that the actual area reserved, that is, the actually reserved Government forest, was about 48,000 square miles. The details will be found in the Review of Forest Administration of the Territory of India, by Dr. Schlick. }

75. Besides that 48,000 square miles of specially reserved forests which are under Government control, there is a considerable acreage which

A 3

you

21 July 1885.]

Mr. PEDDER.

[Continued.]

Dr. Lyons—continued.

you have stated is only partially under care?—About from 27,000 to 30,000 square miles, exclusive of Madras and Bombay. Probably there are not less than 60,000 square miles in India generally, but nobody knows precisely what the area is.

76. There is a considerable amount of forest land in a condition not very valuable, is there not?—Yes, there is a great deal of such.

77. And some very worthless from the growth of the prickly pear and the interlacing of the trees?—Some of it is worthless because there are no trees in it; the trees have been cut down and nothing but scrub remains.

78. When you spoke of the gross and net receipts, I do not think you made a distinction, which I would like you to draw, between the amount which is annually spent before counting net receipts upon the extension of the system of conservation and for maintenance; you said in round numbers there was about, say, 900,000 £. received in gross from the forests?—£. 975,000, nearly one million; 96 or 97 lacs of rupees.

79. A certain amount of that is spent in the extension of the system of conservation, is it not?—It is.

80. Will your accounts show how much is devoted annually to the system of conservation of the forests before you count the net proceeds?—The charges, as I said, I think, were last year 567,000 £.

81. I observed that; but you must draw a distinction, I think, between what is expended for the maintenance of the forests that are standing and their extension. What would be the natural cost of a forest, say, of a given area, and the amount which you expend in extending the forest by your re-forestation operations of one kind or another, which you carry out extensively?—You will, I think, find it very clearly shown in this review.

82. But could you, without too much trouble, pick out from that book what is the cost which goes to the extension of the forests, and what is the regular cost of the conservation of the standing forest?—I suppose the item you refer to would be put under the head of "demarcation, improvement and extension of forests," and upon that in the last year about 725,000 rupees were spent.

83. In round numbers, how much would that be in English money?—That would be about 72,500 £., counting the exchange at 10 rupees to the pound.

84. What I want to make out is this: the profits as returned by your reports are really net profits after expenditure and extension, and they are rather less, are they not, than the total sum you actually gain from the standing forests; you take, in fact, out of your profits a certain amount; you do not count that among your net receipts; but if you expended that sum in extending the system, that will, in the future, undoubtedly, bring you in larger and still larger revenues?—Undoubtedly it will; but you must remember that the establishments, which amount altogether to 220,000 £. are, to a large extent, themselves employed in the extension and improvement of those forests, and, in consequence, it will be diffi-

Dr. Lyons—continued.

cult to draw any distinction between the maintenance of existing forests and the extension of forest conservancy. The total receipts, as I said, were between 96 and 97 lacs of rupees, of which about 47½ lacs is the price of the timber and other produce removed by Government agency; about as much more is for timber and other produce removed from the forest by consumers under the fee system, and for grazing fees, and things of that kind. Then, on the expenditure side, about 19½ lacs were spent in cutting and removing the timber, which fetched 47½ lacs. Then about 2½ lacs were spent upon the improvement of communications, forest buildings, and things of that kind, and then, as I said before, about 7½ lacs were spent upon demarcation and the extension of the forest, and 22 lacs were spent upon establishment.

85. The forests upon which that expenditure takes place every year will, in turn, add to the profits of the forests?—Undoubtedly; I have said in my evidence that I do not consider the Forest Department has as yet begun to pay.

86. Then it may be taken that your returns are strictly within the limits of what you actually make by the standing forests of any given extent, because, as you been just saying, a certain amount goes to the extension works. Supposing a man owns 1,000 square miles of forest, and spends so much of the profit that he receives from that area in adding another hundred miles, that, of course, in its turn will add to the profit, but it has for the time to be deducted from what you would call your net profits?—Yes; and also in the improvement of the existing forests the same will apply to that.

87. But then a distinction must be drawn in keeping a clear account between the expenditure in the maintenance of the standing 1,000 miles of forest and the extension expenditure?—Yes, true; but at the same time I ought to say that I think that the reserved forests have, probably, nearly reached their limit, that is to say, forests which are actually reserved to the Government and put under strict conservancy. There are 48,000 square miles now reserved, and I do not think that that area will rise, probably, by more than a few thousand square miles in the course of the next 20 or 30 years, so as to make, perhaps, 60,000 square miles in all.

88. May I ask you why you draw the limit at from 50,000 to 60,000 square miles of reserved forest; is there any external reason for it, or shall we have exhausted to a great extent the available forest land when we have reached that point?—We shall have practically exhausted the land available for forest. It is not desirable to take up in strict conservancy the whole available forest lands of India, and, in the next place, a great many of them belong to private individuals, and you cannot deal with them.

Chairman.

89. When you say you will have exhausted the forest lands, may I ask what you imply by the word "exhaust"?—I mean to say that there is a certain area of land in India which is suitable for forests. And having used that up, you would not

not

21 July 1885.]

Mr. PEDDER.

[Continued.]

Chairman—continued.

not turn a richly-cultivated plain, for instance, into forest land.

90. What you mean is that you would have brought into forest all the land applicable to that purpose?—Quite so.

Dr. Farquharson.

91. You do not use the term in an agricultural point of view, as meaning that you would have exhausted your land so that it would not grow trees?—No; but that we shall have exhausted all the land that will be available, apart from the areas in which trees will not grow, such as stony tracts; and again, something must be left for the people to use in the way in which they have always used it.

Dr. Lyons.

92. It is a long established rule, and recognised by all forest authorities, that from a fourth to a fifth of the land of any country should be forest, in proportion to the rest left unafforested. Could you tell me what proportion the 70,000 square miles now standing as forest land in India would bear to the total soil of British India?—About 9 per cent, or say one-tenth.

93. Then you would not for a considerable time, even in accordance with that rule, which is as old as the Duke of Burgundy's time, have come to the point of exhausting the forest land required for the proper protection of the rest of the country. That is to say, supposing a fourth or a fifth to be the rule in a well-organised country, you would not, having only a tenth now, be near exhausting the land which ought to be, according to the rule I mentioned, applied to forests?—We ought according to that rule to have 140,000 square miles instead of 70,000; but we must remember that in many provinces the land is not available for the purpose. In the Ganges Valley, and the North-West Provinces, in Berar and Bombay, a great part of the cultivable land is not at present occupied with forests at all, nor is it possible without expropriating the people to put forests upon it. On the other hand, there are parts of India in which the forest which I have named to the total area of the land.

94. And also it is very well known that in many tracts not yet properly explored there is a vast quantity of useless wood under the name of scrub, occupying thousands and thousands of acres?—Yes, that is so.

95. It is impossible in those circumstances with your present means to deal with the reclamation of these vast areas as yet?—You mean reclamation of it to forests; not reclamation from forest. But these areas are being to a large extent dealt with by a system of closing them to cattle grazing for the purpose of preventing fires upon them. The thing which prevents fires more than anything is preventing grazing. At the end of 15 years when a forest has been shut during that time, you will find that the trees have grown up beyond the reach of damage from grazing, that is what I mean by the 30,000 square miles of protected forest.

96. But grazing is very valuable, is it not, when the forest has grown to a certain extent 0.135.

Dr. Lyons—continued.

and the trees have got beyond the age when they can be injured or devoured by animals; then grazing forms a material point in the profit of a forest?—It does.

97. I daresay you know the old term of fallage in connection with woods?—Yes; we use the woods in that way to a certain extent; but it must be remembered that people have privileges of grazing which they consider very precious, and which it does not do to deprive them of or to charge them too highly for.

98. Those privileges of grazing are attended with very great risk. I find that Dr. Harwood in his report of 1871-1872 upon the forest lands of Seinde, says that immense fires take place in consequence of the graziers coming in and the grass accidentally or otherwise catching fire and spreading to the trees; is that in accordance with your experience?—Yes, certainly.

99. But you say you have adopted the system of fire paths and other provisions for the preservation of forests, from destruction by fire?—Yes. And what is more than anything is that we endeavour to interest the people in putting out fires by offering rewards for the purpose.

100. In the year 1871-72 it is stated that 36 fires were reported, and the area burnt was 1,590 acres. Of course that is a very serious inroad, even upon your very extensive forests in India?—What Provincial Report is that you are reading from may I ask?

101. It is a Report on Forestry by Dr. Harwood of the American Forest Department, and he gives your details quite as fully as those of the rest of the world?—But what is the particular province in India to which he is referring?

102. He is referring to Seinde; he is reporting upon forest work in Seinde in the year 1871-1872; he enters very fully into the subject, and he gives the measurements of the fire paths, their length, and the widening of them by 50 feet; and then he mentions one instance of a single fire path measuring 1,500 miles long, by 70 yards wide. Now in your forestry system, necessarily besides your superior officers, whom you have given as numbering 150, you give employment to a very large number of the population as forest guards, do you not?—Yes.

103. Could you give me any idea of what number of persons you can occupy in that way?—I am afraid I cannot. The total number of forest rangers at present employed is about 200. They are the executive officers under the assistant conservators, and there are about 200 of them; but the number of men employed varies immensely from time to time. Below those are the foresters; then there are the labourers who are put on as required; then there are the clerks and the forest guards and peons, and it is impossible to say what the number will be.

104. But it must be something very much more considerable than anything you have stated; it must appear in some of those returns surely?—I can get the return out by looking at the different provincial reports.

105. As a means of comparison, I may mention to you that during the Franco-German war the Forest Service supplied 7,000 volunteers to the French army; and you cannot work your forest

21 July 1885.]

Mr. PEDDER.

[Continued.]

Dr. Lyons—continued.

forests more economically than the forest system in France does, and they have in all about 10,000 men?—A great deal of our work is done by contract. Contractors are employed for instance to cut a certain forest under supervision; they are supervised by the forest rangers and a couple of foresters perhaps, and they may employ any number of men they like. We employ also the forest tribes very largely; we enlist them.

106. Then the system of forestry in India, it may be said, gives a very considerable amount of employment, does it not?—Yes, certainly.

107. And makes a return to the native population in that way?—Yes.

108. It adds to their comfort, puts them in a better position, gives them better pay and so on, and raises their status altogether?—Yes, that raises the question which has been very much disputed in India indeed, namely, the effect of forest conservancy upon forest tribes; the tribes of the Bheels, Sonthals, and Gonds, and an immense number of tribes of that kind. Those tribes, it has been represented, and with an amount of truth, have suffered very much indeed from the operations of the Forest Department, the Forest Department having prevented them from cutting wood where they liked, and cultivating in their own rude manner wherever they liked, which was generally by a system of cutting down a piece of the forest, burning it and planting in the ashes, ransacking the forest wherever they liked, and taking in people's cattle to graze in the forest; no doubt those people have suffered considerably. On the other hand our object has been to give them regular employment under the Forest Department with wages, either fixed by contract or casual, so as to give them a means of subsistence instead of that which has been taken away from them.

109. But in procuring their former means of subsistence, were not they actually destroying that upon which their subsistence depended by their extravagant use of the forest?—Yes.

110. And would in the end have deprived themselves of their means of subsistence altogether?—Quite so; when the forest had gone they must have starved.

111. Would you not say that the Forest Department in India has, on the whole, improved the status and permanent condition of those employed in it; has it not put them upon a better and more permanent footing?—I entertain no doubt whatever that in the long run the proper conservancy of forests is of the utmost consequence, both to the people who use the forests, and are directly concerned in the forests, namely, the forest tribes, and to the people who get their living outside the forests.

112. You have shown that upon the whole, and after careful deductions from the gross receipts, the forests of India are paying their way, and that the revenue now produced from them is advancing year by year?—That is so.

113. Now you have shown that you are putting the persons employed in the forests into a more permanent or substantial way of living?—Yes.

114. I should like you at your leisure to add to your evidence, by making out as carefully as

Dr. Lyons—continued.

you can, the total number of persons employed in the forest service in India, and you can either do that in your own terms, or some officer in India will, no doubt, do it very carefully for you?—I doubt if we can give the number employed.

115. I daresay you can approximately?—It must be very approximately.

116. I can give you the example of France, and the number of people employed there, as a modulus to go by, and I am sure you will be able to make something out of it. Now this system in India has produced several beneficial results, has it not, for instance, in regard to a more permanent water supply; has that not been found to be so?—Yes, the destruction of forests was undoubtedly seriously affecting the water supply in many parts of the country, and seriously affecting the climate.

117. And, indirectly, by affecting the water supply, did not the great denudation of the surface lead indirectly to the famines, which have decimated the country to such a large extent; I do not say it was the sole cause, but was not it a very potent cause?—Yes; of course any cause which makes the rainfall either more scanty or more uncertain, has a tendency to lead to famine. It would be difficult to say to what extent the denudation of the forest lands has ~~actually caused~~ famine, because probably there were famines when the country was all covered by forests which were worse than any we have had of late years; but then those famines were due to other causes.

118. Have any instances come within your knowledge where a very considerable diminution in the volume of streams or rivers has taken place by the incautious cutting of considerable forest areas?—I do not know any instance which has been exactly proved; but there are no doubt many instances in which it has been strongly suspected that the diminution of the water supply of the streams has been caused by the cutting down of forests.

119. You are aware that is a recognised consequence?—Of course it is.

120. And that it has operated elsewhere very materially. Are you aware that it has been felt so much in Canada that in April of last year the Canadian Parliament passed a law for inclosing large forest parks in the Rocky Mountains with the view of storing the water falling from the heavens?—Yes; I ought to say that there is a great deal of evidence in India which tends to show that the denudation process has had an effect upon the water supply in two ways; one in diminishing the moisture of the country in the way of falls of rain, and another in making the rain run away more rapidly and causing floods.

121. As far as you know, has there been any material effect upon the mountain torrents in India by denudation; is that a subject that you have followed up, it being a very important one, and one well recognised in the south of Europe?—In the north of the Punjab it has been represented by men whose opinions are of very great weight, that the denudation of some of the Himalayan forests has caused great destruction from

21 July 1885.]

Mr. PEDDER.

[Continued.]

Dr. Lyons—continued.

from the way in which the torrents have washed immense masses of sand and stone from the mountains into the plain.

122. And is it not also well recognised that the growth of forests leads to the storage of water and its gradually being distributed in streamlets and rivulets to the streams which it ultimately supplies?—I believe that is an unquestionable fact and is the foundation of all forestry.

123. Do you know of any other material effects which have been produced by denudation on the one hand of your forests of India, and by the restoration of them in the last 39 years in the other?—There is a district called Ratnagiri, south of Bombay; it is a rice district which lies between the sea and the Western Ghats—which used to be considered to be the most productive of the rice lands of the West of India at that time—I am speaking of 50 years ago—and I know from the reports which I have read of the officers who were employed to make the original trigonometrical survey, that that country was covered by dense forests. The diaries of those officers show that in some cases they had to cut a base line at the rate of half-a-mile a day for miles through dense forest—whereas now the same district has been almost entirely denuded up to the crests of the hills; the hills are now almost a bare sheet of rock; and people have complained and complained bitterly of the decreasing yield of the rice land below, which has been attributed, and I believe truly, to the destruction of the forests, which operates of course to prevent the water from being stored upon the hill sides; it runs away in violent floods instead of flowing gently over the country.

124. India is very largely dependent upon wood for fuel, is it not?—Almost entirely.

125. And therefore, the careful and economical use of the wood and its preservation is a matter of very great consequence to a country like India?—It is of the greatest consequence.

126. The supply of wood is now more diffused and more general, is it not, since the system of forest conservancy has been adopted?—I think in all probability that the result of the establishment, speaking generally, of the system of forest conservancy has been to raise the price of wood. That is one of the great complaints made by the people; and it is almost impossible that it should not have been so, when you find large tracts of forest, which nothing but being absolutely closed for 10, 15, or 20 years will save from absolute destruction. That being the case with a considerable number of forest lands in India, it stands to reason that you must increase the price of wood, seeing that you make wood more scarce year by year from those forests.

127. On the other hand do you not provide the certainty of there being a wood supply in future years?—Yes, undoubtedly you provide for the future of the wood supply—whereas if you had not taken such steps at the commencement, you would not have had any supply at all in future years.

Mr. Portman.

128. When you use the word "reproduction," do you do much in the way of re-planting?—Yes, a good deal.

0.135.

Dr. Lyons.

129. As the subject of fire-wood is so essential to India, I was asking you about that, as one of the great functions of your forest work; you also supply the materials for architects and furniture, and also the materials for sleepers?—Yes.

130. Do you know whether there is any available forest map of India, showing the distribution of the forests in India?—Yes; in the Parliamentary Return which is now in the press, the "Moral and Material Progress Report," a forest map will be printed.

Mr. Seely.

131. When you cut your forest, do you cut it down in sections; do you cut the whole of the trees in any section, or do you cut some trees in it and leave others remaining?—In India, the forests have now begun to be worked upon what is called the block system; a forest is divided into blocks, and those blocks are cut in rotation. The system of reproduction in India is almost purely a natural reproduction, and to enable natural reproduction to succeed, you must leave a certain quantity of timber standing; it is the universal rule in India in forest administration to leave a certain portion of the trees standing.

132. You find that better than cutting down the whole of the trees and re-planting?—Yes; re-planting is never attempted in India, except where you have no alternative. Forests that have been destroyed you must re-plant, but our object is to deal with the forests by means of natural reproduction as much as possible.

133. How long do you find it pecuniarily advantageous, speaking generally, to allow the trees to grow, and at what age do you cut them?—It depends entirely upon the nature of the trees; a teak forest ought to have a rest of about 40 years.

134. And as regards the trees which are used for the purpose of fuel?—That depends entirely upon the nature of the tree; it may be 10 years, or it may be more. One of the principal duties of the forest officer is to decide what the rotation of the cutting should be.

135. And you have a general law upon that matter?—No.

136. That is one of the main points in your school of forestry, is it not?—It is.

137. Practically speaking, in a systematically cultivated forest you would have no re-planting; it would all be natural reproduction?—It would.

Dr. Farquharson.

138. I suppose forests have existed in India for a great number of years?—Yes, from the creation of the world.

139. Then who planted them originally?—No one; I suppose they planted themselves; they are primeval forests.

140. They have not been planted within history?—No.

141. Then the process of managing these forests in ancient times must have been better than it is now; because if the process of destruction that you say is going on so rapidly had gone on before they would have disappeared from the face of the earth long ago?—Yes; but there are reasons

B

reasons

21 July 1885.]

Mr. PEDDER.

[Continued.]

Dr. Farquharson—continued.

reasons why they could not be interfered with; forests through which there were no roads, it was impossible to cut and take away.

142. They protected themselves naturally, and under the natural management, those forests were successful in former years?—Yes.

143. You would not you say propose to plant land that was available for cultivation?—No, I would not; but when I say that, I ought to mention that occasionally land capable of cultivation is purchased from the owners for the purpose of rounding off a forest, but that is an exceptional case.

144. What sort of tree is principally grown; are they of great variety?—Yes; there are the great pine forests of the Himalayas; there are the great sal forests in Central India; there are great teak forests in Burma and Bombay; and besides that there are innumerable kinds of wood.

145. Is there a great market for Indian wood, or is it only consumed in India?—Principally in India, because India could consume a great deal more wood than it produces.

146. With reference to the training of young men at Cooper's Hill, it appears to me to be rather of a theoretical character. We have heard a good deal about biology, but they do not appear to get much of what we call in medicine clinical instruction?—We have not begun practical instruction yet, but the object is to give practical instruction in the forest by the utilization of the Royal Forest of Windsor for the purpose.

147. Is there enough planting going on there to make it a useful place for study?—Dr. Schlick has arranged, I believe, that young men shall be practically instructed in these woodlands.

148. Then I suppose Windsor is the exception to the rule, and must be omitted from the sweeping statement you made just now, that in England the woodlands are not scientifically managed?—I do not suppose the authorities of Windsor would allow that their woods are not well managed, but it is the opinion of a well-known forester that they are not as well managed as they might be.

149. Did this gentleman, M. Boppé, visit the large Scotch forests of Lord Seafield?—Yes.

150. Did he include them in his denunciatory remarks?—He speaks of Lord Seafield's forests as being particularly well managed, but he mentions the system in force as being almost entirely that of artificial reproduction, which he considers is inferior to that of natural reproduction.

151. I suppose he meant that that was rather an awkward way of doing it?—No; it was not that.

152. Is there any particular scientific study requisite for natural reproduction; the trees merely drop their seed and grow; is it anything more than that?—I believe it requires a great deal of scientific knowledge to manage a forest upon the principle of natural reproduction.

153. Would you consider that if there were any facilities provided for theoretical instruction in schools, and facilities for watching the operations of planting, that would be sufficient for practical study, if the artificial planting and the natural planting were also looked after?—I

Dr. Farquharson—continued.

could only speak as far as the Indian department is concerned. I have always considered that the great advantage of the continental training which our forest officers have had is that it shows them what can be done, as they go upon the principle of natural reproduction.

Mr. Seely.

154. Will you explain a little more fully what you meant by the importance of the rotation of crops or cutting upon the system of natural reproduction?—What I mean is this: Working upon what in India is called the block system, you divide the forest into a certain number of blocks. For instance, a forest which has a 40-years' rotation is divided into 40 blocks, one of them being cut each year. As a matter of fact they do not exactly work it in that way; it is cut into a smaller number of blocks, and those are partially worked each year; but if you fix the rotation, which ought to be fixed at 40 years, at, say, 25 years, it is obvious that the forest is gradually being destroyed; it does not reproduce naturally sufficient to replace the trees taken away. If, on the other hand, a forest only requires a rotation of 40 years and you cut it once in 60 years, you are not making the most of it.

155. When you spoke of a rotation did you mean that in one period you grow one sort of trees, and that in the next period you grow another sort of trees?—No, a forest in India contains mainly one kind of timber—say, teak, sal, or blackwood, as the case may be; but, of course, there is a great deal of undergrowth, which is valuable for firewood and things of that kind. The object of scientific management, as I understand, is this—you give the main forest a sufficient period of rest to recover itself; at the same time you thin out and clear away the underwood and subsidiary growth when necessary, so as to give the main forest its best chance; but I should tell you that I am not a trained forest officer myself.

Colonel Nolan.

156. Do they not do nearly the same thing in the New Forest?—I am not aware of the practice in the New Forest.

157. Have you any idea whatsoever as to what the effect upon a climate like that of Ireland would be if you increased the amount of forest to about 5,000 square miles, there being about 2,000 square miles now?—I am afraid I can give no opinion, because my experience is of a very dry country, and one which requires its moisture increased.

158. You could not give any idea?—No.

159. You could not give any estimate of the number of people who would require to be employed, taking the case of educated men, say upon an area of 5,000 square miles, in a country like Ireland, if put into forest?—I can only speak from the analogy of India.

160. Or taking the example of France?—I do not know what the staff is in France.

161. In the first place, how many educated first-class men would you require for 5,000 square miles?—That would be about the area of the Northern Division in Bombay, and we have

ten

21 July 1885.]

Mr. PEDDER.

[Continued.]

Colonel Nolan—continued.

10 or 12 men of the upper class of officers in that case.

162. So that it would require about a dozen?—Yes, judging from the analogy of India.

163. Then, of the under class have you any idea how many would be required?—Of the under or bailiff class we have about double that number, that is to say, about 30 officers for the 5,000 square miles.

164. Then, what else would be required?—It depends entirely how you work the forest, whether upon contract, as we do in Bombay, or otherwise; that I could not say anything about.

165. Would you require a number of men of the game-keeping class?—I am speaking entirely from memory, but I think that in that division of Bombay, which is about 5,000 square miles, the number of the guard class is about 300 men.

166. The superior officers, the bailiff class and the guard class, would comprise the whole except the actual labourers?—Yes, I think so.

Sir Edmund Lechmere.

167. How would you propose to apply the experience which has been gained in India to England, with the practical purpose of improving our woods and forests. Knowing, as I suppose you do, the state of forestry in this country, have you ever formed any scheme or laid down any plans for carrying out a similar system in England?—I do not think I have ever gone into that question.

168. Then what would be the practical use of information we have obtained with regard to forests in India, looked upon as a practical question?—I presume the object of my examination has been to show that the establishment of a scientific forest department has been followed by a large extension of revenue, and by large improvements in the conservation of forests.

169. I do not know whether you wish to show that a similar system could be applied to England?—I do not know enough about English forests to be able to answer your question.

Colonel King-Harman.

170. You mention that it was not settled that biology was to form part of the instruction at Cooper's Hill?—It is not settled yet.

171. But you do teach that in India?—Yes; in India the students receive instruction in entomology. The object of teaching them some entomology is to enable them to take up that branch of the subject.

172. How is it that you do not send your students to Germany at all, but that they all go to France?—They were at first sent half to Germany and half to France, but it was found that those young men sent over there by themselves required some control, and it was determined to appoint an officer to look after them and to keep them all together, so they were placed under the control of Colonel Pearson at the French school at Nancy.

173. Was any preference felt in India for the French system of teaching?—I believe some of the Indian forest officers consider that the system of working the French forests in the south of France, about the Estrelles or the Basses Alpes, more resembles the system of Indian forests than 0.135.

Colonel King-Harman—continued.

the German system; that there is more analogy between the two; the climate is more like for one thing.

174. You were speaking of land under cultivation; speaking of Scotland, and I think you said the north of England too, do you think that there is a great deal of land in England that is more adapted to planting than to tillage at present?—I do not know how that may be.

175. Is that a question which a trained forester would be competent to decide?—Yes.

176. And which would be taught to advantage in any school of forestry that would be established in England?—Yes, it should be.

Mr. W. H. Gladstone.

177. Have you any particular mode of dealing with the timber when it is cut; is it sawn on the spot or transferred bodily away?—It depends upon the means of communication which exist; we have to a large extent set up sawmills in India for the purpose of cutting up timber upon the spot. There are large sawmills in the teak forests of Canara which do a great deal of work.

178. Do you use water for transport?—We use water for transport wherever it is possible to do so, but the streams are very often not deep enough to be availed of for water transport.

179. Do you not find great difficulty in replanting?—Yes; we find very great difficulty in artificial planting. I believe the principle adopted of late has been broadcast sowing at the commencement of the rains; the seeds, particularly the teak, spring up after the rains.

180. Has the planting been successful?—There have been some very successful instances of artificial plantation in India; the great teak forest at Nilambur in Madras is an instance. The experiment has generally been made under favourable conditions, but it costs a great deal of money.

181. Of course it must be all, whether natural reproduction or artificial planting, of the same kind of timber, must it not?—No; some of the mixed forests in India are the best examples of natural reproduction.

182. Are any special precautions used in getting the timber out so as to avoid damaging the undergrowth and small trees?—It is, of course, the duty of the supervising forest officer to arrange that as little damage should be done as possible.

183. I suppose that is a difficulty?—It is some difficulty.

Dr. Farquharson.

184. You spoke about forests being injured by grazing cattle; is that because the cattle eat the young trees?—Yes.

185. But in Scotland we are in the habit of grazing our woods with Highland cattle, and we always hold that the sheep eat the young shoots, but cattle do not?—Cattle do eat the young shoots very largely, but they are not so bad as goats. We are obliged to exclude cattle very carefully from the young growth.

Chairman.

186. I think M. Boppé pointed out that if you

21 July 1885.]

Mr. PEDDER.

[Continued.]

Chairman—continued.

you had 120 years as the time fixed for the existence of the trees in any particular forest, you might leave the cattle and sheep to graze there for about half the time without any injury; that is to say, you must exclude them when the trees are young, and again when the forest is replacing itself, and that for about 70 years you might leave the forest open to pasture?—I think the Indian foresters generally leave the forest open for a larger portion of the time than that; they close the forest for only about one-third of its duration.

187. M. Boppe was also of opinion that under that mode of treatment the pasturage would be so much improved that, even if the cattle were excluded for a third or half the time, still the cattle and sheep would derive a greater advantage than they do at present?—There is a very striking case in India to the same effect. The grass in a forest which had been closed for a few years has fetched more in one year than it did in 10 years under the old system.

188. You used the expression that the Indian Forest Department had not yet begun to pay. I presume you do not wish to withdraw your previous statement that your net revenue had risen to 370,000 £, but rather to show that that figure did not represent at all the actual improvement which had taken place?—Yes.

189. In addition to that, we must take into account the great improvement in the forests themselves?—Yes; and that in 20 or 30 years hence, when the result of what is now done has become apparent, the net returns will become very much larger.

190. Have you any return of the approximate value of the increase in Indian forests during the last 20 years?—No; nobody even knows what the actual value is.

191. I suppose the Indian Government established their school at Dehra Dun because it was desirable that officers even of the lower grade should have some special training?—Yes; there was great complaint, from the superior officers particularly, as to the untrained men who were appointed to the department; they complained that the men they had to deal with were so ignorant of all the first principles of forestry; and the outlines of reproduction and everything of that kind, that they found it almost impossible to teach them.

192. In your opinion has the establishment of the forest school at Dehra Dun been of advantage to the Forest Department in India?—It has only been established for five years, so that we cannot tell yet what the result of it may be.

193. We have, as far as I know, nothing of the same kind in Great Britain at present?—No; except that they are teaching something of forestry at the Cirencester Agricultural School. I understand they teach a little forestry there.

Colonel Nolan.

194. Is anything done at Kew?—At Kew there is a magnificent school of botany, but not of forestry.

Colonel Nolan—continued.

195. In your opinion, the establishment in England of a similar school to that of Dehra Dun would be advantageous?—I should think it must always be advantageous to be able to get men who know their business.

196. Am I correct in stating that the general tenour of M. Boppe's report was, that while, no doubt, there were exceptional forests which are well managed on the whole, our woodlands are not, in his judgment, satisfactorily managed, and he considers that there are also large tracts of land, particularly in the north of Scotland, and probably in Ireland, which might be advantageously planted, and that he is strongly of opinion that it would be desirable that a forest school should be established in Great Britain; is that the general tenour of his report?—I think it is; but I ought to mention that M. Boppe was asked a particular question, which was whether the English and Scotch forests were in such a condition as to enable the Indian forest students to be practically trained in them with advantage; he says, "No;" and all that he says else is really incidental to the main question.

197. But I think, if you look at pages 8 and 10, you will see that he refers to the Forest of Dean as possibly well suited for the establishment of a forest school; and that he closes his report by emphatically recommending that a national forest school should be established in Great Britain?—Yes; I think that was principally with regard to some conversation which he had with Sir Louis Mallet, who was then Under Secretary. Sir Louis asked him, as he had been through the British forests, to place on record his impression of their character, and what should be done about them. I may mention that we asked the same question in 1883 of, perhaps, one of the most eminent of the forest authorities, who was the late head of the Forest Department in India; and Dr. Brandis says, "The object of giving effective training to the recruits of the Indian Forest Department cannot at present be attained by having a school of forestry in Great Britain. The further development of forestry in Great Britain should be encouraged as much as possible, for there is little doubt that the income of landed estates might in many cases be increased by systematic treatment of the woodlands; and it is desirable that early measures should be taken to place some of the Crown forests in a condition to be utilized for purposes of instruction." This, however, will take time. "Eventually, when a regular gradation of ages of different classes of forest over sufficiently large areas has been established in the Crown forests, and when in other respects the result of systematic management becomes visible so as to carry conviction to the minds of students, it will be possible to train the Indian officer at the forest schools which will by that time have been established in Great Britain." From that I gather that his opinion of the management of the British forests, especially the Crown forests, is, that it is not very scientific.

21 July 1885.

Colonel JAMES MICHAEL, C.S.I., called in; and Examined.

Dr. Lyons.

198. You were, I believe, at the inception of the Forest Service in India?—I was.

199. Will you kindly tell the Committee what were the first steps taken in the Madras Presidency in regard to the promotion of forests?—I must premise that I can merely give information regarding the early stages of forestry in India, and simply of the Madras Presidency, because I had, after seven years' pioneering, to leave the Forest Department, my health having suffered so much from jungle fever. But I have ever since taken the greatest interest in the subject, and have studied the progress of it, and have always kept myself well au fait as to what was going on. As Mr. Pedder has already told the Committee, in the first instance the Bombay Government began to feel the pinch (as Sir George Birdwood expressed it in one of his papers upon the matter) of not getting sufficient timber for the Bombay dockyard. Ships used to be built there for the Royal Navy; and they established a Conservancy Department in Bombay, in 1846, mainly for the purchase of timber; and in a year or two after that the first actual steps towards the Government taking forests into their own hands and working them and conserving them, and, in short, starting a Forest Conservancy Department, originated in Madras through General Frederick Cotton, of the Engineers, who suggested to the Madras Government that they should thus take the southern forests in hand. Upon his recommendation the Government appointed me to commence the first experimental scheme in 1848. I hardly like to talk much about myself, but I might hand in a letter which appeared in the "Journal of the Society of Arts" in 1882, written by Sir George Birdwood; I think the honourable Chairman will recollect the circumstance, as he presided on the occasion of a paper being read by Colonel Pearson, who, in alluding to the commencement of the Forest Department of India, commenced with the year 1857. Upon that Dr. Birdwood (now Sir George) wrote a letter, published in the "Journal of the Society of Arts," in which he mentioned that just 10 years before that date the foundation upon which the Forest Department was constructed had been deeply laid in the Madras Presidency when Major-General Frederick Cotton, who was then a captain in the Madras Engineers, first drew the attention of the Government of Madras to the subject. And then he goes on to say that I was appointed to carry out the experiment, and that in consequence of the success of that undertaking between 1848 and 1856, the Court of Directors sanctioned the application of these plans to other forests in the Madras Presidency, and directed the formation of a regular Forest Department which was commenced then, and spread throughout the whole of India.

200. Have you any idea how that came to be originated with General Frederick Cotton?—I know perfectly, because I saw a great deal of him at that time, as I was placed

Dr. Lyons—continued.

under his orders. Riding across the southern forests of the Madras Presidency, then unexplored, he was struck with the bad order in which they were kept, being destroyed as they were by Government leasing them out to contractors, instead of keeping them in their own hands. It struck him that if the Government would put a stop to this system, this terrible waste would be stopped, and he urged the matter upon the Madras Government. Upon his recommendations those steps were taken. He was asked if he would undertake to put a stop to waste in at all events a small portion of the forests. He consented, and he asked for me as an assistant, as we had been much together; my regiment had been stationed at the same place and we had hunted together. Having known me in this way he asked for my services, as he also knew I had had some little experience of forestry in Europe before I entered the army.

201. What was your knowledge of forestry in Europe?—I had been a great deal in Switzerland. I had been educated there, and I had often talked to him about the mode of working the forests there by means of timber slips, and the result of our conversation was that we made one in the Annamullay Forest in the Coimbatore district. The first thing that became apparent directly we began working the forest was that we should at once with the greatest advantage undertake the conservancy, and see that unauthorised people were kept out of that forest, that fires were kept down, the young saplings protected, and the forest taken regularly in hand. Conservancy was then introduced.

Mr. Portman.

202. Are these forest fires intentional in some places or are they accidental?—I would hardly say that they were entirely accidental. They are the act generally of the jungle tribes collecting honey in the woods, cardamoms, and things of that sort, or cattle graziers lighting a fire for the purpose of cooking their food which may catch the grass and become a furious fire.

Dr. Lyons.

203. Speaking of the timber slides are you familiar with the great slide of the Mount Pilatus in Switzerland?—I have seen it. There was one also near the falls of Giessbach into the lake of Brienz, which shot the timber right over the precipice into the water. The above really was the origin of the idea of taking up the forests in India in 1848.

204. Then the idea spread very rapidly in India, did it not?—After about seven years of this pioneering work the Court of Directors were much struck with the result; the financial result was very good, and the report was favourable from those who had anything to do with it.

205. Were you able to produce important financial

21 July 1885.]

Colonel MICHAEL, C.S.I.

[Continued]

Dr. Lyons—continued.

financial results in seven years?—Yes, very important results. In 1854 the Court of Directors wrote out to the Governor-General of India in Council:—"The financial result of Lieutenant Michael's superintendence of the Annamulley teak forests since the Madras Government have taken the working of them into their own hands, appears to be very favourable. The saving at the end of the year 1852," that was four years after the commencement of the work, "contrasting the entire expense with the amount which would have been paid to merchants for an equal quantity of timber, being estimated at about 72,245 rupees. This reflects much credit on Lieutenant Michael, and having considered the statement of that officer with regard to his expenses for travelling, &c., we concur in the propriety of raising his salary." That was the first result, as far as I was concerned.

206. Then you found it necessary to extend the system of planting, did you not?—The first step we took towards conservancy was to lease an adjoining forest which adjoined the forest I had charge of belonging to a native zemindar. I found I could not introduce proper conservancy, protection from fire and cattle trespass, and that sort of thing, without getting another forest under control also, so the Government leased the adjoining one from the zemindar and put them all into my hands.

207. Could you say what size was the first forest you got in charge, in round numbers?—It was about 50 miles long by 30 miles across, I should think. Then we leased one equally large; on the borders of Travancore and Cochin, and directly we took them in charge Travancore and Cochin put their woods under protection.

208. You first dealt with the timber that you found growing, and applied conservancy and proper regulation to it?—Yes, and felled the right timber; the trees that were thoroughly ripe we felled, and sent down to the coast for the Bombay Dockyard, where they were then building ships for the Royal Navy.

209. Then you found it necessary to commence planting other trees, did you not?—No, we never planted upon the Annamullays, but Mr. Conolly, the collector of the adjoining district of Malabar, began the magnificent Nilambar plantations, which are very well managed.

210. This was a new operation, was it not?—Yes, the planting of teak had never been undertaken before.

211. You exhibited in the Edinburgh collection 39 years' growth year by year, did you not?—Mr. Conolly began planting in the year 1844, and specimens were shown at the Edinburgh Exhibition from the Nilambur plantation, comprising 36 sections from trees planted in consecutive years from 1844 to 1876; the largest measuring eight feet four inches in circumference, taken from a tree 103 feet in height.

212. That plantation has been very successful has it not?—It has been very successful indeed. There are now upwards of 3,500 acres planted entirely with teak; they are planted 6½ feet apart, being about 1,040 to the acre.

213. When do you expect those will be ripe?

Dr. Lyons—continued.

—The plantations are now paying already, they pay very well indeed from thinnings. They are cutting very valuable timber out of them now.

214. What becomes of the timber you get from thinnings?—It is put into the public market, and there is a great demand for it.

215. What is it used for?—I believe for the decking of ships; it is large enough for that now.

216. Could you tell the Committee briefly what are the various causes which led to the great destruction of forests in the early days of the system?—It was principally that they were, so to speak, in nobody's charge. The inhabitants of the neighbourhood were allowed to go about them as they liked, and cut young saplings. They would cut down a valuable teak sapling if they wanted a post. They would set fire to the forest without hesitation in order to get a fresh growth of grass for the grazing of their sheep or goats, or cattle, and in many parts, especially on hill slopes, which are by far the most important parts of the forests on account of the water supply, it was the custom all through the western ghats of India, from Bombay to Cape Comorin, to practice what is called *coomree* cultivation, that is to say, a jungle tribe would fire, say, 100 acres of the primeval forest, and burn it in the hot weather, simply for the sake of getting one crop of indifferent grain on it. That was one of the great reasons which led to the destruction of considerable areas of wood. That, however, has been put a stop to by the introduction of the Forest Department, but that was one of the causes of it.

217. Teak is a very valuable timber, is it not?—Yes, it is a very excellent wood for all purposes, especially under water.

218. It contains a peculiar oil, I believe?—A very strong oil.

219. Which prevents iron from rusting in it?—Yes.

220. In that respect it is exceedingly valuable in protecting those parts of a ship which are under water?—Yes, it is.

221. I think there are large demands in Bombay for that wood?—Yes, they are very large if the supply could be met. I may mention that some good logs were sent to the Edinburgh Forestry Exhibition from Burmah, and they fetched a very good price indeed, 6 s. 3 d. per cubic foot.

222. How would you compare teak and oak for the purposes for which the best quality of timber is supplied in ship-building and for architectural purposes generally?—I have not experience enough to enable me to say, but I have been told that there is no timber in the world equal to teak for putting behind the iron of ironclads. Teak is preferred to all other woods for that purpose.

223. Is teak backing not very commonly used in the experimental targets of the present day?—It is.

224. It is found to be one of the most resisting woods?—It is.

225. It is about the best backing that can be found?—It is.

226. In your opinion is teak capable of being brought here commercially; would it bear the

21 July 1885.]

Colonel MICHAEL, C.S.I.

[Continued.]

Dr. Lyons—continued.

cost of carriage, and sell at such a price as to remunerate the grower for the cost of carriage?—I should say, judging from the price these logs fetched at Edinburgh, and from questions put to me, and from information we obtained from men in the Indian timber business, that teak would be remunerative if brought to England. I presided a short time ago at a meeting of the Society of Arts, at which Mr. Simmonds read a paper upon "The Teak Forests of India and the East, and our British Imports of Teak," and I mentioned at the conclusion, when I was thanking him for his paper, that "there were a great many other Indian woods which only required to be known to be thoroughly appreciated, and I had no doubt a trade might be developed with India, Burmah, Siam, Johore, Borneo, and other eastern countries. At the close of the Edinburgh Exhibition, a local cabinet maker and builder purchased a number of pieces of almost unknown woods, at the price of 5 s. per cubic foot all round, which was a clear proof that if woods of that description were put on the market a remunerative price could be obtained. Amongst these woods were *Pterocarpus indicus*, *Shorea obtusa*, *Cedrela toona*, *Pterocarpus Marsupium*, *Terminalia glabra*, *Lagerstomia*," I mentioned various other trees.

227. But confining yourself to teak, which is so well known in this country, you think it is commercially capable of being brought here and paying the cost of carriage?—Certainly; I should expect that a large portion of the wood which will be taken from the Nilambur plantations would find its way to England, because they are upon the coast.

228. What is your opinion of the influence of the denudation of forests upon the rainfall and water supply as derived from original observations?—I personally have no doubt whatever upon the subject; in fact, I have seen myself the effects of the denudation of hill slopes.

229. Would you briefly mention what you refer to?—I have seen a well-known perennial stream dried up completely upon the slopes of the Neilgherries, undoubtedly from the fact that the timber all round it had been cut for coffee planting.

Chairman.

230. Was that a stream which had been perennial?—Yes, it had been perennial, and it had utterly dried up; I have seen several at the station of Ootacamund; I can quote a particular spring near the church of Ootacamund, which used to be always the source from which most people got their drinking water; it was an excellent spring; and within my memory the wood which surrounded that spring was cut down, the result being that the spring has disappeared, and that there is no water there now.

Dr. Lyons.

231. Then, *vice versa*, can you give the Committee any instance of water being restored by planting?—No; I think that is a matter for a great many years; I do not think that by planting you could bring water to a ravine within the memory of man. You could not produce a spring at once, though, no doubt, your action will produce

O.135.

Dr. Lyons—continued.

one eventually, but it will take a number of years.

232. You do not happen to know of any instance, though there are several mentioned in American experience?—I can mention many instances of springs being lost from a forest being cut away, but not of any stream being formed by the formation of a forest; though I have no doubt that would be the case in years to come.

233. Are you familiar in India with the recurrence of the great forest fires?—Yes, I have seen a great deal of them in my forest experience. I had to deal with them as one of my greatest enemies.

234. You have arrived in India at a very considerable control over these fires now, have you not?—It is very systematically and cleverly and scientifically done. They now protect their forests very well indeed from fires; in my days we used merely to clear the brush wood round the young saplings and protect them in that way.

235. Do you think that the Indian forestry system, as carried on now, gives rise to a great deal of occupation amongst the people?—Immense. I heard what Mr. Pedder said just now, and I was rather surprised at his not laying more stress upon it, for a Forest Department gives an immense amount of employment to people in the country.

236. You could not refer us to statistics at all upon the subject?—No, and I do not see how you are to arrive at it, as so much is done by giving contracts to people employing their own labourers; and you can hardly tell how many labourers they employ; but wherever work is going on in the forest there must be a large amount of labour. I know when I commenced work at the Annamullays, and was cutting timber for the dockyard, I used to have a camp of as many as perhaps 2,000 people for myself alone, and I was working upon a small scale. There are people who fell and who clear away the brushwood from the stacks, the people who cart, the elephant people, who drag the timber, and all that; so that a forest camp is a very large camp indeed.

237. Has the result of that been that the timber in the forests has developed a great many industries which did not previously exist nearly to that extent?—It does not develop many new industries perhaps, but it draws artisans and labourers together.

238. Does not it promote the erection of saw mills, and give occupation to a great number of people in them?—Certainly.

239. And out of the timber there cut are manufactured waggons and furniture, and so on?—Yes, that is so.

240. Would you not say that a considerable number of industries necessarily grow up wherever timber is very abundant?—Wherever timber is abundantly worked, no doubt it would be so, but I thought you asked me whether the Forest Department did not give employment to a considerable number of people.

241. I did, but in connection with that there are also developed from the wood a large number of industries?—No doubt when the timber is produced, it is practically worked up by various trades.

242. Have you made any general observations upon

B 4

21 July 1885.]

Colonel MICHAEL, C.S.I.

[Continued.]

Dr. Lyons—continued.

upon the climatic effects of the extension of forests in India?—No, I cannot say that I think we have had sufficient time to enable us to judge of the effect upon the climate. It must run over a great number of years before we can do that, but I have no doubt it will affect the climate.

243. You are barely more than in the 39th or 40th year of the State experiment in India; is not that so?—Yes, it was about the year 1848 that we began doing anything; that is 38 years ago.

244. Are you practically familiar with the Dehra Dun school?—No, I have merely read about it.

245. That was instituted years subsequently to your time?—Yes, it was instituted long subsequent to my time.

246. You have said that you are familiar with the Continent; are you familiar with the system of Continental forest schools?—I have never been to one of the Continental forest schools, but I have met some of the professors of those schools. I was Commissioner for India at the Vienna Exhibition, and I took a great deal of interest in the Forestry exhibits, and there I met the directors of nearly all the forest schools.

247. You have not been to the schools of central Germany?—No, I have not been to them.

248. Are you aware of the general effect and operation of those schools?—Yes; I have read of it, and most valuable I consider it.

249. You consider very beneficial results would follow from the education of such a number of foresters in the schools upon the Continent?—Certainly.

250. Do you think it desirable that a forest school should be established in this country?—Certainly, it could not fail to be of value to the country.

251. Irrespective of giving training for India?—Yes, I think for the country generally it would be immensely valuable for landowners and men who own large woods in this country if they could have men with better training than those they have now.

252. Is it not a fact that great proprietors frequently are in want of good scientific information as to the forest products, and do not know where to look for it?—I have certainly heard so. When I was in Scotland at Dunkeld and Blair Athol, I remarked the forests there; I daresay you remember McGregor, the forester who was on the jury at the Edinburgh Exhibition; I went round with him and know that he has a difficulty in finding men suitable for his work.

253. Do you know that there is considerable difficulty in disposing of English bark at present?—I do not know that.

254. Have you heard any complaints from the proprietors of large woodlands that they find it very difficult to dispose of their bark, and that they do not know what is the matter with it?—I am not aware of that.

255. A proprietor who owns a large property in this country, and also in Ireland, complained to me that he could not sell his bark now to the same advantage as formerly, and he did not know

Dr. Lyons—continued.

very well where to get advice about it, or what was wrong about it; you would not doubt that a scientific and practical forester would be well able to settle a question like that, and that it would be very important to the proprietors of woods that there should be some authority in the country to whom one should be able to refer questions of that sort?—I should think that there must be people in this country who would know the reason why the bark did not fetch a fair price.

256. Would you not think it desirable that there should be a supply of persons skilled in forestry who should be able to decide upon a question of that sort?—Certainly.

257. You believe that it would have a very considerable effect upon the commercial operations in regard to forest products in this country if there should be a knowledge of these things easily available, and the skill to deal with them?—I have no doubt of it.

258. Have you any experience of the great forest products in India, turpentine, resin, bark, and so on?—Yes, a great deal. I took up that subject also when I first had charge of the southern forests; in fact I began collecting these things myself on behalf of the Government, not as a source of revenue so much as for the benefit of the people of the jungle. I wished to conciliate them, and at the same time to get them to help me in the matter of conservancy, and therefore I took to buying from them all the various indigenous hill or jungle produce, such as barks, gums, resins, wax, cardamoms, ginger, &c.

259. If a system of collecting and disposing of forest products were instituted in this country would it not necessarily lead to very considerable industries, which would be of great use amongst the populations where those industries would be established?—In this country, I should think there must be many already, but of course my experience in that subject is limited to India where the products are so much more numerous.

260. They are utilised over there now to a large extent, are they not?—They are all utilised, and now form a very large source of revenue; but there must be also a large number of forest products in Europe, resins, gums, and so on.

261. You mentioned Mr. Simmond's name a moment ago; are you aware of the report that he made on the importation of forest product into this country?—I do not think I have seen it.

262. It was published last December in the "Society of Arts Journal"?—No, I am not aware of it.

263. Are you aware that the forest products imported into this country amount to 31½ millions sterling per annum?—I can quite believe that, judging from the value of forest products which are to be got out of the forests in India, as evidenced by the collection sent to the Forestry Exhibition, drugs, gums, resins, oils, and fibres. There is an enormous industry, which I think will come forward, in these raw materials, especially in paper making substances.

264. You have no returns which would show the

21 July 1885.]

Colonel MICHAEL, C.S.I.

[Continued.]

Dr. Lyons—continued.

the value of the timber imported into this country, which is about from 16 millions to 20 millions, the rest being represented by the importation of resins, gums, and so on?—This report which I have read of Mr. P. L. Simmond's Paper in February last treats only of the teak supply, but it shows that in 1883 there were 647,000 L. worth of teak imported into England.

Chairman.

265. You heard I daresay Mr. Pedder's evidence before the Committee?—I did.

266. Do you concur generally in that evidence?—I quite concur in it. I do not think there was anything that I could take exception to in that evidence.

267. May I take it, generally, that in your judgment the organisation of the forest service in India, under trained officers, has largely increased the revenues from, and improved the condition of, the Indian forests?—Yes, undoubtedly. There is one thing that I should like to say with respect to the Forest Acts for the preservation of forests, which Mr. Pedder spoke about. I should like to give it as my opinion that these Forest Acts ought to be administered with very great care either in India or any other country where a Forest Act is passed. There are many communal rights which the people possess, which ought to be most carefully respected and maintained.

268. I am afraid that point is hardly within the scope of our inquiry, so that we cannot go into it; have you any suggestions you would wish to make as to the present training of Indian officials, or are you satisfied with it?—I am very glad to find that they are going to train them in their own country instead of entirely abroad, for my experience is that some of the younger men who were trained abroad were under great disadvantages from not knowing the language sufficiently. It is very much better that a man should be trained in his own language than in a foreign one which he understands only partially. It takes him a long time to learn the language, and to understand what he is learning in fact.

269. Have you paid any attention to the state of the woodlands in Great Britain and Ireland?—Merely as an amateur, going through the New Forest or Windsor Forest; in fact I live at Ascot, close to Windsor and Swinley, and it interests me very much to see what goes on in those forests; but I cannot say that I have any personal knowledge of English woodlands. I have no forest of my own which I can cut and hack in as I choose.

270. From what you have seen would you consider that the management of our woodland in this country is altogether satisfactory, or would you think it susceptible of improvement?—I often see things, when I go through woods, which I think I could improve. I do not think sufficient attention is paid to judicious thinning and pruning.

271. May I take it that the result of your experience in India and your observations in this country has been to impress upon you that the management of our woodlands might be improved, 0.135.

Chairman—continued.

and that a forest school in this country would have very beneficial effects?—Certainly.

Colonel Nolan.

272. Have you any idea as to what the effect upon the climate would be in Ireland if you planted largely in that country; could you form any approximate idea?—May I ask do you mean would it increase or decrease the rainfall.

273. Yes, or the temperature?—My own idea is that wherever you introduce a forest, or wherever you have a forest, the rainfall is more equable; it does not come so much in fits and starts.

274. Would the effect be appreciable in Ireland, do you think, if there were 5,000 square miles of woodlands?—I can hardly tell.

275. Would it have any effect upon the temperature, do you think?—I think that area would be hardly sufficient to affect the temperature of the whole country.

276. If it were planted to the extent of a fifth or a sixth of the country?—I think the probability would be that the temperature would be much more equable with a perpetual forest. It would not be so much subject to alterations of extreme heat and extreme cold.

277. Do you agree with the last witness about the number of men who would be employed on about 5,000 square miles of forest in this country?—I think he put it pretty fairly; it seems to me that he put it perhaps a little extravagantly; that less men would be sufficient in the higher grades. An energetic forest officer can supervise a large area.

278. Do you think that there is a good deal of land in this country or in Ireland suitable for planting?—I do not know Ireland well.

279. You think there is a good deal of land which might be beneficially employed in that way?—I know that there is in England and Scotland, and I daresay there is in Ireland also.

280. Is there land about Ascot suitable for woodland which is not so occupied?—The whole of Bagshot Heath, and all that style of country, might be planted with great advantage.

281. It has been planted with Scotch fir, has it not?—Wherever Scotch fir has been planted it has been successful. The larch is successful; some of the plantations I saw in Scotland last year were admirable, especially the Duke of Athole's.

Dr. Farquharson.

282. You are familiar with Switzerland, you say?—As a boy I was there a great deal.

283. I suppose there is no country in which the scientific study of arboriculture has been worked with better results?—None. It has always been a great study with them.

284. Was there not some years ago a great waste owing to the reckless cutting, and the absence of any attention being paid to replanting?—Not for very many years I think; it must be many years back. Even before my time they were very systematic in the working of their forests, and they took the greatest possible care of them.

285. Had

21 July 1885.]

Colonel MICHAEL, C.S.I.

[Continued.]

Dr. Farquharson—continued.

285. Had they a school then?—Yes, I believe they had.

286. I did not gather from the last witness that there was any planting in India, that is to say you rather trust natural planting?—Planting is done to a large extent in the Nilambur Plantation, in the Neilgherrie Hills, and other parts of Madras, as well as in the Punjab and Bombay. A great deal has been done in introducing the Australian Eucalyptus and the Acacia, and they are spreading them to all the Hill stations in India. In the plains of India too they plant another Australian tree, the Cassarina. That has been a very great success, yielding excellent wood.

287. I think you stated that there was a great deal of land in England and Scotland which would bear planting?—Yes, I believe so.

288. Do you think that the effect of a school of forestry would be to popularise the knowledge?—In my opinion it would popularise the knowledge.

289. Of course, one drawback is that many of

Dr. Farquharson—continued.

these parts are inaccessible to railway or water communications, so that you could not get your trees away when they are cut?—I think that is hardly the case in England or Ireland or Scotland. It would always pay its carriage. Timber is now imported to a great extent, and of course the carriage by sea must be very high.

Mr. Round.

290. Is bark of oak very valuable in India?—The oak does not grow in India except, I believe, scrub oak in the Himalayas.

291. What is the best bark?—The bark that is much used and is of the greatest value is the bark of the Acacia Arabica; that is used for tanning. There are several other good barks.

292. In England bark has fallen very much, to half its value, and that has been owing to chemicals being used in its place; is that the case in India with the bark which is used there for tanning?—I have not heard that chemicals are used instead.

Friday, 24th July 1885.

MEMBERS PRESENT:

Dr. Farquharson.
Mr. Fremantle.
Colonel King-Harman.
Sir Edmund Lechmere.
Sir John Lubbock.
Dr. Lyons.

Colonel Nolan.
Mr. Plunket.
Mr. Round.
Mr. Seely (Junior).
Mr. Villiers Stuart.

SIR JOHN LUBBOCK, IN THE CHAIR.

Dr. HUGH CLEGHORN, M.D., F.R.S.E., called in; and Examined.

Chairman.

Chairman—continued.

293. You took an active part in the formation of the Indian Forest Department, did you not?—I was appointed in 1856, at the same time as Dr. Brandis; I was in Madras when Dr. Brandis began in Burmah.

294. You were for 12 years Conservator of the Madras forests, were you not?—Yes, in Southern India.

295. After that you introduced the forest system in the Punjab?—I was in the Punjab under Lord Elgin and Lord Lawrence introducing the system there.

296. You are I daresay, speaking generally, conversant with the evidence Mr. Pedder gave before the Committee at their last meeting?—I have had many conversations with him and know his views generally in regard to Forestry.

297. Do you generally concur in his views?—I do.

298. I need hardly ask whether you are of opinion that the formation of the Indian Forest Department has been of great advantage to the country?—I think there can be no possible doubt that it has been an immense benefit.

299. In fact you consider that a trained staff is essential to the management of forests and woodlands?—Undoubtedly it is very essential.

300. And that would apply to every country, would it not?—It would, including Great Britain.

301. You returned from India in 1868, did you not?—I did, and I retired from the service in 1869.

302. For the last 16 years you have paid considerable attention to the subject of our English woodlands?—After I retired, under direction of successive Secretaries of State, I have had to do with the examinations of candidates for Forestry in London, and also for the Highland Society in Edinburgh for subordinate grades.

303. And you have paid attention to the state of our woodlands?—Yes; particularly Scotland and England, but I have seldom visited Ireland.

304. You accompanied M. Boppé?—Yes, I accompanied the three French Professors through Scotland and England.

0.135.

305. Is it your impression from what you have seen that if we had more trained officials, our woodlands would be rendered more remunerative?—I think there can be no doubt about it; it is marvellous that we should not at an earlier date have begun to adopt some means to preserve them.

306. You would apply that not only to the superior officials but also to the subordinate officers?—Yes, to the managers [woodreeves], and to the subordinate officers.

307. Your opinion is that we are in England very good arboriculturists but not very good sylviculturists?—There is no country in the world which has such handsome trees, but the knowledge of the production of timber is somewhat deficient. No country in the world has such fine specimens of trees in point of arboriculture, but as regards sylviculture we are deficient; the one is what is called *jardinage*, and the other is professional forestry.

308. In the production of fine specimens of trees we stand high?—We stand higher than any other country.

309. But not in the management of the woodlands?—Not in the skilled management of the woodlands, or in the production of timber.

310. I suppose the selection of species, the choice of soils, the situation, the mode of planting, the mode and degree in which the thinning should be carried on, and determining the time of felling the timber, so as to obtain the best results, are questions with regard to which skilled training is of great importance?—All those matters require skilled training, and much observation and care.

311. Is it the general opinion of those who are conversant with our woodlands that the establishment of a forest school would be of great advantage to this country?—I think it is universal. The Highland Society expressed their very great gratification when they heard that Parliament was taking the matter up, and the Scottish Arboricultural Society in the same way. On all hands there is a general feeling of satisfaction in favour of the movement.

c 2

312. The

24 July 1885.]

Dr. CLEGHORN, M.D., F.R.S.E.

[Continued.]

Chairman—continued.

312. The late Mr. Adam (who was so much respected in this House), the late Governor of Madras, expressed a very strong opinion on the subject before he left the country?—He was President of the Scottish Arboricultural Society, and expressed his views a few weeks before he sailed. I have the volume with me, if the Committee would like to hear it.

313. Would you kindly read the paragraph?—The Right Honourable W. P. Adam, in an address delivered in Edinburgh on 7th October 1879, said, "I regret much that in face of this improvement, which still requires extension, we have yet to lament the want of a school of forestry. This portion of our educational system, tending so much to the benefit of the State, is undertaken by every nation of any consequence except our own. I trust this neglect of an important branch of our national well-being will not be continued; and considering the importance of the forests of our Indian empire and colonies, we shall not always have to send young foresters to be taught their business abroad. It may be said that we have no large forests in this country under the care of Government in which this course of instruction can be given satisfactorily and systematically; but I do not think this argument holds good. There are many extensive woodlands which may be visited and examined, but the practical part of the training does not necessarily require a great extent of forest. I believe, looking to the addition lately made to the area possessed by Government in these [Botanic] gardens, that a school of forestry might be established in this very place, where all the operations of forestry might be practised and taught, and where young men could learn as much as in Germany or France. The forests in those countries are not planted, pruned, and tended as our woodlands are, but in many cases are self-sown; and experience in them does not necessarily fit a man to superintend all the operations of home forestry. Occasional visits to large woodlands and a survey of the operations carried out on a large scale, which have been taught here in detail, would of course be required; but I maintain that for all practical purposes of home work, perfect training might be given here." This address was given a few weeks before Mr. Adam sailed; he left the manuscript with me and I had it printed.

314. You would consider that Mr. Adam, from the attention he had paid to the subject, was very well qualified to express an opinion?—He had a large extent of wood himself, and he was President of the Arboricultural Society for some years.

315. Mr. Adam in that passage refers to some steps which had been taken in Edinburgh with regard to the management of woodlands?—Soon after the above meeting the Arboretum was sanctioned by the Town Council, and 9,000 young trees were planted adjoining the Botanic Garden. Since then we have had the Forestry Exhibition, and derived therefrom the rudiments of a museum and library; what we want now to make a good beginning is a lectureship, or chair of teaching; without that we cannot go much further.

316. You have been summoned before this

Chairman—continued.

Committee at a very short notice, and, I am afraid, at some personal inconvenience. I would not, therefore, ask you for any exact expression of opinion as to any precise steps to be taken, if you would prefer to defer that to any future opportunity?—I only came yesterday from St. Andrews, at a day's notice.

317. The general sense of your evidence is that the establishment of a forest school would, in your opinion, be extremely beneficial to our English woodlands?—Yes, to all grades of foresters, and the forests.

Mr. Seely.

318. To British woodlands?—To British woodlands and Irish woodlands.

Mr. Villiers Stuart.

319. What are the largest forests in Scotland?—The largest forests in Scotland (those I visited with the French professors) are those of Lord Mansfield (Seone), the Duke of Athole (Blair Athole), and Lord Seafield (Strathspey).

320. Have you any idea how many acres there are in those forests?—I could not from memory mention the acreage, but there is a very great extent of forest: the Duke of Athole's forest is ten or twelve miles in length.

321. We have no forest of anything approaching that size in England, I believe, or in Ireland?—I do not know. Lord Seafield's woods extend over three contiguous parishes, and the Duke of Athole's forests in the Pass of Killecrankie and neighbourhood are very extensive.

322. Would you say that they were more than 10 square miles?—At this moment I could not speak positively from memory, but they take a day's journey in walking through them; they are of very large extent.

Dr. Lyons.

323. You are aware, are you not, that these countries, Great Britain with Ireland, stand in relation to most of the countries of Europe in a very backward condition as to forestry?—As regards systematic planting, with a view to the production of wood, they do so; as regards true silviculture, we are in a very backward state.

324. But, also, as to the extent of acreage under forest, are we not in a very backward condition?—Certainly we are, as regards systematic forestry.

325. Do not you think that, commercially, the state of forestry in these countries is a matter for serious consideration for the empire?—I think immense benefit would result, both economically and otherwise, from a more systematic management of our woods, and the skilled training of wood managers and subordinates.

326. With a view, as one of its main objects, to the extension of the forestry system in this kingdom; is not that so?—Certainly.

327. You are aware that the acreage under forest in the United Kingdom is excessively small as compared to that in France, in Germany, and most of the other countries of Europe?—That is the case.

328. So that, as compared to the great forests that

24 July 1885.]

Dr. CLEGHORN, M.D., F.R.S.E.

[Continued.]

Dr. Lyons—continued.

that you know so well, the forests of India, it might almost be said that we are in a very bare state in this country?—Very much so.

329. Do you think that the institution of a forestry school in this country, independent of that which has been established at Cooper's Hill, and in connection for a time with the school at Nancy, would be of very material consequence to the empire at large?—Without a Forest school I do not see how we are to make any further progress; it is of immense consequence.

330. There has been considerable movement towards the establishment of a school of forestry in Scotland, has there not?—Various steps have been taken, which I have already alluded to. We have the arboretum attached to the Edinburgh Botanical garden, and we have the beginning of a museum and a library, and we want now a curriculum or chair of forestry for teaching.

331. You want a systematic plan of teaching forestry in Scotland?—We are endeavouring to apply the small surplus of the late Forestry Exhibition in that direction. Lord Lothian has sent out a circular, and some 800 £. or 900 £. have come in towards that purpose; but we want 10,000 £. to found a chair.

332. But besides establishing a forestry school in Edinburgh, would you not also think it very desirable that there should be a forestry school in this country?—I think there should be one in Scotland, one in England, and one in Ireland.

333. But in England?—Certainly.

334. You think it very desirable that there should be a forestry school in England embracing a class of foresters for the service of this country, independently of those who are educated at Cooper's Hill for the Indian service?—Certainly.

335. Are you aware that forestry schools have existed on the Continent of Europe for a very considerable time. It is stated in a work that I will have the pleasure of showing to you that "the history of schools of forestry goes back in Germany more than a century, and in that country we find the oldest, best endowed, and in some respects the best managed institutions of this kind in the world. There are, at present, nine such establishments in the German Empire, viz., two in Prussia, one each in Bavaria, Saxony, Wurtemberg, Baden, Hesse Darmstadt, Brunswick and Saxe Weimar." Therefore you would not think it at all excessive that there should be a forest school established in Edinburgh, and one established in London, irrespective of the Cooper's Hill school?—Most certainly.

336. Are you also aware that schools of forestry have been established in the United States of America?—Yes, and I have seen a school in France, Germany, and Vallombrosa in Italy.

337. You have seen the schools I have recited now, perhaps?—I have seen the school near Dresden, the school at Nancy, and the school in Italy.

338. Are you aware that a very careful and elaborate system of education is carried out in those schools?—Yes.

339. I would just like to read for you briefly some of the principal points of education in the great school of Lystadt, Eberswald; do you know it?—I know of it.

340. It includes the cultivation of forests, 0.135.

Dr. Lyons—continued.

forest improvements, and all similar matters which are necessary for the practical instruction of the pupils, and a very elaborate system of scientific education is conducted in preparatory courses for the training of the pupils in the highest possible way?—Yes, I am aware that it is so.

341. You are aware also that in this country there is a very large consumption of timber, are you not?—Very large, indeed; there is no country relatively where it is more so.

342. Did you happen to see the statistics furnished on this subject by Mr. Simmonds?—I did; I have seen the paper read before the Society of Arts.

343. He has gone over with extreme care a paper which I had published, and several reports from abroad, which, through the kindness of the Foreign Office, I have been able to procure, and he has added very materially to the statistics of this subject of the timber supply of this country; and he makes out that there is a total importation of 17,000,000 £. value in timber alone, and that, including the forest products, tar, resin, turpentine, and so on, he raises the total of that by the returns of 1883 to 31,548,919 £. Now, let me ask you this: With your knowledge of England and Scotland, and what you know of Ireland, do not you think that with the assistance of a forestry school to propagate correct ideas throughout the country, a very material proportion of the supply of timber requisite for industries in this country could after no very long time be supplied from the home-grown plantations?—I think it would be very important. It is difficult to forecast what proportion we might be able to supply, but we might do a great deal more than we do at present to supply the needs of the country.

344. What we do at present is comparatively little?—Yes, it is comparatively little.

345. And you do think, I believe, that in a comparatively short time a very considerable addition in the way of home-grown timber and forest products could be made to the general supply on which the country is dependent at present?—Yes; forest produce might be utilised, and a better scantling of timber might be grown by careful management, and many things turned to account which are already saved in Germany.

346. Do you think that this country, by which I mean the three kingdoms, England, Ireland, and Scotland, can hope to depend much or at all in the future commercially upon the Indian supply, having regard to the great distances, the cost of carriage, and so forth; would you suppose that, from the vast areas of forests in India, any practical commercial supply could be obtained for this country?—No, I think not; there are very few woods now exported; teak-wood is the great wood of India, and those which are sold by weight, such as sandal-wood, box-wood, &c.

347. Teak wood is of exceptional value in the timber trade, is it not?—It stands quite alone for shipbuilding.

348. But the purposes for which it is used are comparatively limited?—They are comparatively limited at present.

349. And you do not think any considerable commercial supply could ever be hoped for from

24 July 1885.]

Dr. CLEGHORN, M.D., F.R.S.E.

[Continued.]

Dr. Lyons—continued.

any such distance as India?—Only teak-wood, box, and fancy woods.

350. Those which are used for a very limited purpose?—Which are of great value for a special purpose.

351. Do you think the same applies to most of the foreign possessions of England, that there would be very considerable difficulty in getting anything like a permanent supply?—The colonies are borrowing some of our best forest officers; we have sent five of our best forest officers to the colonies, that is to say, Indian trained officers, and they are all taking up the subject, more or less, and it is of very great importance that they should do so. There is one going now to Jamaica and British Guiana.

Chairman.

352. Are they permanent appointments?—No, they are only for two years; they are only sent on loan, as it were.

353. You could not spare them for permanent employment?—No.

Dr. Lyons.

354. You have no excess on your own staff, so that you could spare officers for other Colonies?—No, they are lent as a special favour.

355. With regard to Canada, are you aware that the great supplies that we draw from in Canada are being very seriously diminished?—I have not myself seen it, but there can be no doubt of the fact from what we read.

356. Perhaps you saw the report recently procured through the kindness of the Marquis of Lansdowne, wherein it is shown that the province of Prince Edward's Island, which was once very richly wooded, is now totally denuded of timber; the Lieutenant Governor reports that there is no longer any timber to export there, that it has all gone down under the clearances by lumbermen, and the general traffic in timber?—I believe that is so.

357. Do you think this country can depend in the future, as she has done in the past, upon her supplies from abroad with the same certainty as was formerly the case?—There is no doubt that the supplies are rapidly diminishing in many countries; there can be no doubt whatever of that.

358. Does not it then become a very serious question for this country, that we should take thought to supply by some production, as far as we can, timber to supplement the short comings of those countries upon which we have been hitherto dependent for supply?—I think it is of great consequence that we should increase the production in our own country and do as much as we can to meet its wants.

359. Have you directed your attention to considering what area of land for the growth of timber could be fairly supplied in England itself, in Scotland, in Wales, and in Ireland?—I could scarcely venture to state the figures that are available from memory. I have not sufficient knowledge. There is a very great extent of land available for planting, no doubt, in Scotland and in Ireland also.

360. Is there not also a very considerable part

Dr. Lyons—continued.

of England itself now lying comparatively unproductive, which would grow timber better than anything else that could be suggested?—Yes, on the banks of navigable rivers, and in favourable positions, it is very desirable. In other places it might be difficult to make it financially successful; but where there are navigable rivers and special advantages of carriage, it is very desirable to turn them to account.

361. Are there not great tracts in Cumberland, in Westmoreland, and Northumberland which would naturally invite plantation as a suitable thing whereby to occupy them?—I believe there are. I am not specially cognisant of those counties.

362. I do not suppose you have specially turned your attention to that; I merely want to know whether you do not think, as the result of your observations elsewhere, that those great stretches of land in Wales, as well as in the north of England, would afford very suitable places for re-afforesting?—I believe there are very extensive tracts which might be utilised.

363. You know Scotland very well?—Yes, I know Scotland very well.

364. May I ask you with regard to Scotland, as the honourable Chairman suggested it, do you consider that a greater area than the three-quarter million acres, which is about the extent of the forests in Scotland at present, could be fairly devoted to the growth of timber, as on mountain slopes or other situations which are not very profitably occupied at present?—I think there are sub-alpine districts in the Highlands very suitable for planting, and a very great extent of area which might be planted. I am familiar with Perthshire and Inverness-shire, and with places in the west of Scotland where trees grow very well. Upon the east coast they do not grow so well, being exposed to the east wind. But there are very great extents in those highland counties which might be turned to good account; especially towards the seaboard of the west coast they would grow very well, and in the midlands of Scotland also.

365. You know some parts of the north of England pretty well, do you not?—Yes.

366. Are there not great slopes of land, that are now comparatively idle, which would afford suitable situations for growing timber upon a large scale?—I believe so, certainly.

367. May I ask if you know or are familiar with the rules laid down by scientific foresters of very great experience in all countries as to the extent of land which ought to be in any country under timber, in order to afford the requisite protection of all kinds, shelter, water supply, and so forth to the rest of the country?—That would vary in different situations and under different circumstances. The need for shelter for example. In India we are in the habit of reserving the upper third of the mountains; that is to say, upon the crest for rainfall and other purposes. Narrow belts financially would not succeed where there is a great extent of fencing. Square blocks and plantations upon the banks of navigable rivers would financially answer very much better.

368. Is there not a general consensus amongst the

24 July 1885.]

Dr. CLEGHORN, M.D., F.R.S.E.

[Continued.]

Dr. Lyons—continued.

the chief forest authorities in Europe and America, where the subjects have been very closely studied within the last 50 years, that from a fifth to a fourth of the country ought to be under forest for the realisation of the best conditions for the rest of the country?—Yes, it is so stated as necessary to keep up the natural equilibrium.

369. You would, then, say that that might be taken now as a pretty well established law, in which the great forest authorities are well agreed, that from a fifth to a fourth of any country should be covered in timber in order to protect the rest.—I understand that that is the opinion of many persons of sound judgment and reliability.

370. May I ask you now, after a lifetime devoted with great success to the cultivation of forests, whether you do not concur in that view?—I think it is reasonable, and I concur in it as a general rule. There are certain districts and places to which you could not make the same rule apply always, but I think it might be admitted as a reasonable proportion.

371. Is it not also generally understood that, under the process of denudation of the land, the waste of the nutrient soil is constantly going on where the country is not protected by forests?—The effects of denudation, both in Eastern and European countries, are very serious.

372. Is it consistent with your own observation that denudation has been going on in England herself, as well as in Scotland, Wales, and Ireland, to a very large extent, since this country was disafforested two or three centuries since?—I have been very much struck with it in other countries, such as Spain and Italy. In Eastern countries also the effects of denudation are most serious; but in this country there is so much ornamental and other wood that I could not use the same language with respect to it as I do with respect to other countries.

373. But including even the ornamental wood, and giving credit to it to the largest extent, is it not the fact that the total area under wood of any kind, ornamental or otherwise, is comparatively small in England?—It is comparatively small.

374. I suppose you have sometimes consulted the Agricultural Statistics of England, a very valuable work published annually?—I have.

375. Is it not stated there (special attention having been devoted to the matter since this question has come to the front so much in recent years) that the quantity of timber standing in England is comparatively small? The total amount, as returned in the Agricultural Statistics for England, is only 1,466,038 acres. Now, just for the purpose of furnishing a comparison, I may state that in France the amount under timber is 22,000,000 acres; the amount in Austria proper is 23,000,000 acres; the amount in Hungary is 22,000,000 acres, and so on. In the grazing lands of England 761,892 acres of timber are returned, and in the corn counties 704,146, which makes the total I have just cited for England at 1,466,000; which, taken in comparison with the 22,000,000 in France, 23,000,000 in Austria, and 22,000,000 acres in Hungary, leaves a very beggarly result for this country?—Relatively it seems certainly a very small proportion.

0.135.

Dr. Lyons—continued.

376. Scotland is returned for 750,000 acres, which is at or about the amount, is it not?—It is; it is not much more at all events.

377. Ireland is returned for 350,000 acres, which is 45,000 acres less than that country had in the year 1841?—If so, that is a very grave matter.

378. Is it not also consistent with your knowledge that a very considerable amount of cutting of timber is going on in England, Wales, and Ireland, without any attempt at reproduction of timber?—I believe it is so in certain districts.

379. Therefore we may say that, with a steadily increasing annual demand for timber, which is constantly rising all over the country, the amount of timber in England, Wales, and Ireland is steadily, and I might even say rapidly, diminishing?—It certainly is rapidly diminishing.

380. You in Scotland have paid in the last century very great attention to the cultivation of woods, and you stand for the last 25, or perhaps 40 or 50, years at about 700,000 acres; something has been added recently, but I take the official statistics as representing about three-quarters of a million acres. Now, in the face of that state of things, do not you think it a matter of State importance that the question of supplying by reafforesting certain appropriate parts of the country should be seriously taken up?—I think that the replanting of naked districts would be highly beneficial. In Scotland the Arboricultural Society has existed for 31 years, and we are paying great attention to that point; that the afforesting of naked tracts would be highly advantageous in a climatic and economic point of view, there can be no doubt.

381. Then, besides the timber, which is so directly important and necessary in architecture and domestic dwellings, furniture handicrafts, and manufacture of almost every conceivable kind, is there not a very considerable amount of industries mainly dependent upon forest products, such as bark, tar, resin, turpentine, and so on?—Yes, as to bark, and the undergrowth near large towns.

382. Would not the production of all those materials give rise to very important industries in those countries?—Yes, I think a great deal more could be done than there is done. One of the several premia offered by the Highland Society, is how to utilise those waste products; there is a deal of material burnt in the valleys which might be turned to account. In Germany nothing is lost.

383. Is not there a very high value, even yet, given to iron which is prepared by timber smelting?—Yes.

384. Are you aware that in the Cumberland district the smelting of iron by timber is still carried on very extensively, resulting in the production of a very superior class of iron and steel for instruments in use in surgery and in the arts?—I have no personal knowledge of the Cumberland iron works; but I have seen a great deal in the coniferous forests in the Himalayas of iron smelting by timber; it requires very good management, otherwise it consumes a great deal of wood.

385. Are you aware that charcoal-smelted iron

c 4

stands

24 July 1885.]

Dr. CLEGHORN, M.D., F.R.S.E.

[Continued.]

Dr. Lyons—continued.

stands very high for the production of the best quality of steel?—Certainly.

386. But you are not aware of the fact that in Cumberland it is done now?—I have not myself visited Cumberland with that view.

387. Now I would like to ask you also this: you have had very great experience in the extension of the great forestry system in India; is not that so?—Yes; I am the oldest forest officer, having commenced December 1856; I began with two or three collectorates in that year, proceeding until I accomplished 32; it took several years to do it.

388. Besides the economic care of the forests that were standing at the time when you, and others acting so nobly with you, took up the management of forests in India for the Government, was it not also necessary to undertake considerable operations of reafforesting in India; and very considerable tracts have been reafforested, and plantations now close on 40 years' old are standing that were started in your time, about the year 1859; is not that so?—Yes; but the forests generally very soon restore themselves, if wild animals, camels, goats, and so on, are carefully excluded.

389. Is it not the case that, besides caring the existing woods, you had to undertake reafforesting operations upon a large scale?—Yes.

Colonel King-Harman.

390. Was that by planting?—Yes, by planting on a small scale in India; it is too expensive a work to carry on largely, but by shutting up tracts, and excluding camels and goats and horned cattle, the self-sowing proceeds rapidly if a few remain.

Dr. Lyons.

391. There are many forests that sowed themselves; but, independently of that, did you not also undertake considerable operations of directly reafforesting in places on which the timber had been destroyed by fire or otherwise laid bare?—Yes; we planted teak trees very extensively upon the banks of the rivers, but in such a vast country it is not by planting alone that we can restore the ravages caused by cutting.

392. You had large forests to deal with, and large expanses which you treated upon forest principles. But I want to know whether, besides that, you did not also undertake considerable operations of reafforesting by planting teak seeds and young trees of other kinds?—Yes, other kinds; the deodar sisso and other valuable trees.

393. Having regard to the great extent of the Indian forests, and the importance of reafforesting operations, you would not think that there would be anything impracticable in undertaking a system of replanting on a suitable scale in this country lands once, as we know by very high authority, bearing trees, but denuded for the last century and a half, at least, and in some instances two centuries. There would be nothing impracticable in undertaking such a system of reafforesting, would there, in this country?—There would be nothing impracticable. In India we have certain allowances in the Budget annually for restoring and replanting. In some cases we did it by replanting and shutting up, and in others by natural restoration.

Dr. Lyons—continued.

394. Would not the operations of reafforesting, if undertaken in this country, having regard to the utilisation of the forest products both of timber, bark, and so on, have a material effect in adding to the quantum of occupation in districts where there has been for a considerable time a very large amount of distress for want of labour?—I think there is no doubt that it would give employment to a number. There are, however, many financial considerations connected with it in certain situations which would require careful consideration.

395. I only want to bring out whether forestry operations do not involve a very considerable amount of employment in labour of all kinds?—Certainly.

396. For instance, we know that in France the system of forest guards is so extensive that during the Franco-German War the forest guards supplied between 7,000 and 10,000 volunteers to the Army of Defence of the country?—I do not know the number.

397. As bearing upon that, I asked Mr. Pedder on the last occasion, but at the moment he could not answer it, whether he could give us any idea what the amount of employment given in connection with the Indian Forestry Service was. I do not mean the superior officers alone, but including all the manual labour of all kinds which a system of forestry necessarily involves?—Of course, since I retired in 1869 there has been a great extension. Those who will follow me, who have more recently left India, may be better able to reply. I left in 1869, and there has been since that time a great extension of works. I could not give the numbers now.

398. You could not give the Committee any modulus for calculation; for instance, what amount of employment (as you dealt by miles in India) a square mile will employ?—It varies very much. In the teak and valuable forests you have a large establishment, because every cubic foot of timber is valuable, and the same with black wood, ebony, and boxwood. In some districts you could not afford one man a mile, whereas in other districts you could afford five or six.

399. At all events it may be said that forestry involves a very considerable extension of labour amongst the population where a forest is established?—A fair but variable amount of labour.

400. Suppose a country in which there was a thousand miles of forest; would not that involve a considerable extension of the labour of the locality?—An increase in the people employed if previously a waste.

Chairman.

401. Would not that depend upon what you put it instead of? Do you mean to say that a forest would give more employment than agricultural land?—No; I understood that the land was supposed to be uncultivated.

Dr. Lyons.

402. Then you think there is a considerable field for the operations of reafforesting in this country with every prospect of success?—I think there are many places exceedingly suitable for planting.

403. I understand

24 July 1885.]

Dr. CLEGHORN, M.D., F.R.S.E.

[Continued.]

Mr. Seely.

403. I understand you to say that you would like to see a separate school of forestry in each of the three kingdoms?—I hope eventually that may be so.

404. What I want to ask you is, whether you do not think it would be much the better course to attempt to get one school in the largest of the three kingdoms at first, and not to attempt at first to get three schools?—Yes, but I recommend that being done eventually.

405. You think that it would be better to try and get one good school, with as much opportunity of practical experience as you can, and when you got that school full to perhaps try some other; but you would not think of trying to start three schools at once?—No; the only institution at this moment which gives certificates in forestry is the Highland Society. We have students from Cirencester, from Downton, and from Glasnevin examined there. There are not many candidates, but a beginning has been made, and I should like to see progress, and to have other places ultimately.

Dr. Farquharson.

406. In your visits to those large forests in Scotland, would you describe what opinion you formed regarding the management of the works?—I think there are some very good men, shrewd, practical, intelligent men. They have not had the training such as our men receive on the Continent. They have not been taught inorganic chemistry or vegetable physiology; but for practical work, that is to say, converting timber and forming plantations, they are very good men. We have had three or four of them in India for doing certain work, such as planting, and they did it very well. For example, Mr. MacIvor, of the Cinchona plantations, and Mr. Ferguson, of the Teak plantations, did their work very well, though they had not had a school to go to.

407. They had practical and not theoretical knowledge?—Yes.

408. Would you consider that the result of their planting operations was successful as a whole?—Some of them were very successful. (Mr. MacCorquodale of Scone is a very good planter.)

409. Do you think those woods would have been better if they had been planted by a highly trained man skilled in inorganic chemistry?—In France and Germany they do not plant much, they trust to self-sowing.

410. But in Scotland?—I think that more produce might have been turned out in many places. There are many things which have not been utilised as they might have been, but there are some exceedingly shrewd and valuable men concerned in the work, as you probably know, in Aberdeenshire.

411. Then you think that, on the whole, those forests might have been better if they had been planted by men having more theoretical knowledge?—Yes; but they are exceedingly good planters.

412. If they had had a little more theoretical knowledge, they could have turned their practical sagacity to better account?—I think so, for many of them do wish they had had that.

O.135.

Dr. Farquharson—continued.

They have read what books they have been able to get in their cottages, but having had no school to go to, lacked opportunity of improvement.

413. Do you think that the school of forestry might be made self-supporting?—I think that would be a difficult question to determine; it is difficult to predicate what the number of students would be who would attend the school. The class of agriculture in Edinburgh varies from 20 to 40, and we should have reason to hope for at least an equal number.

414. What class of people attend the arboricultural classes in Edinburgh?—Those who are looking forward to being estate agents, factors, nurserymen, and such like.

415. Is not there a great difficulty in Scotland, that many of them cannot afford to pay the price for the forestry course?—That is a question which I would not answer without more consideration.

416. Supposing I pay my forester 50 l. or 60 l. a year, he is not in a position to go through a very expensive course of education?—No; but he might have had 18 months or two years' training with great advantage; he need not have been there all the year, he might have been there half a year for two years. To obtain those certificates of forestry, which are granted by the Highland Society, we find that two seasons are generally sufficient. That is the beginning of what I would like to see.

417. I think you were asked by Dr. Lyons about the advisability of planting more extensively in Scotland on the mountain slopes, and places of that kind; but is not there the difficulty that many of those places are very inaccessible to railway communication?—Wherever they are inaccessible I would hardly advise their being planted; I would say, generally, that near navigable rivers, and wherever you could get the timber out, it would re-pay its expenses.

418. Do you think that the planting would pay as well as grouse moors or deer forests?—That is rather a difficult question to answer at present.

419. If you planted great tracts of forest land you would exclude sheep, and you take away from the food supply of the country?—You do not require to exclude sheep everywhere after a certain time, and the grazing would improve.

Mr. Seely.

420. How many years do you think you would have to exclude sheep?—Perhaps 30 years.

Chairman.

421. Thirty years out of how many?—After 30 years you might let the sheep in, that is till the trees approached maturity. I am not speaking exactly, but somewhat in approximation.

Dr. Farquharson.

422. Is it not the case that after a fir wood has grown up to a certain height there is very little undergrowth?—The undergrowth dies away after a certain time; it depends upon the light and shade. The German forests are usually darker than the British.

D

24 July 1885.]

Dr. CLEGHORN, M.D., F.R.S.E.

[Continued.]

Dr. Farquharson—continued.

British ones; a German forester always looks up to see what quantity of light comes in.

423. If we grew a much greater area of wood in Scotland, and a great quantity of wood were cut down every year, would not that lower the price of wood very much?—That would somewhat depend upon the foreign supplies coming in; the price is low at present.

424. Does not it happen that when we have great gales in Scotland, and a number of trees are blown down, they become unsaleable?—They should be properly thinned and then they would be less liable to be blown down.

Chairman.

425. With regard to sheep, M. Boppé expressed the opinion that the forests would rather increase the quantity of sheep-feed than keep it down. He said it was quite true that you would have to exclude the sheep and cattle for 30 years out of, say, 100; but he said that afterwards the keep of the sheep under the trees would be much better than on the moorlands where it at present exists. So that, though you would exclude the sheep for a certain number of years, there would subsequently be more grazing for the sheep than there is at present on the land that is not now afforested?—Yes; I presume he was speaking of deciduous trees, oak and such like, and not of fir trees.

Colonel King-Harman.

426. Do you say that in India you only plant by navigable rivers?—We are doing so, because teak is a very valuable heavy wood, and it is necessary that it should be got away by water carriage.

427. You have only planted by the rivers; you have not planted except where there is a good means of easy access?—Planting in a vast country like India is an expensive process.

428. What I ask you is, have you planted anywhere except where there are navigable rivers?—In the Himalayas we have planted a good deal on the slopes.

429. How do you plant?—By seed.

430. You have not planted then, you have sown?—Yes, we have sown chiefly.

431. Do you think that system would do in Scotland?—I think it would only partially do in Scotland.

432. To what extent would you sow larches?—I have seen large patches of self-sown larches.

433. Have you ever seen broadcast-sown larches in Scotland, or anywhere else?—I have seen good patches sown by hand in Inverness-shire.

434. Do you believe it is possible to sow larches broadcast?—I should not like to express an opinion upon a matter I am not practised in.

435. You do not know, perhaps, anything of the difficulty of getting seed from larches in this country?—Yes; much of it has been imported, and much of it is of a very dubious kind.

436. But can you extract the seed from the cones?—Yes; it is a difficult process.

437. It is so difficult that it is impossible to raise them except in a nursery?—Practically so, but improved methods have reduced the difficulty.

Mr. Villiers Stuart.

438. Why is it that the home grown pine is so inferior to the imported pine?—

Colonel King-Harman.] I should like to ask you a question upon that. Is it so, because my experience is, that I always try to get the best from Scotland, in preference to getting it from abroad.

Mr. Villiers Stuart.] I ask why is it that people prefer to buy foreign timber to buying home-grown timber?

Mr. Seely.] We pay 30 per cent. more for white timber home-grown than for foreign.

Witness.] The foreign timber arrives here in the converted state, and it is cheaper to buy it converted; I do not know that it is better.

Mr. Villiers-Stuart.

439. The foreign timber is considered to be much more durable than the other?—Certain varieties are not grown in this country. The old Scotch fir is very fine wood, and I do not know anything that is better than our larch.

440. But the larch is not a native timber; do you think it is owing to the species we cultivate?—Yes, perhaps so.

441. Do you think that the evil might be remedied by selecting valuable kinds of timber from foreign countries, which would be suitable to our climate, and introducing them?—I think there is a very great deal in that; for instance, the Douglas pine and others.

442. Do not you think that nurseries might be attached to those schools of forestry for the purpose of growing valuable kinds of timber for distribution at moderate prices?—Large nurseries are attached to all the continental schools.

443. Taking the Douglas pines, do not you think it would be a great advantage if we could get the Douglas fir seed to a large extent for planting?—Certainly; it is difficult to get that seed.

444. You know the variety I mean?—Yes, I know it well. In Perthshire, on Lord Mansfield's property, it is largely grown.

445. But you believe it is not possible to get large quantities of seedlings in this country?—I could not say positively in answer to that; but there is a difference in the quality.

446. You think that such nurseries would be of great advantage, especially if a commissioner were attached to the school of forestry, whose duty it should be to travel in foreign countries in search of new and improved kinds?—I think it is of the greatest consequence for the pupils to understand everything with regard to the nurseries; it is one of their first requirements.

447. Is not the larch itself a case in point? That is naturally a foreign tree, which has been introduced into this country; is it not one of the most profitable trees we can grow?—Yes, apart from disease itself, it is the most profitable tree.

Sir Edmund Lechmere.

448. You were mentioning, with regard to the economy which arose from water carriage, that you

24 July 1885.]

Dr. CLEGHORN, M.D., F.R.S.E.

[Continued.]

Sir Edmund Lechmere—continued.

you would recommend that all those forests and plantations should be on the borders of navigable rivers. I suppose you are aware that in England the land upon the borders of a navigable river is very valuable and more valuable than elsewhere, because it is to a great extent alluvial soil and bears the best pasture; I suppose what you said upon that subject hardly applied to this country?—It applied rather more to India, but it would apply to any place where you planted, by canals or railways, so that the produce could be got easily away.

449. There is no doubt there is a good deal of the country not under cultivation at present from various causes; but would not the profit arising from planting those trees very much depend upon the question of the taxation and the tithe?—Yes; also the soil, the situation, the elevation, and other circumstances.

450. In order to make any experiment with the profitable growth of timber on uncultivated land, would it not be desirable that there should be some special remission made in the taxation and the tithe, in order to give persons the opportunity of making the experiment?—Certainly, that would be a great help to those who undertook planting extensively.

451. I suppose as a rule, unless the soil is very favourable and the roads are very favourable, the experiment of growing timber for a profit would be rather precarious?—Yes, it would be rather precarious in certain situations.

452. Looking to the average staple of our soil, what wood do you recommend for profitable culture?—The larch is the one which we have trusted to most in Scotland. There has been a good deal of disease lately, but the larch nevertheless is the most profitable and satisfactory.

453. Does the larch grow well upon a clay soil?—Not on a level clay soil, but it grows on

Sir Edmund Lechmere—continued.

slopes, it prefers these, and in its native climate it is always on slopes.

454. Then the larch would not, as a rule, grow very well upon the banks of rivers?—Not unless there was a slope; it naturally prefers declivities.

455. What other wood would you recommend?—The ash and the plane give a good return with us in Scotland.

456. Have you had experience of the forests in France and Germany?—I have visited the Forest School in France, at Nancy; I have visited the schools at Dresden in Saxony, and the surrounding forests.

457. What woods are most profitable in France?—Colonel Pearson, who has recently come from there, will know that more fully than I do; but the oak, beech, and the coniferous trees I understand, are the most profitable.

458. The pinaster?—Yes.

459. I suppose a great deal of the profit in France and Germany is derived from the fact that a great deal of the wood is consumable for burning?—Yes; and coal is very dear.

460. That would not be the case in England?—No, it would not.

461. The woods which would be profitable in France and Germany would not be so profitable in England?—They might not be so, but each locality would have to be considered carefully, separately.

462. Are there any other trees that could be recommended to be introduced into England with profit; I suppose teak would not grow in England?—Certainly not; it is a tropical tree.

463. Are there any other trees that could be introduced into England?—There are osier beds and poplars that pay very well. I am not myself experienced as an English planter; I have spent most of my life in India.

Colonel PEARSON, called in; and Examined.

Chairman.

464. You represented the Indian Government for several years at the Forest School at Nancy?—Yes, for 11 years.

465. During that time you had general charge of the forest students?—I had.

466. While you were there you gave great attention, I believe, to the management of French forests?—I have been about through most of the principal French forests; I have gone on all the forest tours with the professors, and I am acquainted with almost all the principal forest officers.

467. You accompanied the professors in their tours?—Yes, and I went independently of them; I took the English pupils in their vacations, with the assistance of the French Government, who gave me letters to the different forest officers.

468. May I ask, do you generally concur with the evidence which has just been given by Dr. Cleghorn?—Generally, I do; there are some little explanations I might give if I were asked as to details.

469. But, generally, you take the same view as Dr. Cleghorn does?—I do.

Q.135.

Chairman—continued.

470. You are strongly of opinion, I presume, that the more scientific training of the Indian forest officers has had a good effect in raising the Indian forest revenue?—Without doubt it has had a good effect upon the management of Indian forests since I was first connected with them, 25 years ago.

471. Do you think that if our forest officials in this country were more systematically trained we might hope for a somewhat similar improvement in this country also?—Undoubtedly it would be of the greatest possible advantage both for the land agents who have the management of the property, and also for the subordinate officers who have the actual management of the woods. I think both of them want instruction.

472. Have you formed that opinion from your own observation of the general condition of the woodlands?—Undoubtedly; I had the advantage of going through our forests with the French professors. I had orders from the India Office to conduct them round, and I had letters to the principal landowners in Scotland; so that I had ample opportunity of learning the state of the forests

D 2

24 July 1885.]

Colonel PEARSON.

[Continued.]

Chairman—continued.

forests there, and also of the Crown forests in England.

473. I believe in France they are strongly of opinion that it is undesirable to plant oak by itself, and that it does better with beech?—There are not above two or three forests in France in which the soil is capable of growing oak, pure, and this is the case, not only in France, but in Germany, and in the Vosges forests, which I am acquainted with.

474. I believe it is the case in this country, that we sometimes see oak by itself, and sometimes with larch, and sometimes with chestnut?—Yes; they thought in this country that it was impossible to have too much of a good thing, and therefore they planted the oak alone.

475. I suppose you would say it makes a great difference in the ultimate outcome of forests what species of trees are in association?—There can be no doubt about it.

476. I believe you agree with M. Boppé in thinking that in the New Forest a large area is going to wreck and ruin, and will ultimately go to waste?—Undoubtedly it is degrading, as we call it in France; you can see that from the invasion of the heather, which is creeping on in every direction in the New Forest.

477. I believe you have been several times applied to on behalf of the English Colonies to recommend officials to them to take the management of forests?—Yes.

478. Have you been able to supply them with competent officials?—Yes; I could have recommended very clever officers, but they could not be spared at the time. I was able, however, to find some French officers to do what was required.

479. You were unable to find any qualified Englishmen, therefore you were obliged to recommend French officials for the purpose?—Quite so.

480. With regard to the French school, I believe you are of opinion that the French school is a very admirable one, but that there are several reasons why it is not altogether adapted for English students. For instance, the loss of time involved in the use of a foreign language, the difference of the technical terms in England and France, and then, again, the political difficulties which sometimes arise, which have in one case at any rate produced very serious inconvenience, and also that it is undesirable to create an exclusive service for India with our own forest officials, and lastly, that it is undesirable to send the Indian pupils abroad, because that renders it more difficult to establish a forest school in this country; I think you have indicated elsewhere that those, to your mind, were objections to sending pupils to Nancy?—I think those are the principal reasons. I think at the same time that the school is an admirable one and has done great service.

481. You are of opinion that we are much indebted to the French school?—I am fully of opinion that we are under a deep debt of gratitude to the French Forest Service, and to the French Forest School generally, for having instructed a very able body of men who are now carrying on good work in India.

482. Of course it would be practically impossible to send those who are to take the manage-

Chairman—continued.

ment of English woods, and particularly those of the lower grade, to a foreign school?—It is much too expensive. The remuneration which an English forester gets is so low that he could not possibly afford that education in France. It is rather an expensive school and rather an exclusive school, and that is one reason why it has been so much attacked in France; it was not intended for the class of men who chiefly want that education in Great Britain.

483. With regard to the proposed arrangement at Cooper's Hill, do you consider that would meet the requirements of English landed proprietors in the way of supplying them with trained forest officials?—No, I do not think it would be suited to the requirements of the country; it would answer very well for the Indian Government, but the education at Cooper's Hill is much too expensive even for the requirements of a land agent's education.

484. You think the arrangement may be very well suited for the requirements of the Indian Forest Service, but would not assist much in the preparation of English forest officials?—Quite so. I do not think it would affect the question of English foresters at all.

485. You would consider, would you not, that a certain amount of technical training would be very valuable, not only for the head officials, but also for the persons of a lower grade, such as woodreeves, and bailiffs and managers of small woodlands?—I think that, if possible, any education that was given in England ought to be made sufficiently economical to enable the class of wood managers and wood bailiffs to, at all events, participate in a portion of the lectures, which they might do. It would not be necessary for them to follow the higher course of study which one would wish a land agent to follow, but I should try to make the education such that there might be a portion of the course that would be suitable to every one without any undue expense; that I think, we ought very carefully to keep in view.

486. Supposing the case of a man who has the management of 500 or 1,000 acres of land; it would hardly pay to give him a large salary, but still he would benefit by 18 months' or two years' training in the forest school?—Even if he got three or four months in two years mixed up with the rest of his education, it would be very valuable to him.

487. He would be worth 30*l.* or 40*l.* a year more than he would otherwise?—Yes, obviously.

488. You have had a very short time in which to prepare your evidence, and if you are not prepared to give detailed evidence until you have given the matter more consideration, I would not press you at the present moment; but I know you have had a great opportunity of considering the subject, and if you would like to make any suggestions as to the management of our woodlands the Committee would be very glad to hear you?—Two years ago I gave a great deal of attention to the subject, when I was occupied under the India Office with Dr. Brandis, and we then submitted two schemes for their consideration. My opinion is clear that we ought to utilise in some sort of way the existing means in the country of giving a general education, and to supplement that by giving a special forest education in some convenient place where there should be a museum supplied with an instructor

24 July 1885.]

Colonel PEARSON.

[Continued.]

Chairman—continued.

instructor in forestry who might give lectures on the subject, and conduct the pupils from time to time into different forests which he might select, with the view of explaining on the ground the teaching which he had given them in the lecture room. Further, I think there ought to be some lectures on what I think is called physical botany, and especially that class of botany which refers to the growth of trees and the different natures of the different trees. I would put the school in the most central place I could find. I have been to Edinburgh and I have also visited the South Kensington establishment in London. King's College and University College seem both to me to grant facilities for general education. You might have your examination, say, in different standards for different certificates. In the higher class, we will say, the land agents who would be in charge of large properties might attend a larger scheme of lectures, and the wood reeves and wood bailiffs might attend only the elementary lectures, say, upon physical botany and wood management. What is wanted in England is to teach the management of forests in an economical way. Then I would have a series of examinations granting certificates to those passing them.

489. Would your idea be to have a course of either two years or three years, say two years, in the lower grades, and in the third year a course of instruction up to a higher standard?—Quite so; but I think the lower grades need not be occupied entirely with the two years' course. You might arrange the course of the lectures so that if you gave lectures on physiology, biology, and so on, at South Kensington, they would not be required for the lower class of men. These might only attend for the course of forestry, forest management, elementary botany, perhaps, and so on, so that they need not spend their whole time in forest education, but might be carrying on their other education at the same time.

490. Then it might be arranged that the instruction should be given at a particular period of the year, when forest operations are not carried on, so that people engaged in the management of woodlands might come up at a particular period of the year as they do in Scotland?—I think you might supplement the system as much as possible; I think, from inquiries I made as to the means of education at the disposal of the people both in Edinburgh and London, that they are sufficient to afford the means of giving a forest education, if this special instruction be added.

491. I suppose it would be necessary in the case of any forest school, that you should have the opportunity of sending the students into woodlands to see the practical management on the spot, would it not?—It would be absolutely necessary. Even as regards the growth of trees, if you tell a man that the oak will not grow alone, it is no use telling him so in the lecture room unless you take him out in the forest and show him where it is not succeeding by itself, and where it is succeeding with other trees.

492. It would not be possible to leave it altogether to private enterprise; because it would be necessary to have access to woodlands of some

Chairman—continued.

extent?—It would be absolutely necessary to have access to large woodlands.

493. Do you think that even if no assistance were asked for from Government, it would be desirable that Government lands should be rendered available for the teaching of students in forest schools?—Certainly, and I believe many of our private owners would open their lands willingly to the pupils. From my personal inquiries, I might say that there would be no difficulty in getting access for the pupils to the different forests.

494. You think, as I gather from you, that a person who would be receiving 50*l.* or 60*l.* a year without any training might after a year or two's training be worth a good deal more?—He might be worth double his present salary.

Dr. Lyons.

495. Could you kindly give the Committee in a rough way what the cost would be of setting up a forest school in this country, that is to say, a school independent entirely of Cooper's Hill, for civilian purposes, not for Indian purposes?—I should think about 600*l.* a year; I think you would have to pay one man 250*l.*, another man 250*l.*, and perhaps the man in charge of the museum 100*l.*, for making the collection; you would want 600*l.* a year absolutely.

Colonel King-Harman.

496. That would be for salaries alone?—Yes. As regards whether they would require buildings, I should not like to speak about that, because I have heard that you could possibly get buildings; but I am not in a position to say that it would be possible to get Government buildings in which the schools could be established.

497. You want men for the forest service of a superior class of general education, do you not, for the superior officers?—No; speaking of the English forests, I do not think they are any of them of sufficient extent to allow for the salaries of highly paid men, and therefore you could not have them alone. But my view is that means should be put at the disposal of people who will become land agents to obtain a knowledge of forestry; then they would be able to control their wood bailiffs; and I would at the same time give the wood bailiffs and managers a better education, so as to enable them to carry on their operations in a more intelligent manner than they do. But I do not think you could have a class of foresters in the same way as they do in Germany, where there are very large tracts to be managed, and where men make a profession of it entirely; I do not think you would get a very highly trained man to make a profession of forestry in England.

Dr. Lyons.

498. Suppose you took the class of young men who would spend two or three or four years in a university, and who had acquired the principal portion of their scientific education, and you opened a forestry school and put any examination that is thought desirable to mark the stage of education they had arrived at on entrance. Supposing them to be in a position to pass that examination

24 July 1885.]

Colonel PEARSON.

[Continued]

Chairman—continued.

examination in mathematics, and so on, what time do you think it would then take to put them through a course of forest education, specially: would you say one year or two years?—If they had had a thoroughly good education before, one year would be enough; if they were carrying on their other scientific education, which I think would be the best way, concurrently, then two years. In France a young man attending the Forest School at Nancy has to take his degree before he can compete; either he must be *bachelier ès sciences*, or else he must have passed through the Polytechnic School; that at once involves a considerable amount of scientific education. Then he has two years in the forestry school. But a man in the school at Nancy continues his applied mathematics; he continues his instruction in surveying, road making, machinery, certain elements of chemistry, minerals, and geology. If he is carrying on that concurrently, it would take two years, and I think that is the best way of teaching, because you could hardly spend the whole of your time in teaching a man forestry, else the whole of the forestry education could be done in one year. The more extended period also gives a better opportunity of taking the pupils into the forests at different times of the year; that is to say, by spreading it over two years; so I think it should go on concurrently with his other education.

499. You would say, taking a somewhat superior classman from the university or a public school, and submitting him to such examinations as might be thought necessary to test the amount of education he had already got, that in two years subsequently to that you could fit him with a sufficient knowledge of forestry to make him a useful servant of the State for carrying out any forestry operations that would be attempted in this country?—Certainly; there are a good many of the German forest schools affiliated with the universities where the course is four years. Take Carlsruhe and Tübingen, in those cases there are three forest professors only who give lectures on forestry and forest management and botany, and then all the rest of the course is going on concurrently with the regular course in the university. It is only a portion of the time which is devoted to forestry instruction, and the rest of it is going on in the ordinary way. I think that is the best way of teaching them.

500. In the first instance, you would probably have to deal with a class of young men who would be going to superior schools or universities up to, say, their second year, taking them and submitting them to such an examination as you think necessary. Do you think that with such a special education in forestry of two years you would at the end of that time be able to turn them out fitted for the service of the State in this country for forest operations?—Quite so; they are very well taught in two years in Nancy. In Nancy they take *sylviculture* the first year; that is to say, the growth of trees and the physical conditions of their growth. The second year they take *aménagement*, which is the management of forests and their economical treatment, felling and management with regard to the production of a proper amount of revenue;

Chairman—continued.

the two things are distinct; they teach one thing the first year and the other the second year.

501. In addition to the system of school education, especially forestry, would it not be very desirable, if we could accomplish it in any way, that something in the nature of forestry education should be added on to the curriculum of some of the universities, following the example which is set in some of the universities?—I thought I said a little while ago that I did not think Oxford or Cambridge were suited to it, but I said that I should utilise the University College and King's College for the purpose, a forestry course being added on to the education given there.

502. But for an expenditure, which you put at about 600 £ a year, there should be no insuperable difficulty in setting up at least one forest school in this country, to begin with?—Certainly not; I think the first thing would be to get a building, for we could then appoint the officers, and let them make a forest museum, and the things that are necessary. Then I would set them to give lectures, and to that I would, if possible, superadd some lectures in what is called physical botany; that is a necessary part of the forest education.

503. Why is there no efficient system of instruction in forestry. Have you sufficient knowledge of the existing woods in England or Scotland to say whether it would not be possible to carry out a course of practical instruction in some of these forests without having recourse to the French schools, against which exists the difficulty you have already mentioned, of the want of knowledge of the language?—The only difficulty is that the English and Scotch forests are so young. I do not know myself one mature forest at the present time in England or Scotland. There is no doubt that a great part of the instruction might be carried out in the English and Scotch forests; but besides the growth of trees, there is one very important part of the instruction, namely, the removal of the crop; which you cannot do at home, because the forests are not matured; you cannot get that without going abroad for a certain time. You would not have to take much of a tour, but if you want to teach young men what concerns the removal of the timber, that cannot be done in this country, because it is not ripe.

504. You mean a proper system of laying out a forest, so as to cut it in certain proportions?—Yes; removal with a view to reproduction, which should be natural, no doubt; because after you have once established a forest, you should never require to plant it again.

505. I suppose there is no forest in this country where they have adopted the block system of felling and management, or the French system known as *tire et aire*?—I saw a very good natural reproduction of larch in Lord Seafield's forests, which showed me that it could be done, and also of Scotch fir at Lord Lovat's, whose wood manager, Mr. Dewar, is a very intelligent man.

506. Still, on the whole, it is substantially true that there is no scientific laying out of forests in England as on the Continent, with the view of cutting them down in successive crops?—Certainly not. I think Mr. Dewar mentioned that

24 July 1885.]

Colonel PEARSON.

[Continued.]

Chairman—continued.

that Lord Lovat had instituted the system which we have on the Continent, which, however, was very much interfered with by the deer forests; but still the thing is more or less done on correct principles. He told me that the old Lord Lovat had instituted that system himself, and I have no doubt he had seen it on the Continent.

507. But a deer forest has not necessarily a stick of timber in it?—No. I said it was very much interfered with by the deer forest, because Mr. Dewar told us that he could only go into the forest five months in the year, and those were the months when it was least desirable he should be there; but that at the time when he wanted most to be there, he was prevented by the lease of the shooting from going in, the forest being leased to the American gentleman, Mr. Wynans.

508. Are we to understand that you would think it absolutely necessary, in order to train men to this system of cutting and removing the timber, that they should visit at stated periods of the year some of the great French or German forests?—To get complete instruction, yes; but they might learn a lot of useful knowledge without going there.

509. Do you attach very great importance to the establishment of a forest school in this country, having regard to the state of our forests?—Certainly. If possible it ought to supply a kind of education which would reach as low as possible; that is to say, as low a class of agents as possible, so that the wood managers and the smallest paid men should be able to attend. I think that is very important. Perhaps I might be allowed to add that there are a number of bodies who are interested in the instruction and education of land agents, and I think it would be a great thing to interest them in the question also. At present the Surveyor's Institution, I believe, does something in the way of instructing its pupils in forestry, add if they were interested in the question of education, they would probably bring their pupils to the school and send them through it.

510. Are there not in a great many of the Scotch forests, young foresters very well practically instructed in the management of timber for commercial purposes?—If you were to say practically very well instructed, I should say not; but there are many of them exceedingly intelligent men who, by rule of thumb and by the experience which has been handed down to them, have learned the system of planting and growing trees exceedingly well. And that I think was also the impression of the French foresters who came over with me, that in those respects they had nothing very much to teach them, and certainly it was of myself. But there are points on which knowledge is required. In one forest, in which a great number of trees were blown down (we saw a great number on the ground), we were certainly of opinion that the damage might have been saved by a fringe of birch, which would have grown perfectly well above the Scotch fir. They ought to have been planted to keep the wind out of the ravines, but instead of that they planted Scotch fir right up the top of the ravines, the wind got amongst them and knocked them down like a field of corn.

511. Like spillikins, as a Scotch proprietor describes them?—Yes.

Chairman—continued.

cribed it to me?—Yes, we certainly thought that a fringe of birch would have grown perfectly well on the top of the hill, and if it had been planted above the Scotch fir, it would have kept the wind out of the fir, so that a little scientific training would have saved a great deal of loss.

512. Does not the system of planting wind breaks, as they are called in America, where they run sometimes 100 miles or more, require a considerable knowledge, and something more than the mere growing trees?—I can speak of a forest of larch, which is very near the place where I live, in Radnorshire; a magnificent forest, which has succeeded in every way. Seeing that was so successful, the late owner planted the opposite side of the hill with larch too, and that has been an entire failure. I took one of the French professors over with me last year, and we at once came to the conclusion that the first forest was planted in a proper "exposition," as we call it, that is, suitable to the growth of the larch, whereas the other was not, because one was dying away though it was not attacked by disease, while the other was doing perfectly well.

Mr. Seely.

513. Were there any other trees which the French professor thought would have grown there?—Yes, there are a good number of Scotch firs (*Pinus Sylvestris*), which are doing perfectly well amongst the dead larch.

514. Is there not a preference for larch?—Larch is supposed to be worth something, while the Scotch fir, as a timber, is not thought to be worth so much. But I think myself that as the value of the foreign imported timber increases as it must do as the quantity diminishes, people will come to appreciate more the Scotch fir, because I know many barns which have been boarded with Scotch fir for 20 years, and which are standing perfectly well; but it is convenient to get the imported boards ready sawn out, and where the people can get them cheap, they do not pay attention to the Scotch and home-grown timber. But, speaking for myself, I should say that Scotch fir is a perfectly good wood as long as it is sufficiently mature, and I think, as foreign wood becomes dearer, as it will in a few years, English timber and Scotch timber will become of a value which it has not now.

515. Is it not the fact that the sources of the supply of timber to this country are gradually and sensibly diminishing more and more as years go on?—There can be no doubt of that; I saw Dr. Hough, who was employed by the American Government, and had a good deal of talk with him on the subject, and he told me that it was only a question of a few years comparatively now, unless steps were taken in America, when the sources of supply would be so very much diminished that practically we should not get the same timber as we do now; and in Canada also it is the case.

516. Do not you think that it is a question of Imperial importance in these three kingdoms, that well-regulated and well-devised attempts should be made to plant in view of a possible timber famine in the near future?—Unquestionably, there can be no doubt about it.

517. Have you directed your attention at all to

24 July 1885.]

Colonel PEARSON.

[Continued.]

Mr. Seely—continued.

which in this country are very often very much misunderstood, such as trees requiring trimming and pruning, and so on. Those things are not, as a rule, done at all as they ought to be done, and with regard, for instance, to the selection of trees to grow on different sorts of soil, because the oak will not where the Scotch fir will, and so on; and people ought to know that, so that money is thrown away now in planting trees in places where they will never grow.

544. That you think would be learnt in time?—It would be very easy to impart the information which would enable a man to select a proper site. With regard to the planting, I know larch can be produced from seed; I have seen excellent reproduction from seed. In my county, Radnorshire, I cannot see any natural reproduction of larch woods, but I have seen excellent larch woods naturally reproduced in Strathspey and Beaulieu, and other places in Scotland.

Dr. Farquharson.

545. You are aware that in Scotland most of the properties are managed by land agents in this way, that the land agent is probably a lawyer practising in the neighbouring town; he is what is called the factor?—Yes, generally that is so.

546. Of course we could not expect him to go to the school of forestry?—No.

547. He does the legal part of the business; the practical part is carried on by what we call ground officers, farmers and farmers' sons?—Yes.

548. We could not expect those men to go through an expensive course of training?—No.

549. Do you think a practical course of two or three months might be advantageous to those who are not rich and could afford only a short space of time?—I think a chair of forestry at the Edinburgh University, where many of those young men go, with a course of lectures of three months (because I do not think any man could give a course of lectures that would be any practical use at all under three months), would greatly meet the want. Part of this might be in the school and part education in the forest; I know that a good many of these young men who are merely farmers' sons do go to Edinburgh and get an excellent education for a small sum; they might give a certain number of months of their time up to learning forestry, and the more the better, as the more knowledge they would be able to get the more capable men they would be. I think that would have the best possible effect in Scotland.

550. Have you any great faith in teaching?—Lectures in the school I have actually no faith in unless illustrated by practical instruction. If you tell a man in the lecture room that such and such consequences will take place, and do not show him the consequences on the spot, he does not believe anything about it; it goes in at one ear and out at the other; he will think it all nonsense, but if you want to impress your teaching upon him you must take him out into the forest and show him the operations of nature.

551. He would have to plant trees I suppose?—He would have to learn that under a wood manager; he would have to find time to dovetail that in, but that would not form part of the instruction. In the forest schools I would teach all

Dr. Farquharson—continued.

the principles upon which trees grow and are produced, and the principles of germination of the seed.

552. Would you think that the course of education indicated by my honourable friend the Member for Dublin County, was a little too ambitious in its scope?—What the honourable member suggests is very excellent; it is perfectly right in theory, but in practice would you get the men to come to you? I think you would get more pupils under your system than you would under his, but I do not know why you should offer a low system of education. I would raise my standard of education as high as possible; that is to say, I would have the lectures so arranged that the pupils who commence, we will say, and proceed up to a certain point should profit according to their wants equally as those who carried on their studies further.

553. But you will not get University men to come to the school and go through this course of training, unless there is some inducement held out; what occupation would these men get afterwards?—They might go to the Indian forests if the Indian forests were open to them; or they might go to the Colonial forests, where, undoubtedly, there will be a demand now in due course.

554. But with regard to the English woods?—The higher educated men would not find employment in English woods.

555. What we want would be practical foresters, whom you would pay at the rate of 100 l. a year or so?—The practical education you would want for that man would be the same as for the higher man; but you would carry on their education to the point only to which it suited them to go, and to which they could afford to go.

556. I want to ask you a question about matured forests; do not some authorities hold that it is better to get frequent crops off your land?—The German theory which is now being taught, especially at the Saxon School, at Tharandt, is that the most profitable time to cut a tree down is when it is two-thirds grown. Formerly matured timber was much more wanted than it is now; iron and steel now supply the wants for which large timber was formerly wanted. And when a forest is about two-thirds grown there is the greatest volume of timber on the ground, there is no doubt about that; because, supposing you have 1,000 trees growing upon a certain space of ground, when they are 20 years old, some of them the weaker ones begin to disappear, and at 40 years you will only have on that space 500, and at 60 years more will disappear, until at last you will have only 50 or 60 mature trees. There is a certain moment when the trees in proportion to their size stand thickest, and that is when they are two-thirds grown; therefore, it is more profitable to cut the crop down then and to replant it, because you have to count compound interest on the value of the crop as it stands upon the ground from the moment of its removal up to the time when it would have arrived at maturity; that will repay, and more than repay, the cost of replanting the ground.

557. Two crops of trees, when 40 years old, are better than one crop of trees of 80 years old?—Yes; or what I would say is, that two trees 70

24 July 1885.]

Colonel PEARSON.

[Continued.]

Dr. Farquharson—continued.

years old are better than one tree of 120 years old.

558. Do you agree with that theory?—I should say generally so. French foresters were very much against it when it was started, but Monsieur Broillard, one of the most able amongst them and Conservator of Dijon, has very much come round to that theory. In his last book on "Forest Management, and the Proper Mode of Felling Forests," he practically acknowledges the truth of the theory, therefore I suspect it may be accepted; it is a German theory, but undoubtedly in his last work he comes round to that opinion.

Mr. Fremantle.

559. I understand you to say that there is a great want of scientific management in the public forests of this country as well as elsewhere?—I do not think I said that exactly; I think on the whole that our public forests are well managed, and have been managed with a great deal of care. There is no doubt that the fault of the public forests is that they have planted oak pure. I have no hesitation in my own mind in saying that oak is not and cannot be successful alone in most of the places where they have planted it; there are one or two parts of the New Forest where the oak, which has been planted alone, is magnificent. What are called the Salisbury Trenches, where there is a magnificent oak forest above 100 years old, which is as good as anything which could be seen; but those places are so small, as compared with the bulk of the New Forest, that one must generally say that the fact of oak being planted alone in the New Forest has been a failure. That must be said.

560. I understood you to say that there was what you called degradation going on in the New Forest specially?—In talking about the New Forest I was speaking of the forest as it is properly so called, that is to say, the open country, that is the denuded portion of the New Forest, and not the portion that is covered with trees; it has been degraded in quality, and getting worse and worse every year, because there are no trees on it, and you see the heather extending there in every direction; that is always a sign of poverty of the soil; it has been grazed, and grazed, and grazed; in fact, to that extent that the heather is now taking possession of the soil; but the New Forest is under certain conditions. The last arrangement made with the commoners there was that 14,000 acres out of 63,000 acres should be planted. Although the forest officers are quite prepared to extend that area they cannot do it; they have no power whatever to replant, except upon throwing open other portions of the forest; they can do that if they think that any portions of the forest are not getting on well, but they cannot increase the area beyond 14,000 acres; so that the forest officers are absolutely helpless upon that point.

561. So that under the conditions under which they have to work there is fairly good management in your opinion?—Yes; under the conditions under which they have to work the management is very fair?—The forest officer of the New Forest is an exceedingly able gentleman, who wishes to act for the best, and is endeavouring to carry out matters for the best advantage, but, of

Dr. Farquharson—continued.

course, with some 90,000 commoners, or people who have interest in the forest, who are always endeavouring to thwart him, it is very difficult for him to carry out anything that is not absolutely under his control.

562. Would the New Forest do for the experimental stations you referred to as being desirable?—There is quite enough forest in the New Forest and in the Forest of Dean to illustrate the teaching of school, because you want bad forests as well as good forests for purposes of instruction. For instance Compiègne has been partly exceedingly badly treated, whilst at the same time it contains some of the finest woods in France. There was one spot to which they used to take us to see the effect of planting oak alone, and oak with fir, and oak with beech as a practical illustration. Here may be seen one of the finest forest compartments in France planted with oak and beech, while close beside it, in the time of Louis XVI., just before the Revolution, they planted a very large extent of pure oak plantation, just upon the same principle as the New Forest and the Forest of Dean were planted in England. These last are now fast disappearing from the ground, though only a hundred years old, whereas close by their side there are some of the most magnificent oak trees which ever were seen growing mixed with the beech. They used to take us there to see that as being a practical illustration that ground that would produce oak in a certain proportion under the most favourable conditions, was totally unable to produce oak if it was planted pure.

Mr. Round.

563. Do you know what the value per foot is of the best timber in India?—It is 13 or 14 years since I left India. I think the best Burmah teak in Calcutta will fetch 120 rupees per ton of 50 feet. That at the mouth of the Irrawaddy or the Salween would be about half the price, and if it came to England much the same price as at Calcutta. India proper produces very little teak now of mature size, as it has been so much cut, but there is plenty in Burmah.

564. Is bark extensively used for tanning?—No; I think they use myrabolams, the nut of the *terminalia catechu*, or one of the *terminalia*. I do not think bark is much used in India for tanning.

565. Can you tell the Committee the value of the bark per ton?—I do not know what it is in India.

Colonel King-Harman.

566. Do the students at Nancy who attend the course have any practical experience of cutting or planting?—Not much; not in actual planting.

567. Have they any practical experience in cutting or felling?—No, they never use an axe.

568. You spoke of the reproduction of larch on Lord Seafeld's estate?—Yes, I did.

569. Has that reproduced itself?—The best reproduction of the larch that I saw was to the south side of Milton Castle.

570. Was that where the wood has been thinned?—Yes, to a small extent; you must open up the light to the ground else the seedlings will not spring up.

571. The small larch trees have grown in among the larger ones?—Yes, there is what we should call in France self-reproduction, the young

24 July 1885.]

Colonel PEARSON.

[Continued.]

Colonel King-Harman—continued.

growth coming up amongst the plantations on the south side of Milton Castle.

572. Does the forester keep the ground clean whilst the plants are young?—They cut the ferns in some cases; it is necessary to do that. I remember Mons. Boppé remarked that if he would take chain barrows and work up the soil, a great many more of the seeds would catch, than did; it is very necessary to do that; just roughly to turn up the soil and break the clods, else the seeds will very often not catch. At Lord Lovat's forests at Beaulieu there are very good forests of larch which are being naturally reproduced, but I have never seen any to the south of that; there are certainly none in the Radnorshire hills; therefore I am inclined to think that larch for natural reproduction requires a very cold place, because Lord Seafield's place is from 700 to 1,000 feet above the sea, at Strathspey; the snow lies there a long time; I do not think you could count upon the natural reproduction of larch in less favourable places, but, on the contrary, I have seen Scotch fir naturally reproduced in those forests most luxuriantly; it will grow anywhere.

573. The class of men who would be educated in such a school of forestry as you speak of would be able to earn a fair living, would they not, as travelling foresters, going down and giving directions, and laying out, as a sort of advanced landscape gardener?—As advisers I think the superior class of men might. My idea would be to make the education accessible to all; I would have a course of lectures which would commence from the beginning from simple subjects and with simple experiments, going on to higher subjects such as Dr. Lyons keeps in view. If you pay a man, you may just as well keep him at work. I would first give an elementary course, then a more advanced course, and then a little more advanced course still; the wood manager would attend the first, the land agent the second, and the man who wanted a thorough education would attend the three terms, or something of that kind; in that way I think you might try to suit it to all, but I think it must be made cheap enough, and the means made accessible to the lower class of wood manager, as well as to the higher, if you want a practical result.

574. But we were talking of the possibility of such a school paying, and the class of students that would go there; you were only asked with regard to agents who would want such a study as a part of their agency business, and also with regard to the lower class of foresters who would not be able to afford to pay the higher fees; but do not you think there would be a class of men who would take up forestry as a profession altogether as advisers to go down and examine woods. There would be many a man who has a good deal of wood, but who still does not keep a forester of his own to whom such professional assistance would be valuable?—I would make the education complete; but for that purpose you mention I think the men ought to go through the complete course; they ought to go to the Continent. I would not give them a first-class certificate without.

575. We have a class of men in Ireland making a very good income in this way; do you think

Colonel King-Harman—continued.

that people so educated would be able to make a very good income in Scotland and England?—I think so. I have other things myself to do now, but at one time, after I had been through the Nancy course, I thought of taking that up myself, throwing up the service, and offering myself to give hints about the management of forests, as I had acquired a good deal of experience in the matter.

576. You spoke of the new German system of felling the entire block when it had reached two-thirds of its growth on replanting; do they replant the same class of tree?—I do not know that. In places where I have seen it, in the Vosges, I would say they have not done so in all cases.

577. Do they ever answer?—I could not say whether they do. I am thinking of the eastern slopes of the Vosges. A great deal of forest has been planted upon the system of following fir forest with Spanish chestnut, but I am not quite sure whether that was not because they thought they would be more useful for hop-poles, which are very much wanted there. Those are chiefly private forests that I am speaking of, and it was thought they would give a good deal of revenue.

578. Do they fallow for two or three years?—Yes, they certainly fallow for two or three years.

Sir Edmund Lechmere.

579. In forming a British school of forestry I suppose we could not do wrong in taking either the French or German models, with certain variations?—Yes, I think we should have to adapt them to our requirements.

580. You know the foreign school very well, I dare say?—I was attached to the forest school in Nancy.

581. Do you know any of the German schools personally?—I have never visited any of the German schools, but I am thoroughly acquainted with the management of the forest in Baden.

582. And you would have no difficulty, if it were desired, in submitting your own scheme for the formation of a School of Forestry?—I would be very happy to give you any help, but I have other things to do that take up my time. From good-will I would gladly take an interest in it, and place my views in writing, but I cannot give any time to the matter.

583. In answer to the honourable Member (Colonel King-Harman), you said that the School might be applied to two or three classes of pupils, some of them gentlemen's sons, and farmer's sons, with a view to their combining a knowledge of forestry with land agency, and then there would be labourers who would do the felling and the planting and the labouring work of the school?—I would hardly include the labourers; I do not think those would want instruction, they generally do their work very well in most places; the three classes would be first, wood managers or bailiffs, who would get from 60 l. to 70 l. a year, then there would be the land agent who directs them, and who it is most desirable should have a little knowledge, as he would be able to direct and advise what planting should be done, and what timber should be felled and all that branch of work, which

24 July 1885.]

Colonel PEARSON.

[Continued.]

Sir Edmund Lechmere—continued.

which is often very much mismanaged. Then, finally, as Dr. Lyons and others seemed to wish, I would carry on the instruction so that you could have a higher class of men who could either act as agents in the Colonies or as advisers at home.

584. We have had evidence to show that woodlands are very much mismanaged generally, and that they are entrusted to the class of woodmen?—Yes, I have heard of that.

585. Could not you make the schools available for the instruction of our woodmen, because there is no doubt that the management upon large estates must depend upon the managers, the woodmen, more or less?—I would make the elementary instruction such that anybody who had a decent education could benefit by it, but of course such a man cannot be a perfect forester because he does not know a lot of things that scientific education alone can impart, and which it would be impossible for him to understand unless he had a scientific knowledge of a number of things which a man of that class would not know.

586. I do not know whether you are aware that at the Agricultural College at Cirencester the higher class of pupils have labourers who attend them from time to time, and who go out afterwards as bailiffs, but who acquire a certain knowledge of farm management by being attached to the College which enables them to get better places than that of mere bailiffs?—Without saying anything about the school at Cirencester, which I have seen, that is quite the right principle to go on.

587. So that a School of Forestry might be educating a certain number of men who are in the position of labourers, who having obtained a superior knowledge of the best mode of managing woods might ultimately go out as woodmen?—No doubt. I would be in favour of making the education as comprehensive and bringing it down as low as possible.

Mr. W. T. THISELTON DYER, C.M.G., F.R.S., called in; and Examined.

Chairman.

590. You are Assistant Director of Kew?—Of the Royal Gardens, Kew.

591. And you have paid great attention to the management of forests and woodlands?—My attention has been drawn to the general subject of forestry from the fact that Kew performs to a large extent the part of a botanical authority to the Government, and a number of questions affecting botanical work of different kinds are referred to Kew, which it is my special business to attend to. Amongst these, of course, from time to time, are questions relating to forestry, and although I have not myself, like the last witness, Colonel Pearson, any practical knowledge of the management of forests, I have been compelled, of course, to look into the subject, but more especially with regard to the colonies rather than with regard to this country.

592. When the colonies apply for any information to the Government, I believe the Government are usually in the habit of sending to Kew for information and assistance?—That is so. At the Colonial Office they get an enormous mass of detail business of various kinds, and they are

Sir Edmund Lechmere—continued.

588. You think that if the Government would give facilities, the New Forest or the Forest of Dean would be good localities for affording instruction on the spot?—There is one spot in the Forest of Dean which is especially suitable for instruction, and that is the High Meadow Woods. The only thing is that in the Forest of Dean you can show little or nothing as regards the management of conifers; both that and the New Forest are mainly leaf forests, and you would want to take a man into some forest where the larch is planted by itself, because that involves totally different requirements from the trees which you see in the Forest of Dean. Mr. Symonds thought he could teach a good deal in Windsor about conifers, but when I was there I had not sufficient time to go into the question as to whether the plantations about the Windsor Forest are sufficiently varied, because it is a very important thing that the forest in which you give the instruction should be considerably varied. You require every variation of soil, climate, and exposure.

589. But practically for the experimental works those two localities would afford a commencement?—They would afford a certain field. It would be for the professor who had the instruction to give to say what facilities he wanted, but I do not think from what I saw myself in going round the English and Scotch forests that there is the least indisposition on the part of many of the great owners of forest lands to allow pupils to be conducted through their woods. After all the teaching is merely a question of example. You want to show that the things which are taught in the lecture room actually takes place in the forest. It is no use to tell a man that beech makes a suitable nursery for oak, unless you show him under what conditions it is so, and what precautions must be taken when you mix beech with oak to keep the beech from getting above the oak, and so on.

Chairman—continued.

very glad to take advantage of special authorities upon particular points. Of course the business of forestry is continually, in one shape or another, before the Colonial Office. I do not know whether the Committee would like me to say a few words upon that matter, or whether it would be too foreign to its objects; but it would explain the way in which the subject interests us in Kew, and how it comes before us in this country.

593. The Committee would be glad to hear that in a moment, but before you go into that I should wish to ask you one or two questions upon the general subject; in the first place, whether you concur with the previous witnesses that a scientific training is highly important for forest officials?—I apprehend that the business of a forest officer of the highest grade is one that must be based upon some kind of scientific information, because it deals with matters which, although of a purely practical and empirical kind in their carrying out, still require some apprehension on the part of the superior officers of their scientific foundations, in order to get them thoroughly rooted in the mind. I mean, taking

F

24 July 1885.]

Mr. THISELTON DYER.

[Continued.]

Chairman—continued.

an analogy from another profession that there have been very good engineers who have had very little more than an empirical basis for their practice; but I imagine that most people would agree that an engineer is but poorly equipped for his business who has not a knowledge of the scientific foundation upon which the principle of engineering rests. I think the analogy applies exactly to forestry. A man may know a good deal about the kind of soils which particular trees require, but I think it desirable that he should possess at first hand some actual chemical knowledge of the soils themselves, and not merely obtain it from others. I think that scientific education, not of a very profound, but at the same time of a practical kind, is very desirable for foresters of the highest grade.

594. At present there is no institution in this country where an education such as you have indicated can be obtained?—That is the case. I understand negotiations are in progress with the view of educating foresters for the Indian service at the Indian Engineering College at Cooper's Hill. Whether that will be a successful experiment I think is to some extent doubtful, because I understand the course of instruction at Cooper's Hill is laid out with a view to the preparation of engineers, and that some practical difficulty is found in accommodating what may be called the curriculum to the rather diverging wants of the engineers on the one side, and of the foresters on the other. I hope that difficulty may be overcome, because I understand it is no longer considered desirable to send the English students to France for the purpose of instruction, and it seems to me that if we get a nucleus of forestry instruction anywhere in the country it is only a matter of developing the institution to supply the other directions in which the services of a forester might be desired. But at present it may be said that there is in this country no institution of any kind analogous to those which exist in France, Germany, and other countries, and now even in India, for the instruction of persons in forest management.

595. I can easily understand that you might be reluctant to say anything that might be thought to reflect in any way upon the English and Scotch foresters, but without in the least doing that, is it your opinion that if a general education in forest matters were available it would have an advantageous effect upon the management of our English and Scotch woodlands and forests?—I imagine there could be no doubt about that. I was turning over only recently a file of the "Gardener's Chronicle," in which some of the superior members of foresters in this country occasionally write, and I noticed there was a series of articles by Mr. Michie, the Earl of Seafield's forester; he gave an account of the management of a piece of oak plantation in Sussex which he said was not financially successful, and he gave as an explanation that the trees were not planted sufficiently closely, and that they had not been planted pure.

Mr. Seely.

596. What does pure mean?—Unmixed. I believe it is the practice in planting oak to plant other trees to commence with, and that the thin-

Mr. Seely—continued.

nings of those pay to a considerable extent the expenses of the early stage of the plantation. He thought this a bad practice, and that the oak ought to have been planted pure; that is to say, nothing but oak, and closer together, so as to get more timber upon the ground, he was replied to by Sir Charles Strickland, who has some considerable woods of his own, who said that the whole thing was a mistake from beginning to end. I do not mean to say that that reflects in any way upon Mr. Michie's judgment; but I apprehend it shows that the woodland practice in this country is in a very unsatisfactory state when you find two competent authorities on the same subject, in a prominent newspaper, diametrically in opposition to each other upon the same point. Then I find that in France Professor Broillard, whose name has already been mentioned by Colonel Pearson has prepared a manual for much the same class of landed proprietors as exists in this country. I had no notion until I examined his book what a large extent of woodland exists in France in private hands. Some of those woodlands, he states, are exceedingly well managed; others, he says, are very badly managed, but there really seems to be the same state of things in France with regard to private woodlands as exists in England. Monsieur Broillard says a very large number of French landed proprietors are under the impression that they are quite competent, by the light of nature, to manage their woodlands; he does not in any way agree with that view, and he has written his book with the view of showing what are the defects arising from previous ignorance of the subject, and how such woodlands may be economically managed. In France there has been built up, I will not exactly say a scientific system of forest management, but a system under which you have the accumulated experience of a body of experts which can be applied to the particular wants of private woodlands, and that experience M. Broillard so applies in his manual. I cannot help thinking, for my own part, that if the general rules of the French schools of forestry could be brought together and applied to the English woodlands, it will, I will not say, work miracles, but it will effect enormous improvement; we should go upon some well-established and reasonable system, instead of, as far as I can judge at present, upon the more or less haphazard method which is followed in different parts of the country.

Chairman.

597. Now to come the question of the Colonial requirements; you have been applied to from time to time on behalf of the colonies to recommend properly qualified persons to superintend, or report upon, their forests?—Yes; various points, with regard to the colonies are referred to us for an expression of opinion. What generally happens in the colonies is—

598. But before we go into the question of what takes place in the colonies, I wish just to elicit from you whether you have found it possible to recommend to the Colonial Office properly qualified persons either to report upon or to manage colonial woods?—No. To a certain extent we have been able to send out picked men from

24 July 1885.]

Mr. THISELTON DYER.

[Continued.]

Chairman—continued.

from the Royal Gardens, simply under the impression that being men of considerable natural ability and some professional knowledge they would, after some fashion, pick up a practical knowledge of such forestry as was required, and be able to do the work that was demanded of them. In the Mauritius, for instance, that has been very successful; we sent out a man from Kew, Mr. Horne, who is now Director of Afforestation in the Mauritius, and is a very much respected official. When his work was reviewed by a member of the Indian Forest Service, this gentleman, on the whole, was very well satisfied with what Mr. Horne had done; but I think that is rather an exceptional case. In the case of Ceylon, where there was reason to believe that great mischief had arisen from the destruction of forests, we suggested that an application should be made to the Forest Department of India. In the case of the West Indies, which in many aspects are giving a great deal of anxiety to the Government, and where there has been a great waste of the forests, we recommended also that an official should be obtained from the Indian Forest Service by a kind of combination amongst the islands, so that he should make a travelling tour from one island to another.

Colonel King-Harman.

599. Was that done?—I do not know; a gentleman was asked to go, and I had an interview with him, but whether he went or not I do not know.

Chairman.

600. Do we understand that, apart from the trained officials of the Indian Forest Department, you would find it practically impossible to meet the requirements of the Colonies in those respects?—Yes; Colonel Pearson being a great forest authority, has been also consulted upon the matter, and he had recommended one or two Frenchmen, for instance, in Cyprus and the Cape, and so on. But practically, as far as the Colonies have required help upon the forest matters, we have been dependent upon the Indian Forest Department on the one side and the French Forest Service on the other. On the whole, we have the greatest reason to express our indebtedness to the Indian Forest Department, who have been very self-sacrificing in the interest they have taken; but the system is obviously a bad one, because it cannot be expected that a large department could deplete itself to undertake a work outside itself, and of course the inevitable result, if you entirely depended upon the Indian Forest Department, would be that they would not send you their best men, because they would want them themselves, and you would not get the external work done in a satisfactory way.

160. In those cases where the Indian Forest Department spared men, they spared them only temporarily?—They spared them only temporarily, and that fact has caused great inconvenience. When we took Cyprus over, the forests were in a most deplorable state; only one-
0.135.

Chairman—continued.

tenth of the island had any forest at all, and that was rapidly being destroyed. We first got an Indian forest officer to report, and then he had to go back to India; then Colonel Pearson got a French forest officer to go out there, who was engaged for two years, and then he had to go back; then we got another from India, and I have heard that he is on the move.

602. You were going to mention to the Committee some facts connected with the Colonies; would you now kindly do so?—I was going to explain how the sudden demand for assistance in forest matters in the Colonies has arisen. It is very much in this way. When a colony, for example, in the condition of Honduras, which has been very little opened up, is first occupied by planters, a great part of the surface is naturally covered with forest. For a very long time that forest can be drawn upon; in fact, it may be used up, and even destroyed, without attracting any great attention; but there comes a point, when the denudation of the forest reaches the highlands, and especially in tropical countries, when the banks of rivers are denuded, that the water supply begins to fail, the rivers begin to dry up, the hot winds are let into the lowlands from denuding the ridges, and a variety of changes in the physical conditions begin to force themselves upon the attention of the residents. Then for the first time it dawns upon them that the destruction of the forest has either gone too far, or is within measurable reach of doing so; the Colonial Government takes the matter up, and applies to the Home Government for assistance in getting the thing investigated. When a colony has reached that condition it is ripe for the constitution of a Forest Department, because you must maintain some forest protection over the sources of rivers. You must keep the ridges of mountain ranges clothed, or the hot winds will pass over them and dry everything up in the valleys below. But it seems to me that a good many of our Colonies have now come to that state of things that there will probably be a demand for persons who understand the management of forests, as in India and in the Continental States, and it is difficult to see how those gentlemen are to be trained except at some central place in the mother country or in France or Germany. I daresay the Committee would find it tedious to hear the details at any very great length with regard to the particular colonies, but in the Cape, for example, the amount of forest which exists has been reduced to very small limits indeed. A French count, the Comte Vasselot de Regné, has gone out, at Colonel Pearson's suggestion, as forest officer, and he gives a most deplorable account of the state of things. To us, one result which he mentions is almost incredible. You would think that a country like the Cape with large supplies of timber would be able to supply itself; but the forest officer states that the Cape imports something like 80,000 £ worth annually of soft pine wood from the north, I suppose either from Scandinavia or from America. In Natal there is a considerable import of pine wood and so there is into Jamaica, and indeed even in India it is suggested

24 July 1885.]

Mr. THISELTON DYER.

[Continued.]

Chairman—continued.

suggested that notwithstanding the activity of the Forest Department pine sleepers for railways have been imported from Europe. That shows that the drain upon the soft woods of the northern hemisphere is at the present moment something prodigious. I apprehend that cannot last, that there must be a general decrease in the supply of the soft woods, and I think that it is very likely that it would be to the advantage of a country like England which is capable of growing wood, but where at present the marketable value of wood is, I am afraid, very small.

603. Would you be prepared now to state to the Committee what you would yourself suggest in order to remove that state of affairs, or if the Committee were to ask leave to sit during the next Session would you prefer to wait till then to give us your views in any further detail as to what plan it would be advisable to adopt in this country?—For my part I do not profess to have sufficient practical acquaintance with the details of the subject to be willing to undertake to elaborate a scheme; but the Committee has been so well supplied with technical advice from the evidence they have heard from Dr. Cleghorn and Colonel Pearson that I should only be too glad in any way I could to support their suggestions. But what strikes me is that the reasonable way to proceed, if it could be done, is to make the demand for India a kind of nucleus of a school, because that is a constant quantity; it must go on. We are practically going to undertake in this country the education of a number of foresters for India, and it appears to me to be a pity that where you have an inevitable centre of forest education you should not utilise it in the second place for the education of such gentlemen as wish to undertake colonial service; and thirdly, for the instruction of land agents and persons competent to give advice as to our own woods.

604. You think it would be regrettable if arrangements were made for the training of Indian officials which did not admit of other students obtaining access to the same school?—It appears to me that it would be little short of monstrous. I can quite understand that upon administrative grounds what the Indian Government does is like the operations of a foreign country; the Government of India will educate those people at its own cost, and in a manner perfectly distinct from anything which the Imperial Government does; but that appears to be the only difficulty of a substantial character. I cannot conceive that any difficulty of administration could not be overcome, and that the appliances required for one thing would not be extended to the other.

605. It would probably be of advantage to the Indian Government that the schools should be opened to other students, it would diminish the expense for instance?—Certainly, one would hope that they would have professors really competent to teach the most accurate kind of knowledge, and it would increase the interest of the professors to have a large class, rather than to be entrusted with the care of only a few men.

606. The fees imposed in the Cooper's Hill School appear to be 180 £. a year, that might be quite reasonable under the conditions of the

Chairman—continued.

Indian forest service, but would you not consider it to be upon too high a scale for a general forest school?—It strikes me as rather a high rate of expenditure; it amounts practically to the cost of a university education. There are many men who go to Oxford and Cambridge who do not spend more than that sum; that of course fixes it as an education of a costly kind.

607. That has reference mainly to the officials of the higher grade, because the lower class officials for the India forest department are being trained in India at Dehra Dun; but would it not be desirable to combine with the education of forest officials of the higher grade, also that of wood Reeves and other less highly trained officials, who might also obtain to a considerable extent the same instruction, though not carried perhaps to so high a pitch?—I think it would be very desirable indeed. My experience is that there is a class of foremen and persons of that description, persons above the rank of labourers perhaps, not such important people as bailiffs, but still persons of intelligence, who might be exceedingly useful in the management of woods. I know that is our experience at Kew; and that it is very difficult to get persons who really know how to treat a tree, as a matter of arboriculture, so as to exhibit the tree at its best. I was very much struck in reading over the reports from the Cape, that Count Vasselot de Regné was asked among other duties to treat the public avenue in Cape Town, and he really wrote a most instructive account of it; he showed how badly the avenue had been planted, and then how the defects it exhibited in maturity were due to causes which might have been foreseen, and which would have been remediable when the trees were young. Then he stated the measures he would take for treating those trees. His letter was written with all the vivacity natural to Frenchman; and he finally drew a parallel between the treatment of old trees and such an art as that of dentistry. He said it proceeded upon regular principles which could be easily understood; and he described the kind of thing which he did to those trees. It would not be so easy with us to find anybody who could do that kind of work, that is to say, to take a tree in a more or less dilapidated condition and show what limbs should be removed so as to prevent injury from wind, in fact, to treat it generally in an intelligent manner; the art appears to me hardly to exist in England.

608. In fact, speaking generally, your view is that the Indian school might be utilised as a nucleus of a forest school, and that its being thrown open to others upon the same conditions which would make it accessible to forest students, would be of advantage to the owners of woodlands generally; is that your impression?—I think that can be hardly doubted; there might be a difficulty in mixing the two classes of students, but that there might be met by taking the lower class of men in short courses during the vacation.

Sir Edmund Lechmere.

609. Your idea would be to make the school of forestry applicable to India and the Colonies

24 July 1885.]

Mr. THISELTON DYER.

[Continued.]

Sir Edmund Lechmere—continued.

as well as to our own country?—I should like to get all the fish possible into the net; and, if we had such a school, to make it as useful as possible. I think it is surprising, considering how large is the interest of the English race in forestry, that, except in India, we have taken no kind of active interest in the subject; although we own more forests in the world than any other race, we are at present, except in the most piece-meal fashion, absolutely washing our hands of the whole business.

610. Do you consider that if we had had some schools of forestry in England we should have been able to send foresters to Cyprus, and that by this time the replanting of Cyprus, which has been begun by the Government, would have been further advanced than it has been?—It is difficult to say, because the gentlemen who have taken the work in hand have done their best.

611. In what part of the island are those operations of replanting being carried out?—Cyprus is oblong in shape; it has two parallel ranges of hills running about east and west, and there is a very marshy plain between them. I believe the remaining forests are principally in the southern range, and one cause of the unhealthiness of Cyprus is (and it is a very instructive instance of what the reckless destruction of forests may do) that by the cutting away of the woods, and the munching off of the young shoots, by the unrestricted feeding of goats upon the northern hills, every drop of water passes to the plain; the consequence is that this Messaria plain in the middle is much more swampy and malarious than it was when the island was flourishing in classical, and even in the middle, ages.

612. There is a considerable field in Cyprus for the development of tree growing, is there?—I am afraid not. A great deal can be done in preserving the remnants of forests, but to replant a mountain range which has lost its arboreal covering is an exceedingly costly thing to do, and a difficult thing to do; all that can be done is to preserve the remnants from going from bad to worse. It was calculated that by the end of the century there would not be a stick left upon the island. Our operations, however, have stopped that sort of thing; considerable portions of forest have been closed; the tapping for turpentine has been stopped; goats have been kept out, and important blocks of the forests have been permanently saved, which is a considerable gain. In the Lebanon, which is not very distant, in the Turkish dominions, the late forester, Dr. Dobbs, has paid a visit, and he says the absolute denudation of the country is going on steadily, and in the Mediterranean climate the absolute removal of the woods simply means that the country becomes incurably sterile. I have even seen it stated, quite recently, that there is every reason to suppose that the Western Sahara was once clothed with forests.

Mr. Seely.

613. Do you mean the local ground of the Sahara?—Yes; that the Western Sahara was once covered with forests, the destruction of which has produced its present sterile condition; in all Mediterranean countries the destruction

0.135.

Mr. Seely—continued.

of the vegetation produces, eventually, that state of things.

Chairman.

614. It brings the country, in fact, to the condition of a cinder?—Yes; Cyprus has been described as a burnt-out cinder, whereas we know from classical authorities that within the knowledge of a man it was covered from end to end with luxuriant forests. The West Indian islands are steadily proceeding upon the same path, and unless something is done with the help of technical assistance to check their degradation, they will become, as some of them are already, simply impossible places, where nothing can live.

Sir Edmund Lechmere.

615. You think there would be no practical difficulty in making the school available both for British and Colonial sylviculture?—I think not, because there is no great mystery in sylviculture, but what you want is some one who has a sufficient amount of practical and scientific knowledge behind him to be able to say to a Colony, You must not cut down the forest along that ridge, because, if you do, you will dry up the water there and let in the hot wind. The scientific forester sees things which other kinds of men do not see. And these matters are not scientific theories; they are based upon common sense, and consequently can be pointed out and explained in such a way to the colonial residents that they will agree when the thing is once explained to them. The colonists do not do these things out of innate wickedness, but because the thing has not been pointed out to them; they have often not been long-resident in the country, and they do not know its local conditions; and when they find, as they have done in Natal, that the destruction of the forest alters the physical conditions of the colony, they want to know why they have not some one to teach them; they want persons who will advise them. The Government of South Australia got their forest officer from Canada (that is an instance of the condition to which the colonists have been reduced) to show them what to do.

616. Suppose a school of forestry were established in England, what would you say would be the best locality to establish a school for sylviculture?—It is rather difficult to say.

Mr. Seely.

617. Should you say Kew?—There are some advantages at Kew; there is a great store of information there; but there is not a scrap of English woodland there.

618. It is near Windsor?—It is; but I am not sufficiently a practical forester myself to say how far the woods at Windsor would give the instruction needed. I should be rather disposed to place the school somewhere near the metropolis, because I am strongly inclined to think that the education of forest students cannot be completely conducted in this country; it seems to me that the forests, especially in France, are so extremely instructive that we shall always be obliged to send the students over there for a country excursion for a few weeks; even with my own amateur knowledge I could see in the

F 3

Vosges

24 July 1885.]

Mr. THISELTON DYER.

[Continued.]

Mr. Seely—continued.

Vosges that a week spent there was worth a month of reading about it.

619. Have you any collections at Kew?—We have an enormous collection of woods and forest products at Kew. I have taken considerable trouble, being interested in the matter, to ascertain, with Colonel Pearson's help, and other people's help, what on the Continent they do with the wood. I have been very much struck with the number of applications of wood abroad, to which we have nothing analogous in this country. For instance, as Dr. Cleghorn was reminding me, all the toys of this country, which represent a very large industry, are imported from Germany, and are all made out of what we may call the waste of the forests. Colonel Pearson got me for the Kew Museum a series, from the different centres in France, of objects made in wood of different kinds. The multiplicity of these objects, and, therefore, the amount of economic application of timber which they represent is quite remarkable. They are all displayed in the Kew Museum. I was very much struck with the fact that in this country there is hardly any demand for such small wood at all; the only instance I have come across at all, and I never lose an opportunity of informing myself on these points, is the manufacture of bobbins; those are made out of ash and birchwood in a very ingenious way.

Colonel King-Harman.

620. They take every hard wood for the purpose except oak?—A late Member of Parliament wrote to me upon so small a matter as skewers for butchers' meat; he was a large private owner of woodlands; those skewers were originally made of spindle wood, but any kind of wood is now used for the purpose. Some one was anxious to make a contract with him for the wood. I had no idea that any special wood was used for the purpose. Then, gunpowder charcoal is made of the *rhamnus Frangula*, but I was surprised to find that nearly all that was imported from Germany.

Sir Edmund Lechmere.

621. What is the name of that tree in English?—The alder buckthorn.

Colonel King-Harman.

622. They call it dogwood in the trade.—Yes; but what is used is not of English growth.

623. They make gunpowder a good deal from the lime, I think?—I did not know, but they use hornbeam especially in Switzerland.

624. With regard to these toys, you do not attach the prices of labour as well as exhibiting the articles themselves, perhaps?—No, I was merely struck with the way in which the wood is used up. No doubt economic considerations would be involved in the subject. I daresay you know that the mode of manufacture is a most beautiful example of the economy of labour. We have the whole thing shown in the Kew Museum; the animals are not carved individually, they are turned in a large disc. The section of the disc is the silhouette of the animal, so that when the

Colonel King-Harman—continued.

disc is turned it only requires to be sliced up, and every slice is an animal, even the tails are turned in the piece in the same way.

625. You have not got a man out in the West Indies from Kew, have you?—There is a gentleman in Trinidad; the principal man in the West Indies, upon the botanical side, is Mr. Morris, of Jamaica; but what we thought was that some one with a technical knowledge of forestry was required.

626. These gentlemen only confine their attention to botanical enterprise?—Yes; Mr. Morris has written a very good memorandum upon the forest requirements of Jamaica. But the state of things that arises is this: they will not believe a botanist. The Surveyor General is always anxious to make as much money as he can out of the sale of Crown lands, continuing the course usually followed in the colonies, whereas Mr. Morris wishes to restrain the sale. You want an external person, perfectly independent and having nothing but forest interests at heart, to judge between the local officials.

627. Which of the West India Islands did you refer to when you said there were some which had become perfectly useless?—I could not say offhand, but some of the islands have suffered very much from the loss of the wood.

628. How do you account for an island like Barbadoes, where the wood has been nearly all cut, but which produces very largely?—The whole of Barbadoes is cultivated; as long as you keep the soil cultivated it is well known that soil that is tilled is much more hygroscopic. I was rather speaking of the condition when the soil is allowed, when the vegetation is gone, to become baked; then it gets case-hardened, the rain no longer penetrates, and it goes from bad to worse; but I should apprehend that in Barbadoes no great harm would arise as long as the cultivation is kept up. Moreover, I believe, in Barbadoes there is no great elevation anywhere; it is all low-lying land, so that there would be no washing.

Dr. Lyons.

629. Do not you think it very desirable that there should be a class of foresters, highly instructed, be they many or few, trained in a college in this country, whether it be the one you have last referred to or any separate one; is not there an ample field, both at home and in the colonies, for employment for some men, at all events, of very superior education as foresters?—I should think so. With regard for example to a matter in which I think you yourself are very much interested, namely, the development of forestry in Ireland; that would certainly require for its inception forest officials of a superior grade.

630. I mean with regard to the general question of forestry in those countries. Supposing it should be hereafter the intention of the Government to adopt a system of extending the forests in this country; is not the laying out of a forest, as to the site on which it should be placed, the best mode of planting, and all that, a matter which requires a very superior class of education?—It seems to me that the whole thing depends upon

24 July 1885.]

Mr. THISELTON DYER.

[Continued.]

Dr. Lyons—continued.

upon your having a competent man to direct it; if it is not done properly at the start, of course it never can possibly be successful.

631. It is not a thing which could be safely entrusted to persons who are merely educated as solicitors in this country?—That is exactly the allacy that Mons. Broillard attacks. Every one thinks that forestry matters can be managed by the light of nature, whereas to get any successful results they require a very considerable amount of technical skill.

632. There is no doubt that anybody desirous of attaining a high class of technical education should also have an opportunity of instruction in

Dr. Lyons—continued.

practical forestry?—Yes, because you require continuous practical attention in forestry, and the minor persons are required to conduct and superintend the detailed operations upon which the continued success of the forest depends.

633. You have so fully studied the question of French forestry that I daresay you are aware of the important questions which arose with regard to the cutting of great forests upon the German border, which were for commercial purposes intended to be sacrificed, but the Minister of War stepped in and prevented the cutting down of those forests for strategic reasons; are you aware of those facts?—No.

Mr. JULIAN C. ROGERS, called in; and Examined.

Dr. Lyons.

634. You are Secretary to The Surveyors' Institution, I believe?—I am.

635. And you have given a very considerable amount of attention to the question of colonial timber, have you not?—The question has come under my notice from time to time, and at one time I devoted a considerable amount of time to it; the result, I think, is before the Committee.

636. This Report, which is entitled "Colonial Timber: An Analysis of Returns in reply to queries relating to Colonial Timber," was prepared by you, was it not?—Yes.

637. It was presented to Parliament and published as a Parliamentary Paper in the year 1878?—It was.

638. That goes over a long range of subjects, and includes returns relating to the principal colonies; the West Indian Islands, amongst others?—It deals with the whole of the British dependencies, with the exception of India.

639. So it may be taken that we have elsewhere with regard to India the supplements with regard to the other dependencies of the Crown?—That is so; it was, in fact, the first general view of the timber question as affecting the colonies that was presented. At another time, I shall be happy to state how that publication arose.

640. Did you hear the evidence given before the Committee to-day in reference to the institution of a forest school?—I did, some of it.

641. Do you concur in that evidence?—I concur entirely in the general advisability of instituting a forest school.

642. And you have formed some opinions, I believe, as to the sources whence pupils would be drawn to such a school; do you think it is likely there would be a considerable accession of pupils to such a school if opened on suitable terms and in some central place in England?—I think, perhaps, the best answer to that question is the number of land agency candidates whom we get in connection with our corporation examinations. Our examinations are held every year under three heads, chiefly land agency, chiefly

0.135.

Dr. Lyons—continued.

valuation, and chiefly building; the number of land agency candidates we get is on the average from 15 to 18 a year, and the number is growing considerably. Examinations have only been instituted under the charter during the last five years; the number of candidates is increasing almost every year, and I apprehend that in time they will amount to a very considerable number. One of the subjects to which we attach great importance is the subject of forestry, upon which we have not only a written examination but also a practical examination in the field; it is a subject which we mark very high among our subjects of examination, and it is one to which we desire to attach more and more importance as our system develops. I think in all probability a very large accession of numbers might be calculated upon from the land agency class, who are, after all, the class in this country the most interested in the question of forestry.

643. Could you give the Committee a rough idea of the number you would expect?—It would depend very much upon the nature of the system of instruction. If it were such a system of instruction as would involve a prolonged residence, say, a year or two, it would have a tendency to seriously diminish the number of candidates; but if it were such a system as involved a residence of not more than two or three months, terminating with an examination, I think a large number of land agency candidates would avail themselves of it.

644. You think much public advantage would be likely to accrue from the dissemination of a more accurate and trained knowledge of forestry amongst this class of persons you refer to, operating each in his own district of country?—I think a large amount of good would result. I am not of the opinion that there is much ignorance amongst land agents with regard to forestry; but I am of opinion that what knowledge there is requires gathering up and systematising, and I think that would be done very well by a school of forestry.

645. Is it consistent with your knowledge that the desire to see forestry more widely extended throughout the country is growing very considerably

F 4

24 July 1885.]

Mr. ROGERS.

[Continued.]

Dr. Lyons—continued.

siderably amongst this class of persons, and amongst proprietors and others interested?—I think the proprietors are coming to see the very great importance of forestry, and I certainly think that land agents are turning their attention more and more to the acquiring of a scientific knowledge of the subject of forestry. We have the best possible test of the state of feeling upon the subject in our examinations, and in the papers which are read before the Institution upon subjects connected with forestry.

Chairman.

646. I understand that the opinions you have expressed as to the desirability of instituting

Chairman—continued.

a school of forestry have reference to the requirements of this country as well as to the requirements of India?—I am speaking mainly with regard to this country, but I believe it would be a very valuable source from which foresters might be drawn to fill appointments in the colonies, and what the state of things is in the colonies from the want of scientific forestry is revealed in the report which is before you.

647. Will you hand in that Return?—I will hand it in. I will also hand in copies of our examination rules, and copies of the papers which are set on forestry and allied subjects in connection with the institution.

A P P E N D I X.

PAPER handed in by Mr. Pedder, 21 July 1885.

REPORT on a Visit to the ENGLISH and SCOTCH FORESTS by the Professors and Students from Nancy Forest School. By M. Boppe, Inspector of French Forests.

THE total area of Scotland is about 20,000,000 acres, hardly one quarter of which may be reckoned as arable, forest, or pasture land, the remainder being occupied by the lakes, rivers, peat-mosses, moorlands, bare rocks, and mountains. It is surprising, then, to find that against such a vast area of uncultivated ground only 734,490 acres, according to the official returns of 1872, are classed as woodlands.

There is every reason to suppose that, at a remote period, both the Highlands and Lowlands of Scotland were covered by dense forests, which were successfully destroyed by the fire and steel of conquerors and during the anarchy existing under the old feudal system, as well as by the fearful storms which at almost regular intervals sweep over certain districts. So complete, indeed, was this devastation, that, in 1707, all that remained of the grand old Caledonian forests were a few shreds, and those in a most deplorable condition.

From the union of the two kingdoms dates a period of political calm, during which, time and the marvellous timber-producing properties of the soil and climate would have done much to repair the ruin, had not the sheep, arch-enemy of all forest vegetation, been allowed to retain his footing in the forests.

The noblemen and great landed proprietors of Scotland at last felt the necessity of doing something to restore the parks and woodlands in the immediate vicinity of their mansions, and by the introduction of plantations to vary the sombre monotony of the boundless heather. It was also necessary on these bare moors, where grazing and shooting form the main sources of revenue, to furnish shelter for the cattle, sheep, and deer. Their example was soon followed by the smaller proprietors, and, under the wise patronage of the "Select Society" of Edinburgh, founded in 1754, the area of forest land augmented rapidly, so that in 1812 Scotland possessed, besides 500,000 acres of natural forest, about 400,000 acres of plantations.

The year 1815 marks a pause in the work of replanting which had been so vigorously begun. We do not pretend to enter here into the various causes which led to this economical phenomenon, but it is certain that the laws of 1636, on the constitution of landed properties in Scotland, exercised a baneful influence on the rational cultivation of the soil. The Scottish Parliament in vain sought to counteract the Draconian regulations of these laws, the principal effect of which was to cause the proprietors to look on themselves as only life tenants of the entailed estates, and consequently to take but a very slight interest in the improvement of the soil and the augmentation of its pecuniary value.

From the moment the planting ceased the area of woodland diminished, and necessarily so, for in any forest where sheep have free entrance the removal of a tree, whether by the axe of the woodcutter or by the violence of the wind, causes an empty space which can only be refilled by resorting to artificial means. It is thus that the returns of 1872, as compared with those of 1812, show a diminution of some 200,000 acres in the area of forest land in Scotland. Whether it was a portion of the old natural forests or the newly planted ones that had disappeared during this period of 60 years, the documents extant do not show. There is, however, good reason to suppose that both suffered equally in this respect. For, on the one hand, the construction of the Highland Railway necessitated the employment of a large number of sleepers, which could be procured from the woods of from 50 to 80 years of age, along the line of route; and, on the other hand, the increased facilities of transport, and the scarcity of wood in England, gave an unexpected value to certain tracts covered with birch, and so tempted many of the proprietors to cut down the old forests composed of this species.

In 1870 the work of replanting seems to have recommenced with increased ardour, and on all sides may be seen young plantations vigorously striving to fill up the gap which separates them from those of half a century's standing.

Such, in a few words, is a brief outline of the history of the forests which we have had the good fortune to visit, under the guidance of our excellent friend, Colonel Pearson. Thanks to the kind forethought of the authorities at the India Office, and to the hearty

welcome which we everywhere received from the great landowners and their agents, our flying visit was accomplished in a most agreeable and instructive manner. We eagerly seize this opportunity of offering to all concerned with it our sincere and hearty thanks. We would fain also express to the eminent personages who did us the honour of receiving us so graciously, that we accepted their kind marks of attention as being addressed, not only to ourselves, but also to the French Government and the Forest School at Nancy, which year by year, since 1868, has offered to the English students, without any distinction of nationality, the advantages of a forest education.

Before proceeding to a description of our tour, it will perhaps render the narrative more intelligible if we give a brief sketch of the country we visited, its general aspect, and natural resources.

From a forest point of view, Scotland may be divided into two distinct regions, by an imaginary line drawn from Perth, on the Firth of Tay, to Greenock, on the estuary of the Clyde. To the south of this line we find the Lowlands, a country which agriculture and manufactures have combined to render one of the richest in the world. The economic situation of this wealthy district is as prosperous as possible, and the thoroughly developed system of high farming which is there employed leaves but little room for forest cultivation. The Lowlands are bounded on the south by the Cheviot Hills, which afford excellent sheep-walks. To the north of this line lie the Highlands, intersected in all directions by the far-stretching chain of the Grampians, whose rugged nature gives to the country an aspect not unlike that of the western coast of the Scandinavian peninsula. One would imagine that at some earlier geological period immense polar glaciers, flowing over the solidified North Sea, traversed the whole of the north of Scotland, polishing on their way the mountain sides, excavating the lake beds, and breaking off abruptly the cliffs surrounding the coast. The culture of cereals is here confined to a few favoured localities, situated near the mouths of the rivers or on the low-lying ground bordering the sea, where the glacial deposits constitute an excellent soil. The rest of the country is wholly occupied by water and heather, and thus out of the 13,000,000 acres which this region comprises, only 1,600,000 (or less than one-eighth) are classed as arable, forest, and pasture lands. If out of the remaining 11,000,000 acres of unproductive land we allow a half for the lakes, bare ridges, and sterile mountain tops, there will still remain 5,000,000 acres capable of furnishing valuable timber forests. Here then is a problem for British economists, and a vast field for enterprise and capital.

Highland Forests.

In the Highlands, to which we principally directed our attention, the districts around Perth, Elgin, and Inverness are those in which the most extensive forests are to be found. These three counties together contain about 247,700 acres of forest, and being well served by the Highland Railway system, these are easier to visit than any of the other Scotch forests. Starting from Perth, we made our way across the Highlands, visiting *en route* the towns of Dunkeld, Blair Athole, Aviemore, Grantown, Forres, Inverness, and Beaulieu. We were thus enabled not only to make an inspection of some of the finest forests in Scotland, but at the same time to obtain a fair idea of the general aspect of the country. The punctuality and precision, so thoroughly characteristic of Englishmen, with which all the details of our journey were arranged by Colonel Pearson, added to the hearty reception we met with at every turn, enabled us, in the short time at our disposal, to thoroughly inspect more than 100,000 acres of every description of forest, under ever-varying physical and geological conditions. Everywhere, both at a few feet above the sea level and on the sides of mountains at a height of 2,500 feet, in the sands of Forres, and in the schists, red sandstones, granites, and gneiss of the interior, we were struck by the wonderful aptitude of the soil to forest vegetation, favoured as it is by a regular climate and the constant humidity of the atmosphere.

In the low-lying districts, at an altitude of from 250 to 300 feet, we found growing, both singly along the roadside and collectively in the forests, magnificent specimens of oak, maple, elm, ash, beech, and lime, which, by the vigour of their growth and the rich colouring of their foliage, bore testimony to the favourable conditions of soil and climate under which they grew. We were struck with admiration in beholding the colossal trees of every description forming the avenues at Scone, Dunkeld, Blair Athole, and Darnaway. It was near the first of these places that the venerable father of Scotch forestry, Mr. McCorquodale, showed us, with legitimate pride, a small oak forest of about 400 acres, which, 60 years before, he had himself assisted to plant. In this forest the trees were standing about 24 to 30 feet apart, and their diameters measured from 12 to 18 inches, whilst their magnificent tops formed a perfect canopy of leaves above the bright rhododendrons, in which colonies of young pheasants found a home. In the spring time this ought indeed to be a fairy-like spot. But, independently of this undergrowth, which is, after all, only suitable for the wealthy few, we cannot help thinking that a more careful study of this superb forest would go far towards clearing up some of the doubts which have always surrounded the difficult question of the cultivation of forests composed solely of oak.

The mountain vegetation commences at about 400 feet above the level of the sea; beyond this we find ourselves in the domains of the Scotch fir, the larch, and the birch.

In selecting the Scotch fir as the tree to be cultivated before all others in these regions, the promoters of forest plantation during the latter half of the past century showed no mean proof of their thorough appreciation of the natural requirements of the soil and climate of the Highlands, for not only have they ensured the success of their operations, but they have traced out the best line of action for their successors.

Equally

Equally fortunate were they in their endeavour to introduce the larch into Scotland; transported from the ice-bound summits of the Alps to a country where the climate is tempered by the softening influence of the Gulf Stream, this tree does not appear to have suffered to any material extent by so sudden a change of latitude.

When, in 1737, the Duke of Athole brought home amongst his baggage, as a kind of remembrance of his travels in the Tyrol, the seeds which were sown in his park, and from which sprung the first larches in Scotland, he rendered a most valuable service to his country.

From a forest point of view, the results obtained by the cultivation of these two species (Scotch fir and larch) are truly marvellous. Anyone who has seen the beautiful larch forests planted in 1815 on the banks of Loch Ortie and the vast stretches of Scotch fir covering the flanks of the Bruarwood mountain, cannot fail to admit that the question of the replanting of the Scotch Highlands is practically answered.

The absence of the beech from all the forests of any standing is easily accounted for by the fact that it is only quite recently that the timber of this tree has become of any value for industrial purposes. For many cultural reasons, however, the beech is a tree of the highest importance, and we should strongly recommend its introduction into all future plantations, and it is, moreover, as much indigenous as the Scotch fir and birch. In many cases even it might with great advantage be substituted for this latter, or, better still, mixed with it.

Considering, too, the wonderful success that has attended the introduction of the larch, we think that a similar attempt might be made to acclimatise the *Pinus montana* in the peat mosses. These immense sponges, so to speak, which cover sometimes entire districts, discharge their dark-coloured waters into all the streams, and give to the lakes and rivers of Scotland that sombre tint which is so peculiar to them. The fuel which they afford is of very second-rate quality, and supposing that half the surface was converted into plantations, there would still be enough peat left to keep going all the whiskey stills on the country side.

As foresters of the Continental school, accustomed to live among forests regularly managed, and having for their sole object the production of timber, we had no little difficulty in understanding the widely different motives which actuate forest cultivation in this country. Everywhere we found the forests fenced in on all sides with walls and hedges; and, as a matter of fact, the forester or agent generally carries the keys of the gates in his pocket. We learnt that these costly enclosures were erected, not for the purpose of keeping out the cattle and deer, as in the Jura, but for the purpose of keeping them in; it appeared to us like shutting up the wolf in the sheepfold.

We were also struck by the monotonous regularity in the height and age of the trees, unmistakeable sign of their artificial origin and want of methodical management. The forest, here left to its own devices, continues growing just as the hand of man has planted it; the undergrowth is constantly grazed down by the sheep and cattle, and nature, in spite of the immense resources at her disposal, is quite powerless to modify the work of the planter, or repair the errors committed by woodcutters.

When, under such circumstances, the time arrives for the trees to be cut down, or should they be uprooted by a hurricane, the forest disappears in its entirety, owing to the total want of young growth which is necessary as a link between the old forest and the new one which ought to be created. Such, at least, appears to us to be the case in all the forests that we visited in the valley of the Tay and its tributaries, and further north, near the foot of Cairngorm.

Not far from a mansion to which are attached some of the pleasantest recollections of our tour, we saw the remains of a noble forest, which some 20 years ago had been cut down and converted into railway sleepers. The sight of the huge stumps, blackened by time, with their gnarled roots twisting themselves over the ground, gave us the idea of some vast charnel house. This scene of utter ruin was indeed a sad spectacle, though the present proprietor is doing his best to again cover his estate with timber; with a better system he might have been spared both time and expense. It is easy in Scotland to perpetuate a forest by natural means, and of this a practical proof was given us in two forests which we visited; the one near Grantown, in Strathspey, the other at Beaulieu. In these the results obtained under the skilful and intelligent direction of the gentlemen who manage these forests for their employers form a striking example of what may be done in the way of reproducing forests by natural means. In fact, nothing had been neglected which even the most critical forester could desire; the gradation of age was here complete, and the reservation of specially vigorous trees, of known pedigree, duly carried out.

The *modus operandi* here pursued consists simply in the exclusion of the sheep and deer, in the judicious thinning out of the growing crop, and in the removal of the mature seed-bearing trees, by successive fellings, as the young forest grows up and acquires more vigour.

Nevertheless, we would not have it be supposed that the sheep need be absolutely debarred from all grazing in the forest; it is only in those portions where the undergrowth is very young that the damage caused is irreparable. We feel convinced that if, every year, certain portions of the forest best capable of supporting it were marked out for grazing, the quality of the pasturage would be greatly improved, and the heather would quickly disappear under the cover.

It is an established fact, beyond all contradiction, that on any soil, whatever its geological

geological origin, a complete covering of forest vegetation will kill the heather as soon as the trees reach the age of between 30 and 40 years. Suppose then that 120 yards be the term fixed for the existence of the trees in any portion of the forest, and that the trees of 100 years of age and over are reserved, there would still be one half of the forest always open to the sheep, and the other closed. But, at the same time, it is certain that this open half, owing to its superior quality, will furnish pasturage for at least twice as many head of cattle or sheep as the same quantity of moorland.

Although, under ordinary conditions, the regeneration of a forest will be sufficiently assured by the exercise of a discreet control over the grazing, something more than this must be done if it is desired to turn the land to the best possible account. It is therefore a matter of regret that nothing has yet been done to place forest management in Scotland on a sound economic basis.

The productive powers of the soil and of the climate have been made use of by able and intelligent planters, who have thereby enabled nature herself to accumulate a considerable store of timber; but all this wealth is exposed to the carelessness of some and to the ignorance of others, until the hand of a forester manages it properly and places it on the only sound economic principle of all agricultural and forest property, a constant annual revenue and a constant improvement in production.

It would certainly not be fair to hold the Scotch foresters responsible for the present regrettable state of affairs, for, though they have for the most part admitted the inefficiency of the present system, they are powerless to effect any improvement so long as the landowners and general public have not learnt to appreciate the manifold advantages to be derived from a regular and methodical management. They have to struggle against many adverse interests and hindrances, such as grazing and shooting interests, questions of routine, pecuniary exigencies, and the fancies of sportsmen from all parts of the world.*

In wishing Scotland, then, a hearty farewell, we venture to predict for her forests a great and prosperous future. It does not need that one should be a very great prophet to predict this for a country where the oak and beech, the Scotch fir and larch, flourish with equal vigour, and where the *Abies Douglasii*, *Abies nobilis*, and *Abies Menziesii*, the *Sequoia*, and the cedar, form mighty trees, in company with *Aruncaria* and various exotic shrubs, which only languish miserably under the climate of Paris.

Before leaving this country, however, we would fain add a word of advice, for the moment appears to us a propitious one for deciding on the future welfare of the forests, which, owing to the rapidly increasing value of timber, runs great risk of being compromised. Ordinary fir timber now fetches 8d. per cubic foot, larch is worth nearly double that amount. We ourselves visited a forest of Scotch fir which, at this rate, would be worth 120 l. an acre, and another of larch worth considerably more; whilst a third forest of 1,600 acres, composed of Scotch fir, was purchased a few years ago for 52,000 l., or only about 30 l. an acre. The plantations on the Culbin Sands, near Forres, would readily find buyers at 50 l. an acre at the age of 45 to 50 years. The very day we were at Grantown, the agent for the Strathspey forests concluded a bargain to furnish birchwood to the amount of 2,000 l.

All these figures are fraught with extreme significance for the future, and the large forest owners of Scotland will do well to pause before allowing their forests to be "over-worked." We would recall to their recollection the old fable of the goose that laid the golden eggs.

No doubt, people are often frightened by the long names and big words they find in treatises on scientific forest management, but they may very well neglect the text if only they will adopt some of the principles which they contain. Let the owner of a forest, after having made a careful and detailed inspection of it, divide it off into blocks or compartments so arranged that they should be uniform as regards conditions of soil and of planting, and then proceed to count and measure all the trees of 3 feet girth and upwards, classing them in categories according to their diameter. He should then open a debit and credit account for each compartment, placing on the debit side the actual volume of the standing crop, and on the credit side the volume of timber removed at each successive felling. This register should always be consulted before undertaking any forest operation, and when the annual fellings fall due, it will show which compartments can best support the withdrawal of timber, and which require to be left untouched. Moreover, the balance sheet will render an exact account, favourable or otherwise, of the condition of the forest.

Ten years of such systematic treatment would form in itself the basis of a regular forest-working plan, and the doctor's prescription would no longer frighten the patient with its long words.

Our programme, however, was not yet complete, and fresh excursions awaited us in England. It took us only four days to reach Windsor Forest from Inverness, passing by the Caledonian Canal, and halting at Oban (from whence we visited Staffa and Iona) and Edinburgh, whence we took the train to London.

Even

* A deer run, over unproductive land, has just been let to an American for nine years, at the fabulous rent of 10,000 l. per annum.

Even with a four-in-hand and the best of drivers, it would be impossible to see Windsor Forest in such a short time as we had at our disposal.

The history of that noble park has been published in a splendid volume by the late Surveyor, but the history of Windsor is, so to say, a repetition of the history of England herself; if we follow all the phases in the development of this park, where, since the time of William the Conqueror, each sovereign in turn has given his name to some remarkable tree, Windsor Park may with justice be called the Westminster Abbey of British monumental trees; its history is one which belongs as much to archaeology as it does to sylviculture, while in it the beautiful deer are almost as numerous as the trees themselves.

Nevertheless, the practical forester may rest assured that, although the first place is here given to art and beauty, he will still be able to find much to interest and instruct him. Windsor Park is indeed one of the most magnificent fields for the study of forest botany that even the wildest imagination could conjure up. Here may be seen, growing singly or collectively in clumps, specimens of all the finest trees, native or exotic, which exist in Great Britain, and, since care has been taken to keep an exact record of the age and origin of each plantation, the forester would be enabled to follow out in detail studies of the highest interest and importance regarding the growth of the principal forest species. It would be more difficult to do the same with regard to their longevity; for one is led to think, in looking at some of them, that, in this hallowed ground, trees never die of old age. One sees in these relics of the past that religious respect for things so characteristic of Englishmen, when even the most violent revolutions could pass over the country and yet leave these monuments and these trees intact.

The Surveyor of Windsor Park, who is, by turn, a forest officer, an organizer of shooting parties, a director of the royal workshops, and conservator of a museum of antiquities, can, in consequence, have but little time to devote himself to sylviculture, unless it be to prepare the iron armour, intended to preserve the veterans of the forest in their struggle against the elements, or to prop up with crutches some invalid deprived of a limb by a recent gale.

Having come all the way from Scotland to Windsor, we were not to be alarmed by the journey from there to the New Forest, for a few hours sufficed to carry us to Southampton.

As old as Windsor Park itself, the New Forest has not had the good fortune to be the dependance of a royal residence. The barrenness and poverty of the soil has sufficed to preserve it from being plundered even at an epoch when land was valued more for its extent than its fertility. But, on the other hand, this very fact attracted a poor and necessitous population to settle in and around the forest, who during long ages, have been accustomed to derive a precarious existence from it, and by careless abuses have threatened it with certain ruin. For many centuries the New Forest has thus been a prey to commoners, who use up its resources without either method or control. One may see there the steady onward progress which is made by the heather; and, although it is not perhaps so quick under the feet of the almost wild ponies and cattle as under those of the sheep, yet it is none the less sure.

The sole remedy for this state of things was to restrict the commoners to certain defined localities, and that could only be done by sacrificing a portion of the forest to save the rest. This is, in fact, what was done about 20 years ago; but the sacrifice has indeed been a heavy one, for the reservation of some 14,000 acres has cost the abandonment of 49,000 more. The part which has been freed, however, is sufficiently extensive to constitute some day a respectable forest, whilst the part given up is hurrying to its destruction in a manner deplorable to behold, and before very long there will be nothing left but a worthless barren heath.

It is not, however, in 20 years that a forest so badly used as the New Forest can be restored. The first thing to be done was to put the soil in good order, and then to plant some of the vast stretches of heather with firs. Of late years the forest officers have sought, by excluding the cattle, to bring about the natural reproduction of some portions hitherto abandoned to pasturage. But with whatever care these operations may be carried out, at least 50 years must elapse before they can resort to systematic fellings, with a view to furnishing a regular revenue.

At present, contiguous portions of the forest often present the most curious contrasts. On one hand we see young firs and oaks growing side by side, in another place a forest of pure oak, languishing among chestnuts, and in a third plantations of fir and beech, indicating by the vigour of their vegetation, and their healthy appearance, that it is on them that the future of the forest ought to depend. Further on, there is a valley filled with aged beeches, whose weird forms gave an almost supernatural aspect to the spot; we almost expected to see the ghost of William Rufus pursuing that of Walter Tyrrell through the haunted forest.

Without contesting the marvellous beauty of some parts of the New Forest, so dear to artists and lovers of nature, we are bound to say that before long it will not be here that a professor of sylviculture, desirous of teaching his science, will choose to pitch his tent.

On our return to Lyndhurst, after the excursion in the New Forest, there remained but three days at our disposal before our duties necessitated our return to France. These were employed in visiting the Forest of Dean.

The present Forest of Dean occupies the site of the old forest of the same name, which formerly covered the whole of the plateau between the estuary of the Severn and the valley of the Wye. ("Dean," "dén," signifies "forest" in the old Celtic language). The old forest has disappeared within the last few centuries, owing perhaps to the demand for charcoal and mine-props for the local industries; if, however, we were not afraid of being accused of being prejudiced, we might say that unrestricted pasturage may have had something to do with the disappearance. It is on these ruins that the new Forest of Dean has been created; in less than a century more than 16,000 acres of the original 22,000 have been replanted. The older plantations are generally of pure oak; the beeches, chestnuts, and birches form but a small percentage of the trees. Scotch fir, spruce fir, and larch are generally only found in the plantations made during the last 30 years or in bad peaty portions. The state of vegetation is generally good, varying, however, with the quality of the soil, but indicating in every point the artificial nature of the forest.

We may take this opportunity of remarking that a plantation of "broad-leaved" trees (oak, beech, &c.) takes a much longer time to establish itself than one of "needle-leaved" trees (conifers Scotch fir, larch, &c.). In Scotland we saw the most magnificent plantations of larch and fir, whilst in the Forest of Dean the plantations of oak were always more or less dwarfed in appearance. The cause of this is, that oaks furnish the soil with much less vegetable manure than the coniferous trees; and again, in an oak plantation, there is a marked absence of undershrubs and spontaneous ground vegetation, which, by their organic remains, tend to increase and improve the surface soil. It is rare also that a plantation of oaks, on a soil which has been long unoccupied by forest vegetation and is but moderate in quality, succeeds well during the first generation; it is only at the second generation that the trees acquire their normal development.

At present, while the trees are yet in their youth, the only cultural operations that can be undertaken are the periodical "thinnings," and these are here conducted with great skill. There is, no doubt, however, a great future in store for the Forest of Dean, thanks to the workmanlike manner in which it is managed, and to the laws regulating the pasturage, which date back to the time of Charles I.

We were not able to suppress a certain vague feeling of sadness in wandering through these endless plantations, rendered so dreary and monotonous by the total absence of that undergrowth which seems to inspire the woods with freshness and life; and it was with a sense of great relief that we emerged from them, and entered into a well-managed forest composed of standard oaks surmounting coppice wood.

This forest, comprising about 3,400 acres, was formerly the property of Lord Gage, and was purchased by the Crown with a view to presenting it to the Duke of Wellington. It is composed of pure oak, and for more than 100 years the coppice has been cut every 18 years. We might add that the reserved trees form the staple element in this forest, for the coppice forms but a small proportion of the standing crop. These reserves, varying in age from 20 to 100 years, are in an excellent state of vegetation, and number about 80 trees to the acre. The largest trees are about four or five feet in girth, and from 25 to 35 feet in height of stem. It would be a great pity to cut them until they have attained at least double their present age. This forest would form an excellent field for the study of the treatment of standard oaks.

In such a forest, where the soil is so exceptionally fertile, it might be possible to find a solution to the oft-discussed problem of obtaining the maximum production in quality and quantity from a forest of oak. This was, at least, the impression we carried away with us as we turned our faces homewards.

Forest School in Great Britain.

We had barely sufficient time, on our arrival in London, to pay our respects to the authorities at the India Office, when we were asked by Sir Louis Mallet to place on record the observations which we have now the honour to submit, and to state whether, in our opinion, the immediate foundation of a Forest School in Great Britain is possible. In order to reply to this question, it was necessary for us, even at the risk of our narrative being found tedious, to enter into a somewhat detailed account of the Scotch and English forests.

Were it only for the purpose of replanting the five or six millions of moor and waste land which cover one-third of the Highlands, we should consider there was a sufficient reason for the formation of such a school. The question, however, must be studied on broader grounds.

Considering the present depressed state of agriculture all over Europe, it becomes more and more necessary to endeavour to draw the greatest possible advantage from the land, and, by properly adapting a different vegetation to different soils, to seek to obtain, through the medium of the enormous capital which the present generation can command, the maximum production from a minimum area. It is thus that the forests are called upon to play an important part in the immediate future, and the farmer will henceforth find a powerful auxiliary in the forester.

After making every allowance for the great fertility of the soil in Great Britain, we feel certain that in many districts more than one of the forests which were cleared some time back would now be jealously preserved by the same proprietors who formerly cut them down to satisfy their pressing wants.

It must also be borne in mind that the British Empire is not confined to Great Britain and Ireland, and that, by reason of her immense possessions, England is perhaps of all nations in the world the one most richly endowed with valuable timber forests. It is by

by hundreds of millions of acres that we may reckon the forests of Canada, India, and Australia, New Zealand and Cape Colony, not to speak of those in the West Indies and Borneo.* All these natural sources of wealth are worked by British enterprise and British capital, and, consequent on the present wonderful development of commerce throughout the globe, it is a matter of importance to every civilized nation that this vast accumulation of forest riches should not fall into the hands of ignorant persons, or be squandered away regardless of the future.

For these reasons the establishment of a Forest School in England becomes a matter of primary importance.

The science of forestry is, however, a science of observation, based upon facts which must be studied both from a practical and theoretical point of view. It is therefore absolutely necessary that a Forest School should have attached to it a forest which has for some time past been under scientific management, serving, so to speak, as a natural laboratory for experiments, and without which the best theoretical teaching in the world would be of no avail. This is especially the case in England where the young men, by reason of their national character and their mode of education, are accustomed to pay more attention to facts than to theories: here the teacher of a technical profession, resting solely on theories, would command very few disciples.

It is, therefore, a matter of regret that, among all the forests visited by us in our travels, there is not a single one suitable for the teaching of sylviculture on that broad basis so essential when the pupils are called upon to apply it in all quarters of the globe. In England, as in Scotland, all the woodlands may be arranged in two categories, the one containing plantations too young, recently created by the hand of man, the other containing plantations too old, or too much overworked, to be useful for the purpose; nowhere did we see a high timber forest formed of really mature trees.

Moreover, a plantation must always be incomplete as a field of study, and especially for persons who will generally have to deal with natural forests. Nature, ever prodigal of her bounties, if left to herself, scatters them broadcast without any regard for the particular wants and requirements of man. It is then the work of the forester to control this generous prodigality, and, by careful selection, to concentrate her fertilizing powers on such trees as are best adapted to meet the general demand. In the case of a plantation there is no need for this interference; here, natural selection, the struggle for supremacy amongst the different species, and even art herself, can play but a very insignificant part in the various phases of its existence.

In a forest, then, of this nature it would only be possible to apply a very limited number of the principles of sylviculture.

A practical Englishman will have no difficulty in understanding our meaning. It is not to be supposed, however, that the foundation of a Forest School is at present an impossibility, for, while leaving the question of time and place to be settled hereafter, it would be advisable to at once decide, in principle, on its creation; such a decision is the only mode of arriving at its foundation. It is necessary also to take measures for preparing the public mind to regard the science of sylviculture as an additional means of developing the national resources, and to take steps for the gradual creation of accessory forests.

This accessory forest must necessarily be incomplete at first, but would be perfected in time; but the essential point is that it should be placed under the absolute control of the officers of the school. This can only be done by choosing a State forest. If it should be considered desirable also, in order to render the teaching more complete, the State ought to purchase or lease in Scotland a forest suitable for the purpose.

We would also suggest the founding of professorships of "Forest Economy" at two of the great public seats of technical instruction. One of these might be instituted at Coopers Hill for England, the other at Edinburgh for Scotland.

The professors should be selected from among the young men who have received a thorough forest education on the Continent, and have had eight or ten years' practical experience in India. They should publish from time to time a series of articles in the leading agricultural and forest journals, in order to influence the landowners in favour of a systematic management of their woodlands, and to prove to them that uncontrolled pasturage is the certain destruction of forests, and that, in the long run, the timber furnished by forest land is of greater value than pasturage or game.

The establishment of a course of Sylviculture at Coopers Hill would have the great advantage of giving to the young engineers a rudimentary knowledge of a science which cannot fail to be useful to them in their after career. It would, perhaps, also be possible by this means to modify the present method of recruiting the Indian Forest Service, by offering to the students at this excellent institution a certain number of appointments in that service.

The course of instruction afforded at Coopers Hill would then comprise all the essential parts of the education of a forester, and it would only be necessary to supplement it by sending

Necessity for a Reserved Forest.

Natural Forest required.

Under control of Forest Officers.

Professors of Forest Economy.

* The total extent of the forests in the British possessions is 340,000,000 acres of timbered land. 0.135. H 3

R
JB 'MS 21
M82

sending the selected students for one year to a Continental school, where they would have the opportunity of perfecting themselves in the practical details of forest culture. After this, it would be advisable for them, accompanied by their English professor, to complete their training by making a tour of inspection in some of the mountain forests of France, Germany, and Austria. So prepared, the young men would be perfectly capable of undertaking forest work in any portion of the Indian Empire.

ommendations. In conclusion, we beg to submit the following recommendations :—

1st. That a National Forest School be founded in Great Britain.

2nd. That Professorships of Sylviculture be instituted at Coopers Hill and at Edinburgh.

Such are the conclusions at which we, in conjunction with our travelling companions, Messrs. Reuss and Bartet, have arrived, and we feel that an apology is due for their length. This is really due to the excessive courtesy of our hosts, who, jealous of the success of Jules Verne's hero, who made the tour of the world in 80 days, were determined to make us traverse, in less than three weeks, more than 300,000 acres of forest land situated in the most opposite parts of Great Britain, from Cape Duncansby to St. Catherine's Point.

7379
R E P O R T

FROM THE

SELECT COMMITTEE

ON

F O R E S T R Y ;

TOGETHER WITH THE

PROCEEDINGS OF THE COMMITTEE,

MINUTES OF EVIDENCE,

AND APPENDIX.

*Ordered, by The House of Commons, to be Printed,
24 July 1885.*

[Price 7½ d.]

287.

H.—20. 8. 88.

Under 6 oz.

7993
R E P O R T

FROM THE

SELECT COMMITTEE

ON

F O R E S T R Y ;

TOGETHER WITH THE

PROCEEDINGS OF THE COMMITTEE,

AND

M I N U T E S O F E V I D E N C E .

*Ordered, by The House of Commons, to be Printed,
18 June 1886.*

LONDON:

PRINTED BY HENRY HANSARD AND SON,
PRINTERS TO THE HOUSE OF COMMONS.

To be purchased, either directly or through any Bookseller, from any of the following Agents, viz.,
Messrs. HANSARD, 13, Great Queen-street, W.C., and 32, Abingdon-street, Westminster ;
Messrs. EYRE and SPOTTISWOODE, East Harding-street, Fleet-street, and
Sale Office, House of Lords ;
Messrs. ADAM and CHARLES BLACK, of Edinburgh ;
Messrs. ALEXANDER THOM and Co., or Messrs. HODGES, FIGGIS, and Co., of Dublin.

202.

Ordered,—[*Tuesday, 23rd March 1886*]:—THAT a Select Committee be appointed to consider whether, by the establishment of a Forest School, or otherwise, our Woodlands could be rendered more remunerative.

Ordered,—[*Wednesday, 12th May 1886*]:—THAT the Committee do consist of Eighteen Members.

Committee nominated of—

Sir John Lubbock.	Sir Edmund Lechmere.
Mr. Charles Acland.	Mr. Gillhooly.
Mr. Biddulph.	Colonel Nolan.
Sir Savile Crossley.	Mr. Northeote.
Viscount Ebrington.	Sir Herbert Maxwell.
Dr. Farquharson.	Mr. Mulholland.
Mr. Farquharson.	Mr. Mark Stewart.
Sir John Kennaway.	Mr. Seely.
Sir George Grant.	Sir Henry Meysey Thompson.

THAT Five be the Quorum of the Committee.

THAT the Committee have power to send for Persons, Papers, and Records.

Ordered,—[*Monday, 17th May 1886*]:—THAT the Committee do consist of Twenty Members.

THAT Colonel King-Harman and Mr. Sellar be added to the Committee.

Ordered,—[*Tuesday, 18th May 1886*]:—THAT the Committee do consist of Twenty-two Members.

THAT Mr. Evelyn and Mr. Albert Grey be added to the Committee.

Ordered,—[*Wednesday, 19th May 1886*]:—THAT the Minutes of Evidence taken before the Select Committee on Forestry in Session 1885 be referred to the Select Committee on Forestry.

REPORT	- - - - -	p. iii
PROCEEDINGS OF THE COMMITTEE	- - - - -	p. iv
MINUTES OF EVIDENCE	- - - - -	p. 1

R E P O R T.

THE SELECT COMMITTEE appointed to consider whether, by the establishment of a FOREST SCHOOL, or otherwise, our WOODLANDS could be rendered more remunerative ;—HAVE agreed to the following REPORT :—

YOUR Committee have taken some evidence upon the matters referred to them, but have not had sufficient time to conclude their investigation on account of the Dissolution of the present Parliament ; they have, therefore, agreed to report the Evidence already taken to the House, and to recommend that a Committee on the same subject should be appointed in the next Parliament.

18 *June* 1886.

PROCEEDINGS OF THE COMMITTEE.

Wednesday, 19th May 1886.

MEMBERS PRESENT :

Sir John Lubbock.	Mr. Biddulph.
Sir George Grant.	Mr. Farquharson.
Mr. Evelyn.	Mr. Mulholland.
Dr. Farquharson.	Sir Edmund Lechmere.
Sir Henry Meysey Thompson.	Mr. Albert Grey.

Sir JOHN KENNAWAY was chosen Chairman of the Committee, and in his absence Sir JOHN LUBBOCK was called to the Chair.

The Committee deliberated.

[Adjourned till Tuesday, 1st June, at Twelve o'clock.

Tuesday, 1st June 1886.

MEMBERS PRESENT :

Sir JOHN KENNAWAY in the Chair.

Mr. Farquharson.	Mr. Biddulph.
Sir George Grant.	Sir Edmund Lechmere.
Mr. Seely.	Sir Savile Crossley.
Sir Henry Meysey Thompson.	Mr. Gilhooly.
Dr. Farquharson.	Colonel Nolan.
Mr. Evelyn.	Viscount Ebrington.
Sir John Lubbock.	Mr. Albert Grey.
Mr. Charles Acland.	Mr. Mark Stewart.
Mr. Northcote.	

Colonel G. Pearson and Mr. J. C. Brown were examined.

[Adjourned till Friday next, at Twelve o'clock.

Friday, 4th June 1886.

MEMBERS PRESENT :

Sir JOHN KENNAWAY in the Chair.

Sir John Lubbock.	Mr. Gilhooly.
Mr. Evelyn.	Mr. Albert Grey.
Dr. Farquharson.	Mr. Charles Acland.
Mr. Seely.	Mr. Northcote.
Sir George Grant.	Mr. Mark Stewart.
Mr. Mulholland.	Colonel Nolan.
Mr. Biddulph.	Sir Edmund Lechmere.

Dr. W. Schlich, Mr. Julian Rogers, and Mr. Alexander M'Kenzie were examined.

[Adjourned till Friday, 18th June, at Half-past Three o'clock.

Friday, 18th June 1886.

MEMBERS PRESENT :

Sir John Lubbock.	Mr. Charles Acland.
Sir George Grant.	Mr. Biddulph.
Mr. Evelyn.	

In the absence of Sir JOHN KENNAWAY, Sir JOHN LUBBOCK was called to the Chair.

DRAFT REPORT, proposed by the *Chairman*, read the first time, as follows :

"Your Committee have taken some evidence upon the matters referred to them, but have not had sufficient time to conclude their investigation on account of the Dissolution of the present Parliament; they have, therefore, agreed to report the Evidence already taken to the House, and to recommend that a Committee on the same subject should be appointed in the next Parliament."

DRAFT REPORT, proposed by the *Chairman*, read a second time, and *agreed to*.

Ordered, To Report, together with the Minutes of Evidence.

EXPENSES OF WITNESSES.

NAME OF WITNESS.	Profession or Condition.	From whence Summoned.	Number of Days Absent from Home, under Orders of Committee.	Allowance during Absence from Home.	Expenses of Journey to London and back.	TOTAL Expenses allowed to Witness.
				£. s. d.	£. s. d.	£. s. d.
Colonel G. Pearson	Colonel	Kington	2	2 2 -	2 15 -	4 17 -
The Rev. J. C. Brown	Doctor of Laws	Haddington, N. B.	3	3 3 -	5 10 -	8 13 -
TOTAL				- - -	£	13 10 -

LIST OF WITNESSES.

Tuesday, 1st June 1886.

	PAGE
Colonel Pearson - - - - -	1
Rev. John Crumvie Brown, LL.D. - - - - -	14

Friday, 4th June 1886.

Mr. W. Schlich, Ph.D. - - - - -	20
Mr. Julian C. Rogers - - - - -	33
Mr. Alexander Mackenzie - - - - -	38

MINUTES OF EVIDENCE.

Tuesday, 1st June 1886.

MEMBERS PRESENT :

Mr. Charles Acland.
Mr. Biddulph.
Sir Savile Crossley.
Viscount Ebrington.
Mr. Evelyn.
Dr. Farquharson.
Mr. Gilhooly.
Sir George Grant.
Mr. Albert Grey.

Sir John Kennaway.
Sir Edmund Lechmere.
Sir John Lubbock.
Colonel Nolan.
Mr. Northcote.
Mr. Seely.
Mr. Mark Stewart.
Sir Henry Meysey Thompson.

SIR JOHN KENNAWAY, BART., IN THE CHAIR.

Colonel PEARSON, re-called ; and further Examined.

Sir John Lubbock.

1. You have paid considerable attention for many years past to the question of forestry?—Yes; I was in the Indian Forest Department from 1860 to 1872, at the end of which year I came home. Then I was appointed to superintend the pupils at the Nancy Forest School, and I was there till two years ago.

2. You were 11 years at Nancy?—Yes, I was 11 years at Nancy.

3. And you have visited some of the other forest schools, have you not?—No, I never was at any of the other forest schools; I have visited some of the German forests with the forest officers, but I never was at any of the other forest schools.

4. You were deputed by the India Office to accompany Monsieur Boppe round the English and Scotch forests?—I was; I accompanied him round the forests.

5. I would like to ask you whether you have seen any reason to modify the opinions you expressed before the Committee last year?—None whatever. I am very strongly impressed with the desirability of doing something to promote forest education in this country; or rather, to put it in the way of young men who may be desirous of obtaining it.

6. You are just as strongly of opinion as ever that a forest school in this country would be desirable?—Some forest education.

7. And that not only from the point of view of our Colonial and National forests, but also with

O.108.

Sir John Lubbock—continued.

regard to woodlands in the hands of private owners?—Yes; more especially with regard to the woodlands in the hands of private owners; the others are more or less satisfactorily provided for.

8. When you were before the Committee last year your evidence was mainly of a general character; but you were good enough to say that if the Committee were re-appointed you would make some more or less definite suggestions as to the course which should be pursued; have you thought of any definite suggestions to offer to the Committee?—I have thought over the subject since, and I am prepared to suggest, not in detail but in a general way, what I think would be best adapted for the education of young men who would be likely to have charge of our forests; more especially private forests.

9. Would you have the goodness to lay before the Committee the information you have prepared?—The persons for whom a forest education in England is required may be divided into two classes: first, those intended for India and the Colonies; second, those who will seek employment at home. The education of the former is now, as far as I am aware, provided for in a satisfactory manner at Cooper's Hill, save in one essential particular, viz., the want of a tract of forest for practical training. For the second no education has as yet been provided. They are of two classes, viz.: firstly, land agents, being young men of good position

A

1 June 1886.]

Colonel PEARSON.

[Continued.]

Sir John Lubbock—continued.

position and education managing one or more estates, including the woodlands on them, with salaries varying from 200 l. to 500 l. or 600 l. a year; secondly, wood-reeves, wood-bailiffs, woodmen, and foresters, with salaries varying from 80 l. to 120 l. a year. There is no field, however, in Great Britain (at present, at least) in which an educated forest officer, such as we find on the Continent, might gain a livelihood. The main object, then, seems to be to provide a certain amount of practical education in forestry to supplement the present generally very useful education given to the land agent class, and at the same time to teach the wood-bailiffs and foresters who are employed under their orders in our own private woodlands, not only the elements of silviculture, but also the best known methods of conducting ordinary forest work, such as planting, thinning, pruning, the management of coppice, and the best way of disposing of the crop; also, if possible, at the same time to provide a practical training station for the Cooper's Hill forest pupils. It seems to me that the essential point, to which all others are subordinate, turns on the possibility of obtaining a sufficiently large block of forest, say from 3,000 to 4,000 acres; half in leaf forest and half in conifers, in a convenient locality, as a practical training ground. This tract must be placed under a trained forest officer; and for reasons of economy it seems to me that he should be the Professor of Forestry at Cooper's Hill for the time being. Under him there must be a practical executive officer, with an ordinary woodman to do the work. If such a tract of forest could be obtained, say, in the Crown forests outside Windsor Park the other details seem to me very easy. I should think that an arrangement might be made with the Professors of Forestry and Physiological Botany at Cooper's Hill to give, at certain convenient periods, lectures in those subjects of a simple, practical, and useful character. The executive officer in charge of the forest should teach the pupils all kinds of practical work on the ground, including the estimation of standing crops of timber, and the measurement of fallen trees; while occasional tours to see forest work in other places could be arranged for those who chose to follow them. In order that all societies and public bodies, interested in the good treatment of the land, should have an interest in the system of education, I think that the general direction and control should rest with a council or board, of which the Director of Kew Gardens might be *ex-officio* President, and the Forest Professors at Cooper's Hill members, and to which the Royal Agricultural Society, the Highland Society, the Surveyors' Institution, and similar bodies should send delegates, while two or three of the great owners of private woodlands should be requested to sit on the board. This board would be necessary to keep the teaching in touch with the requirements of the country; and it should control the course of study, arrange for the examinations, and granting of diplomas, and regulate the scale of fees. It must have a paid secretary for correspondence. I do not think that any great expense for buildings would be necessary. There would be wanted a lecture hall, with desks, &c., handy to the forest, and a few huts, perhaps, for the students, who might

Sir John Lubbock—continued.

wish to stop there; also, perhaps, two or three cottages for labourers and subordinates. But I do not anticipate any large outlay, as the bulk of the pupils would live elsewhere. I should assume the probable expenditure as follows: salary to lecturers, 500 l.; resident lecturer and executive officer, including house-rent, 350 l.; wood bailiff, 100 l.; paid secretary, 200 l.; journeys and miscellaneous, 200 l. Total annually, 1,350 l. I have not included anything for expenditure on the forest, as that should be paid for from the thinnings; as for museums and collections, those at Kew and Cooper's Hill should suffice for all. To meet this expenditure there would be the fees, not only of regular students, but it may be presumed of many wood-reeves and wood-bailiffs, whom their masters would be likely to send there for instruction. The deficit, if any, in early years may very well be supported by Government. But it must be clearly understood that to be successful such a tract of forest must be under the absolute control of the forest professor charged with it, who must be in fact its surveyor, and subject only to the financial control of the Treasury. As for the pupils, it is to be hoped that most of the young men who seek a land agent's career would gladly avail themselves of such a supplementary education with a view of augmenting their salaries in the future; that young men of a subordinate class, who seek employment as wood-bailiffs or wood-reeves would do the same, and that many gentlemen who are possessors of more or less acreage of woodlands would gladly send for purposes of instruction the men who now manage their forests. It is certain that all these classes would derive enormous benefits from the establishment of such a forest school.

10. At present the Professor of Forestry at Cooper's Hill has no control over any forests in this country, I believe?—Absolutely none.

11. And the Indian students go abroad for their practical instruction in forestry?—It is intended that they should do so. I do not know that up to this time they have been anywhere; but I have nothing to do whatever with Cooper's Hill, or the training there, and I know nothing except from hearsay about it.

12. But your impression of the intention is, that they should go abroad for their practical instruction?—Yes, I think so.

13. But you would rather that the Committee should get that information definitely from the authorities at Cooper's Hill?—Yes. I do not know anything definitely about it myself.

14. The training of a person who was to occupy the position of a forester would, of course, be carried further than that of a person who was to be a wood-reeve or wood-bailiff; but in many respects it would also be the same?—Up to a certain point it would be very much the same; but a person in the position of a land agent, who is to have the control and management of woodlands, ought to know much more, because he ought to know the effects of climate and species, so as to know what is suitable to plant in certain cases.

15. Therefore there would be no difficulty in making the instruction which was intended for the higher grades very useful for the lower grades?—They might be made to fit into each other.

1 June 1886.]

Colonel PEARSON.

[Continued.]

Sir John Lubbock—continued.

other. I expressed myself strongly about that, I remember, last year.

16. How long do the studies last in the French forest school?—The training in the French forest school extends over two years; only it must be remembered that it extends over other subjects than forestry; there are about 45 lectures in forestry, the same number in botany, half that number in geology, and half that number in mineralogy each year.

17. How long do the Indian students remain at Nancy for that portion of their training?—They have hitherto remained there three years; that is to say, two years and eight months exactly; viz., eight months as a preparatory course before they went into the school, and during the remaining two years they followed the same course as the French pupils. In the preparatory course the pupils went through, in a preliminary manner, with one of the professors, the general subjects of education, so as to put our students generally upon a level with the French pupils, and *au courant* with the subjects.

18. In the case of wood-reeves and wood-bailiffs, how long would you propose to devote to their forest instruction?—I should think from six weeks as the minimum to three months as the maximum, according to the amount of training that you might wish to give them, or that they might wish to have. A man of that sort could get all that it would be necessary for him to know in three months.

19. You think that an owner of woodlands having an intelligent wood-reeve, if he sent him for three months to the school, would then find him fairly qualified to manage his woodlands?—Yes, certainly, three months would be ample for a man who "knew himself" in a forest to manage afterwards, because he would at once pick up things when shown the reason of them.

20. Although our forests in England may not be quite so well adapted as those in France and Germany for the purpose of this instruction, you consider that there are woodlands which would serve the purpose?—It would be distinctly necessary to bring in a tract of forest into what we should call order, and it would take years to bring it into what we should call a proper state; but the very fact of doing that would be instructive of itself.

21. No doubt, after that process had been gone through, the forests would be more suitable for instruction than they are at present; but I understand you say that even at present there are woodlands which would serve fairly well for purposes of instruction?—I think any intelligent and educated forester would adopt his teaching to the place.

22. Out of the 1,350 l. which you have estimated as the probable cost of your forest school, a considerable amount, no doubt, would come back in the shape of fees; do you think it would be possible to form any estimate at present of what the net expense might be?—It is very difficult to do so. I have talked the subject over with Mr. Rogers, of the Surveyors' Institution, and he thought that we might soon calculate upon 50 pupils.

23. That would be 50 pupils of the higher class?—Yes.

24. Therefore the expense probably would not 0.108.

Sir John Lubbock—continued.

be any considerable proportion of the 1,350 l., and possibly after a time it would be self-supporting?—We thought we might charge them 20 l. for the course; if so, that would provide for 1,000 l., and then you would pick up whatever you charged the wood-reeves. If their masters paid for them, no doubt you might charge them an appreciable sum; but upon the young men themselves, who hoped to get employment afterwards, you would have to put a low fee. I am not very well acquainted with the sums paid for education by those classes, but I think generally you could very soon either cover or nearly cover the sum.

25. Then there would probably be some young men who would go to the school with the view to obtaining employment in the Colonies afterwards?—Yes; but I suppose men who would hope to get appointments in the Colonies would hardly get a sufficient amount of training here. The Colonies would look for young men who had spent more upon their education, who had been sent to Cooper's Hill, and gone through a perfect course there.

26. The young men who would be qualified for the Indian forest service would clearly be qualified for the Colonial forest service?—Certainly; for one or two who have failed to get appointments for India I have obtained appointments in the Colonies, and the Colonies have gladly accepted them.

27. Is there any point which you would like to add to your evidence?—I think that embraces pretty well all that I have to say.

Mr. Charles Acland.

28. Not having had the opportunity of hearing the evidence given by you last year, and though there might be something in it already about the course of education given at the school at Nancy, would you kindly tell the Committee the way in which you prepare men there; what your main object is?—The Nancy school is a Government forest school, established for the purpose of training officers for the Government forest service in France. The pupils are admitted every year by open competition, except that the pupils who pass through the Polytechnic School and two pupils from the Agricultural Normal School at Paris every year have the right to go in without competition. The rest of the vacancies, to the number that may be fixed by the Minister of Agriculture every year, are placed at the disposal of the public by competition.

29. Is the competition upon general subjects?—It is very much what they would have here; they have to pass the ordinary degree of the Baccalaureate in the French Universities. Nobody who has not passed that can compete. Then the examination is in mathematics and physics; they do not require botany, because they like to teach that from the beginning. The examination is a general one, but mathematics and physics, with chemistry, form a prominent part of it.

30. It is in no sense technical with regard to forestry?—Absolutely not; it is a perfectly open examination, embracing pretty much the subjects which are taught in the Polytechnic School in Paris. When they get to Nancy they are taught forestry in two branches; that is to say, silviculture

1 June 1886.]

Colonel PEARSON.

[Continued.]

Mr. Charles Acland—continued.

ture and the management of the forest. They are taught botany, both the classification of plants and also physiological botany; they are taught mineralogy, geology, applied mathematics, mechanics, everything connected with the steam engine, saw mills, and everything of that sort. They are taught surveying very thoroughly, road-making, and, you may say, the elements of engineering generally, without going very much into detail; they learn the construction of forest houses, bridges, and so on; they do not teach them chemistry, but I ought to have said that the competitive examination at the beginning entails a certain amount of knowledge of chemistry, which they are supposed to have when they come there; because a good deal of the mineralogical and physiological training bears upon chemistry; but there are no lectures in chemistry. Then also they get lectures in agriculture, and very excellent ones, the general use of manures, and so on. They go on with that for two years, and then there is a final examination, which is a pass examination; if they fail to attain a certain standard, they are turned out "séchés," as it is termed.

31. You teach them, I suppose, about the disease of trees?—Yes, that comes into sylviculture. I ought to say that they are taught entomology, and about the animals, insects, &c. that are destructive to woodlands. It is a very good education; the young men who go there are very well trained for any practical out-door business, and I must say that I think our forest pupils who went to India went very efficiently turned out to be useful in a country like India.

32. What class of men would they be?—Mr. Wren sent a great many of his pupils who were failures for the Indian Civil Service; he considered it the second best thing to go for; others were there who had failed for the army, and others who liked an active profession, but did not care to go in for the army; officers' sons, clergymen's sons, and so on; and there were a few, notably, who came from a lower class; some of them answered very well. There was one, who is now in India, whose father is a shopkeeper in the north of Ireland; he went to the Belfast University; thence he came to Nancy, succeeded in competition, and has done very well indeed in India, and is one of their most promising young men; but it is the exception to find that they come from anything like the lower class.

33. What is the length of the course?—Eight months preparatory, and two years in which they actually follow the course of the school; two years and eight months altogether.

34. You stated, in reply to a question put by Sir John Lubbock, that you thought a wood-reeve or bailiff in England could in three months be able to pick up all that they would be able to give him in the institution you were sketching out. I suppose you were speaking of men who had had some experience?—My idea is, that if a tract of forest near Cooper's Hill could be obtained for purposes of instruction it should be placed under the Professor of Forestry at that college; under his orders there should be an executive officer, who need not necessarily be a trained forester, but a young man of the land agent class, who had received a diploma at the

Mr. Charles Acland—continued.

Surveyors' Institution, or some agricultural college; but he must be distinctly under the control of the professor, and should manage the forest under his orders. The professor would give the higher and scientific training, and the executive officer could then teach the practical work; and it would be his business especially to give instruction to wood-reeves and bailiffs, and people of that class.

35. But the wood-reeves and bailiffs who could go there would not be, I suppose, in your view, men who were coming for their first experience of wood management, but men who had had some slight knowledge of wood management, though not gained by scientific training, but on the ground?—I think, quite so. But nowadays a man gets a very good education in a board school or one of our country schools, and the young man who had the chance, after passing through his school course, of getting an appointment in a neighbouring forest, by going to Cooper's Hill for three months, ought to be also able to get a sufficient training. Then the owners of woodlands ought to be able to send their men to be trained, and they should go there for a short course to render themselves more efficient.

36. Do you think you could find for any institution of that kind both practical and theoretical training in the same man?—I consider that the professor at Cooper's Hill (and it would be much cheaper to employ him, because he has got an appointment already) would be the proper person; it would be easy to arrange for him to give the scientific lectures. Under his orders he ought to have a practical working man in the forest, who ought to be there always at work, showing to the wood-reeves and the wood-bailiffs the best way of conducting every practical operation. When I say that three months would be enough for their education, no doubt it would be much better to divide the time; to give six weeks in the spring, a month in the autumn, and a fortnight in winter, or something of that sort, because they would require to see the whole of the work done in the forest; but it would not be necessary to keep them the whole year.

37. Should you regard, as part of the object of the institution, anything in the way of experiment?—Experimental stations of course are very valuable; they have been established in Germany to a large extent; and in France, also, latterly; in fact, much that is known now about sylviculture has been obtained from those experimental stations; and no doubt if you had a scientific man, like the Professor of Forestry of Cooper's Hill would be, with an officer on the spot under his orders to organise experimental stations, that would be only a natural part of the plan.

38. Should you agree with me that experimental work, to be carried out efficiently, must be carried out either with regard to practical results, that is to say, to pay, or else in the way of scientific illustration?—Both. But the experimental stations in Germany are small tracts of only a few acres each, and each under different conditions; it does not require a large spot for the purpose.

39. So as to experiment upon the combination of different trees?—Yes, the combination of different trees; their annual growth, under different

1 June 1886.]

Colonel PEARSON.

[Continued.]

Mr. Charles Acland—continued.

different circumstances, the effect of what is called exposition, that is, the lie of the ground; the effect of planting upon the east, west, north, and south sides of hills, and so on. But you do not require a large station for all that; you require only a few acres in different stations, only they must be very carefully watched.

40. You do require in that case, however, a certain amount of expenditure without much hope of profit?—You must make one fit into the other. I think that, generally speaking, supposing you give three or four thousand acres of forest over to a practical forester, he ought to make any expenditure of an experimental nature payable out of the proceeds of the forest, unless it was very young. But all tracts of that class that you could get hold of would contain trees of a certain age, some coming on and some going; so that you would always get a certain return out of them.

41. Of course the results in forestry would always be slow as compared with agriculture; they would take 20 or 30 years, as against 20 or 30 months?—Yes, you cannot do anything in a few months; but if you had a forest handed over to you, there would always be a certain amount of wood to be got out of it. There is always a certain amount of growth going on, and the annual increase upon the ground would give you a certain return; but I should not look to getting a profit out of it, it would be very wrong to do so. The most you could expect would be, that the officer in charge would carry on his work without expecting you to give him any money.

42. You would require, would you not, for practical improvement in the management of our forests a certain amount of travelling about, so that persons might see the effects of different exposures and so on, which you could not get in a small school?—Yes. In that case you ought to make the pupils pay their own expenses. I have estimated 200 £. for the expenses; but the pupils, whether they were wood-reeves, or bailiffs, or students, should pay their own expenses; that was always done in France. Although the Government were very liberal towards the French school, they never thought of paying anything except the professor's expenses; the pupils pay for themselves in all cases.

Dr. Farquharson.

43. I think, as I understand Cooper's Hill, it is purely a place for theoretical instruction?—Up to the present time it has been entirely so; but I have only been to Cooper's Hill one day since a forest school has been established there, and, except that I know personally the people connected with it, I have no information about what they do at Cooper's Hill.

44. It is not like the Royal Agricultural College at Cirencester, where they have practical and theoretical instruction combined; there is no forest in connection with Cooper's Hill to which the students can be taken?—No; that is precisely what I wished to convey by my evidence. To my mind the instruction now given at Cooper's Hill will be thrown away unless a tract of forest is provided handy, to which pupils can go. I do not see how it can be carried on without it.

0.108.

Dr. Farquharson—continued.

45. As matters stand, by the time the pupil gets into actual practical contact with forestry, he has probably forgotten all about the theoretical instruction?—Yes. The only way to convey instruction is, after having been in the lecture-room, to take the pupils on to the ground and point out the facts. Unless you do that they do not believe it; that is done most carefully in the Nancy College.

46. Then our pupils are compelled to go to Nancy for, what we call in medicine, clinical instruction; but I suppose the conditions of forestry in France are very different from what they are here in respect to climate and trees?—No; I do not think there is much difference in France from what there is here. I sent Broillard's book on forestry to one of my brothers, who possesses some woodlands, who wrote to me: "I am very much surprised to find that I have the same condition of things here as M. Broillard's book indicates; one would not have thought it possible that the conditions were so much the same upon both sides of the Channel." If you went to the Alps the conditions would be different, of course, but not upon the level in the centre of France.

47. Have you calculated what would be the expense to a forester if you sent him up to study?—It would cost him from 10 s. to 12 s. a week to lodge and board in some country inn, and if you added whatever the fee was, say from 5 £. to 10 £., and the journeys, that would be about the expense.

48. I think, from the evidence you gave last year, you did not recommend that a Scotch forester should be sent up to Cooper's Hill?—No, I should hope that the Scotch would establish a similar school in Edinburgh, which would be in the same relation to their own people. It is better not to think of too many things at once; if you could establish one as a model, the others would be able to work upon it. I should never think the Scotch would send their pupils to Cooper's Hill; but if you could once start the thing here, I have no doubt a similar school would be arranged in Edinburgh.

49. You think that would be suited for practical work?—Certainly, I think the instruction would be practical; and if you had your lecture room contiguous to the forest you could give both descriptions of instruction; but you must have the forest handy.

50. But suppose you had your lectures in Edinburgh, where could you take your young men to?—That would be the difficulty, unless any of the large woodowners near Edinburgh would give up a great forest to be managed in that way, as has been done by the great landowners in Bohemia, where the conditions are very much analogous.

51. I have no doubt you are aware that it is a very common practice for the foresters in Scotland to go to Lord Seafield's, and stay a fortnight or so there with the head forester, to go through a course of practical instruction with him. Would it not be possible to form a school of that description, so that practical instruction could be given?—Mr. Thomson, Lord Seafield's agent, is a very able man, but he has learned forestry himself by

A 3

rule

1 June 1886.]

Colonel PEARSON.

[Continued.]

Dr. Farquharson—continued.

rule of thumb; he would give a very good practical education, no doubt, but I do not think you could interfere with him; he would not like to be interfered with. He has his own way of teaching, which would be very good and sufficient, no doubt, for many of the young men who go to him, but I do not think he would like to be interfered with.

52. Have you considered that the forests in Scotland are managed upon sufficiently scientific principles to make them available for instruction?—If you ask me generally, I should say not; but there are some very good instances of management. Lord Lovat's forests north of Inverness are very good, and his manager is a very excellent man; and there are some portions of Lord Seafield's forests that are very good; especially the natural reproduction of larch forests are very good.

53. You went with M. Boppe?—Yes, I did.

54. I believe he rather objects to the forests which do not happen to fit in with his own theories?—Yes, he would like to have seen natural reproduction very much more largely practised in Scotland; he thought it an error to cut down trees at an early age and plant them again, but he thought both at Lord Lovat's and at Lord Seafield's that there were very many good things.

55. That is merely a conflict of opinion between M. Boppe and Lord Seafield's manager. I fancy that the forests are managed very well as a commercial speculation?—Yes, I fancy so; for instance, Mr. Thomson is making a lot of money by the birch, which had never been used before. It was a very good idea to utilise it for cotton bingles.

56. I suppose the main object is to make the rests pay?—Yes.

Mr. Northcote.

57. I see that last year you estimated the cost of your forestry school at 600*l.*; you have doubled our estimate this year?—I was asked very suddenly last year, and I had not time to think of it. I only thought, to tell you the truth, of what we had calculated, supposing the English forest pupils were brought from Nancy to England. It slipped my mind when I gave that answer that a forest school for England would have to be self-dependent, and that a school would get no help in the shape of the Indian pay to the teachers.

58. Then as to a point which the honourable member for Launceston raised, do not you think the expense of the journeys which would be necessary to take men to the New Forest or the Forest of Dean would practically be so heavy as to deter that class of men, wood-reeves or bailiffs, from the advantage of that branch of knowledge?—The expense of the journey would not be great. Their masters thought it worth while to send them at all, a couple of pounds would take them nearly any one of those forests. It would be only so much in addition to what they would have to pay supposing they were on the spot, at Windsor Forest, or wherever the school was established. A couple of pounds would take them to the Forest of Dean or the New Forest, and they could put up at one of the country inns.

Mr. Northcote—continued.

It would be most desirable that they should see other places; half the advantage is in being able to see different things, and the effect in different places under different conditions.

59. Do you not think it would be desirable, if possible, to have this school of a rather less permanent character; because, if you had it established in any particular forest, the practical instruction that would be given there, supposing it were established in the Windsor Forest, would be local in its tone; the students would get to know all about the exposure and other technical details of the Windsor Forest, but the conditions would be very different either in a Scotch forest, or even in a Welsh one, perhaps?—The general conditions of the growth of trees are not so dissimilar as you suppose. Undoubtedly climate and exposure have a very great effect on forests; but if you did not have it in one place it would add enormously to the expense. Of course, it would be better as you suggest, but it would add immensely to the expense. You would have to have an officer solely to look after it, whereas, if you could employ the professor from Cooper's Hill for 200*l.* or 300*l.* a year, that would diminish the expense very much.

60. Is there work to be done in the forests throughout the year, or is it not more especially in the autumn?—The main part of the theoretical instruction is in the spring; the practical work is in the autumn, no doubt; it is much better to cut coppice in the winter; at all events, before the sap begins to move.

61. That is why I was thinking whether it would not be desirable to have the college established upon a more roving kind of principle, because during the greater part of the year the pupil would not go out from the lecture room into the forest for practical work?—Exactly, but my idea was that people should come for two or three weeks at a time, as you have an officer who has a permanent appointment at Cooper's Hill in charge of it; and at the time that he would fix he would have pupils come up for two or three or four weeks, to go into the forests; and in the meantime the land agent student, who has an enormous number of subjects to pass in, would be up in London studying, and then he would go to the forest for two or three weeks, whenever the professor summoned or called together his class. I do not think that for the bulk of people who would want forest instruction you could keep them together all the year round. I think that would be a great expense, and an unnecessary expense; I would rather summon them from time to time when it was convenient for the professor to give them instruction; because, except the men who have work already as bailiffs, they all have some other study to do; and if you kept them all for a long period of time they would not be fully employed.

Mr. Biddulph.

62. You mentioned having been to the college at Cirencester; are you sufficiently acquainted with the locality to say whether it would be a good situation for a school like the French school of forestry, to be added to the present agricultural

1 June 1886.]

Colonel PEARSON.

[Continued.]

Mr. Biddulph—continued.

cultural college?—There are some very nice beech woods of Lord Bathurst's close by, but I do not remember any conifers about there.

63. You do not know the locality sufficiently to be able to say that?—No, I was only there for two days, I think.

64. I presume it would be a great advantage to be able to give the students at the Royal Agricultural College the opportunity of learning forestry at the same time as they pursued their other studies?—I think, if you established a forestry school, they would be bound to have a professor of forestry at Cirencester.

65. Lord Bathurst's woods go for many miles behind the back of the college; the remainder of the country is very open country?—Yes, it is.

66. I see you stated last year that you know the Radnor Forest very well?—Yes, I live at the foot of the Radnor Forest.

67. There is a good deal of larch plantation in that part of the country, is there not?—Yes, there is.

68. And, I am sorry to say, a good deal of disease?—Yes, there is, no doubt.

69. Have you any theory as to what the larch disease has arisen from?—I have no doubt it is a fungus; *champignon*, as we call it in France.

70. Does it come from over-planting?—I think that if larch is planted with other woods, either in blocks or in single trees mixed with other trees, you would have very little to complain of in the way of disease; it is planting large areas with it that occasions disease. There are other reasons, and more especially position or exposition, as it is technically called. For instance, the plantation upon the Radnor Forest known as "The Smatcher" is a very good one, and it is my impression that that is because the larch is planted upon the northern and eastern slopes of the mountain; it seems to have answered perfectly well there. Upon the opposite side of the hill Sir Gilbert Lewis has planted very largely larch, but that is perishing and going to decay; some of it is about from 40 to 50 years of age, and others much earlier; and I think the reason of that is because it has a southern and western exposure; that it is too hot for it. But I am not merely speaking of my own opinion; that was the opinion of one of the French foresters who came to see me; I took him up to the woods, and he thought the same.

71. I suppose it follows from that that it depends very much upon the locality itself what trees would be suitable for any locality?—Very much so.

72. In some parts it does very well to mix beech with larch?—Speaking for myself, I think beech is the best mixture for larch.

73. It depends also very much upon the soil, does it not?—Yes, it depends also upon the soil. There are some very fine larch trees about Kington and Radnor. In the wood above Kington there are some exceedingly fine larch trees; they are mixed with oak there, but they are very fine trees.

74. Beech would not grow there?—No. And up towards Gladestry there are some very fine larch trees. I have one in my own garden at the 0.108.

Mr. Biddulph—continued.

end of my house, as fine a larch tree as could be found anywhere.

Mr. Evelyn.

75. You think it is essential to a school of forestry to have attached to it a reserve forest as a school of study?—It is absolutely necessary. I think a mere teaching school is entirely useless. I do not think that the young men who would go there would believe in it; the theoretical instruction goes in at one ear and out at the other when unaccompanied by any practical illustration.

76. In France is there any difficulty in obtaining such reserve forests?—No; because the bulk of the forests belong to the Government. The Nancy school has a great part of the forest above Nancy, two divisions of it, absolutely at its disposal, with some oak forests 10 or 12 miles off.

77. In France is there any obligation upon the owners of woods and forests to place their woods at the disposal of the schools of forestry for the purpose of instruction?—No, except by courtesy. We have frequently been into private forests, but always by the courtesy of the owner.

78. Is it allowable on the part of owners of forests to convert wood into arable land?—Not before they get the permission of the forest officer of the district; before they can make a *défrichement* they must get the permission of the forest officer. There are some conditions, without which a forest cannot be cut; but otherwise they obtain permission in the regular way.

79. Do you know the insect which affects the Scotch fir and destroys the leading shoots; it is very common in Surrey?—I have seen it in the New Forest to a large extent; you mean the beetle.

80. The leader droops and dies?—I remember a large tract of the New Forest where the trees were destroyed; the contiguous block was burnt; there were a number of dead trees in which the insects laid their eggs, and they went on to the further trees.

Sir George Grant.

81. I think you have explained to the honourable Member for West Aberdeenshire that any establishment at Cooper's Hill would not meet the wants of Scotland?—It is too far off.

82. And you hinted at the establishment of a similar forestry school somewhere in the neighbourhood of Edinburgh?—Yes.

83. An essential necessity for that, as I gather from you, would be a reserve forest of some 3,000 or 4,000 acres. What I would ask you is this: you have, I understand, made yourself acquainted with the management of some of the large forests in Scotland, Lord Seafield's you have mentioned, and Lord Lovat's; am I to understand that they are too far distant from your head-quarters, supposing they were at Edinburgh. Are either Lord Seafield's, or Lord Mansfield's, or the Duke of Athole's, sufficiently accessible to answer your purpose?—They are any of them sufficiently accessible; they are quite sufficiently near to be utilised. The only convenience of having a forest belonging to the school is, I think, that no forest is really capable of being properly used for instruction unless it is under the command of the forest officer; he must be

1 June 1886.]

Colonel PEARSON.

[Continued.]

Sir George Grant—continued.

able to transform it in any way he likes. The difficulty in respect to a Scotch forest school seems to be, that it would require a larger expenditure to get possession of a tract of forest in which forestry might be taught.

84. Assuming that were arranged within a distance of 150 miles, that distance is not, in your judgment, too far for the purpose of imparting instruction?—No. In France we went to the forests everywhere; we put up in the village inns, it was no great expenditure, and I do not know why you should not do it elsewhere. Except in the forest of Nancy, where the pupils were taken in every day for ordinary operations, the other teaching was given round about; sometimes we went to St. Gobain, Villars Coteret, and into the Jura. We travelled third-class and stopped at the village inns, and there was very little expenditure over our excursions. But it is necessary also to have a tract of contiguous forest for daily teaching.

85. I wish to ask you a question with reference to the reproduction of larches in Scotland. You stated in your evidence last year that the best reproduction you had ever seen was in the neighbourhood of Milton Castle; can you tell us where that is?—If you are looking from the Spey up to Milton Castle, it would be in the woods to your right front.

86. I would ask you whether Milton Castle was the correct name?—No, they are the Milton Woods; it was not very far from Grantown, near Lord Seafield's residence.

87. That was a north slope?—Yes.

88. I think you stated that the larch disease would be very much mitigated if you did not plant larch in such large plots, but if they were mixed with other trees; have you formed that opinion from your experience, or from what you have seen in Scotland of the larch disease?—No, I think it is more theoretical; it is what, in talking with the foresters who went round with us, I gathered that they thought would be a good plan to try, as it seemed to be desirable to take precautions to prevent the disease spreading. If you got a wood which was infected in one part the disease seemed to spread very rapidly over it.

89. In the large forests in Scotland, have you not found that, as a rule, larch and Scotch fir are mixed?—I think in some places they are; but I do think it has been the practice to plant too much in large blocks.

90. But my experience differs from yours. I think that larch has not been planted in very large blocks. I want to ask your opinion as to whether larch being mixed with Scotch fir would be in any respect a safeguard?—No, I do not think it is; I should prefer to have a deciduous tree. M. Boppe was of opinion (seeing that in the old forests the disease did not seem to have affected the trees) that the seed that is used, being the seed of trees grown in this climate, and not under the proper conditions under which the larch grows naturally, that is to say, in the Alps, where the trees grow in their natural habitat, had partly given rise to the disease. Take the trees grown at Dunkeld: they were undoubtedly grown from seed got from the Alps; and the question arises whether, if the seed were

Sir George Grant—continued.

obtained from the indigenous trees, the plantations would not be safer from being attacked with the disease, which is undoubtedly a fungus, and which affects plants which are constitutionally weak. I know that M. Boppe had a very strong idea about that, although it is one that could only be arrived at by experiment. But the Scotch fir, I should think, would hardly afford adequate protection, because the Scotch fir requires a great deal of light, and for that reason they would not afford adequate protection from contagion, not being close together.

91. You went through Lord Seafield's forests, did you not?—Yes; we were there three days, I think.

92. You saw the natural forest?—Yes, I did. You saw the reproduction.

93. Of the Scotch fir in the natural woods?—Yes; the Scotch fir reproduces itself everywhere with wonderful facility.

94. You found many of the young woods very thick, did you not?—They came up like cabbages, as thick as possible. But what I say is, that the Scotch fir, to develop itself, and to form a big tree, must, at all events, have its whole head exposed to the air and sunlight, when it becomes a big tree. If you take the Milton Woods, the trees are all a considerable distance from each other, and would be no adequate protection to young larch planted amongst them.

95. But those trees that you are speaking of have no side branches?—No; that is exactly what I mean. If you suppose that the larch disease is fungus, as undoubtedly it is, which spreads from one tree to another, you naturally want to have a thick and compact mass which would prevent its being blown from one tree to another.

Dr. Farquharson.

96. Speaking of the disease of larch, do not you think it often arises from the seed being blown to the ground?—I think that is very likely, and it is just the weakest trees which are most likely to be affected by the fungus disease.

97. So that you would say with regard to timber the same as you would with regard to a straw crop, that you should not grow the same crop twice running?—Undoubtedly; the ground would not support it.

98. Do you think, then, that it is impossible to replant the forest lands; if that is the case, do not you think that the new trees would get diseased?—If you were to cut down a larch forest I think it would be very bad forestry to replant it with larch.

99. You would not do so?—Certainly not.

100. Would you break it up for agricultural purposes?—I believe the best plan would be, if the larch reproduces itself, to induce it to do so, because trees naturally reproduced in the first instance, as far as I know, are never attacked by disease. It was the French forester's opinion that it was only trees planted that were liable to disease, and that trees naturally raised would not be liable to disease; and that was why M. Boppe was so strongly in favour of the natural reproduction of larch instead of planting it.

101. But

1 June 1886.]

Colonel PEARSON.

[Continued.]

Dr. Farquharson—continued.

101. But larch will not reproduce itself naturally, will it?—I was just speaking of the natural reproduction of larch at Lord Seafield's, which is exceedingly fine, and as satisfactory as anything could be; and I also know Lord Moray's forests at Beaulieu; those reproduced themselves beautifully; there was no disease. The larch disease is absolutely unknown in the natural forests where the larch springs up by itself in the Alps.

102. Does not that arise from the larches being very thin upon the ground, else they could not have reproduced themselves?—They do not require to be very thin; if the sunlight can reach the ground between the trees natural trees will spring up directly. In fact, the system of felling that they teach in the German and French forests is simply a gradual thinning out to let the sunlight touch the ground, when reproduction will take place at once.

103. Do you think that beech, elm, and that class of timber, say beech, could be planted after oak and larch after beech, or vice versa, without the danger of encouraging disease in the timber; or do you think that all timber should be re-grown upon the same soil?—If you planted oak and beech together there would be no trouble; the great trouble is that very few soils will bear one species of timber alone.

104. If you plant larch after another crop of larch, that is likely to encourage disease in the larch. Do you think that if you planted beech after beech, that would encourage disease in the beech?—No; because it would come with a totally different class of tree. It is for that reason if you plant beech and oak together, as the whole of the trees are not drawing upon the same elements of the soil, that they become stronger.

105. So that in planting forests you have to be careful not to plant the same class of trees that had grown there before?—Certainly not; and also you should mix the trees. You should select what trees you think would be suited of two or three sorts and plant them mixed together. Ash, beech, and larch would often grow well together in certain localities, and beech and larch always will. In some cases you may introduce oak, because I know Mr. Bankes' forests have some exceedingly fine larch trees mixed with oak.

Sir Edmund Lechmere.

106. Have you given your attention since last year to what you would consider the best school for sylviculture in England; last year you had not made up your mind?—I think the best plan would be to get a forest as near as possible to Cooper's Hill, where there is now an educated forest officer, and put the forest under his charge with an executive officer under him.

107. Is there a sufficient amount of woodland close to Cooper's Hill?—Yes, there are about 15,000 acres outside Windsor Park, from which I think a selection might be made.

108. Would you afford facilities for the visits of pupils to our larger forests for special instruction?—I think they would get there what was required for daily instruction, in fact, for the exemplification of the lectures.

109. And what would you estimate to be the

0.108.

Sir Edmund Lechmere—continued.

amount of forest or woodland which it would be desirable to attach to a forest school?—I think 3,000 or 4,000 acres would be sufficient, half in leaf forest and half in conifers. At Nancy they have 1,600 hectares attached to the school, that would be nearly 4,000 acres; there are two divisions of the forest, about 800 hectares in each. A hectare is two and a-half acres, that is what they have considered necessary for the exemplification of the lectures.

110. But in the immediate contiguity of the college from 3,000 to 4,000 acres would be sufficient for the exemplification of the lectures?—Yes.

111. That could be procured at Cooper's Hill, could it not?—Yes, subject to the approval of the Crown, because they are Crown forests. I only make the suggestion. I have no idea whatever whether the Crown would be willing to place that forest at the disposal of the forest school; but I suggest that if it were possible to obtain 3,000 or 4,000 acres of the forest which lie outside Windsor Park the practical teaching of the lectures would be sufficiently provided for.

112. For that reason you would prefer Cooper's Hill to the Royal Agricultural College at Cirencester, as suggested by Mr. Biddulph?—Simply for this reason, that you have the Cooper's Hill professor, whose business it is to be there, and I should think that for a reasonable remuneration you might obtain his services; and he, on the other hand, would be glad to have a forest to which he could take his pupils.

Mr. Mark Stewart.

113. I wish to ask you a question about the larch disease. I understood you to say that the disease has been most prevalent where the larch has been planted in large quantities close together without the admixture of other trees?—Yes, I think so.

114. Is it not also your experience, when the disease has shown itself prominently after one block has been removed from the ground, that it appears to be inherent in the soil, and that if another crop of larch were taken off the same soil the disease would show itself again very soon?—I cannot say from my own experience, because I have been only in England about two years since coming from France; but from what I know generally I should say it must be the case, because supposing, as is known to be the case, that the larch disease is a fungus, the germs would remain; you could not get rid of them, and if you planted immediately afterwards, you would certainly get it.

115. Have you formed any idea how long these spores or germs would remain in the soil?—I have no idea whatever; all my knowledge of forestry is of a practical nature; I never made any pretence to scientific study.

116. But, practically, in how short a time after the removal of a crop of larch does the disease again show itself; when, in your opinion, would it be desirable to plant again?—I should say that it would be most injudicious to plant again until another crop of a different kind had been taken away.

B

117. Then

1 June 1886.]

Colonel PEARSON.

[Continued.]

Mr. Mark Stewart—continued.

117. Then it would not be injudicious to plant up with Scotch fir trees, although the larch disease had manifested itself plainly in the large crop?—Certainly not; larch disease has never shown itself in the Scotch fir, as far as I am aware.

118. Do you not think that the larch disease is increased sometimes by thick planting, probably, or from other causes?—As I said before, I think that larch ought not to be planted alone; and therefore I answer your question in the affirmative.

119. Where the Scotch fir disease has shown itself, have you ever seen any advantage from the *pinus Aletia* or the Corsican pine being substituted as a second crop for the Scotch fir?—I have no practical knowledge of the tree. The only case in which I remember having seen a tract of Scotch fir forest destroyed was one in the New Forest, and that arose from a fire having passed over a portion of the forest, and the insects, which had established themselves in the burnt trees, passing onwards.

120. You lay great stress upon getting good seed, whether of Scotch fir or larch?—I think it is of the utmost importance.

121. Would you recommend seed being got from foreign countries, or would you be satisfied with seed taken from the old forests in this country?—For Scotch fir I should imagine the seed from some of the old Scotch fir forests in the Highlands would be excellent. It was more with regard to larch, where the trees are not indigenous, that the French forest officers thought that attempts should be made to get the seed from the Alps, where it is indigenous; because you can easily imagine that the seed of a non-indigenous tree would not produce so vigorous a crop as one from the natural forests.

122. Has that proved to be the case in France?—I do not know, because they never plant the larch in France, having the natural forests of it. They plant the Scotch fir largely, but I do not think they plant the larch.

123. Is it the unanimous opinion of scientific men that the larch disease is due to fungus?—Undoubtedly, as far as I am aware. All the French foresters and the scientific men I have had the opportunity of talking to on the subject were undoubtedly of that opinion; but, as I said before, in some cases I know where the larches had died off it was not caused by disease, but from being planted in a wrong situation where the larch would not succeed.

124. How is it supposed that the fungus was produced?—Undoubtedly in weakly trees it produces itself. You never see the fungus, at all events, in a perfectly healthy tree; therefore, you may suppose that the larch trees which are affected by the disease, however healthy-looking, are really not strong.

125. Do you not attribute the cause or the effect of this disease partly to climatic agency?—Yes, so far that a tree which is not in its natural habitat, that is to say, in those conditions of climate and soil in which it grows naturally, is not constitutionally so strong a tree as one that is. And you must remember that naturally the habitat of the larch is from 3,000 to 6,000 feet above the

Mr. Mark Stewart—continued.

sea upon the Alps; and if you bring it here and plant it from 300 to 400 feet above the sea, five or 10 degrees north of its natural latitude, you establish a predisposition to weakness. The number of degrees of latitude which you bring it further north, no doubt, compensates to a large extent, but not altogether, for the difference of altitude at which you plant it. But that will not answer altogether. It is evident that you sometimes get larch trees perfectly healthy and vigorous here; at other times you get them quite diseased. But I think, with Monsieur Boppe, that the larch tree should not be propagated from seed grown upon an acclimated larch, but that, if possible, the seed should be from larch grown under its natural conditions.

126. You think that the science of the question bearing upon this subject would be well brought out in a school of forestry?—I think it would be one of the most useful things.

127. And then you think that our foresters, who are not generally highly educated men, would learn sufficient scientific knowledge to enable them to put it practically to a good effect in smaller woodlands, distinguishing woodlands from the larger area of a forest?—I should only give the foresters a very moderate amount of what I should call scientific training. I should only teach them the A B C of the conditions under which trees grow, and then I should take them to the forest and show them the way the trees grow; that would be an enormous advantage. If you take our forest men, you will see that in numberless cases they cut off the arms of trees leaving long snags, which everybody ought to know is about the worst thing that can be done; because a hollow forms where water lodges, which works to the trunk, and tends to the decay of the tree. But if you talk to nine woodmen out of ten in this country, they will argue that they have always done that, and that it is the right thing; whereas the experience they have had ought to have shown them to the contrary.

Chairman.

128. They ought to be cut off flat?—They ought to be cut off flush; we have at the school at Nancy a complete set of specimens, showing the effect of the different ways of amputating the arms of trees; five minutes' glance at that would show you the truth of what I have stated. These were sections cut out of trees, showing where the snags had been left in, where they had been cut shorter and where they had been cut straight, and the growth of the wood over the wound. There are 50 or 60 different specimens showing this, and a quarter of an hour's instructions to the pupils would convince every one of them at once, if they were at the same time shown the specimens.

129. Were those drawings or the actual woods themselves?—They were pieces cut out of the trees, and were shown at the Paris Exhibition. Nothing could be better than that, because five minutes' inspection and explanation to an intelligent man would show the different effects of having left the branch with a long snag, and of paring it quite close to the trunk.

130. In

1 June 1886.]

Colonel PEARSON.

[Continued.]

Mr. Mark Stewart.

130. In regard to Cooper's Hill being the centre of the School of Forestry, have you any proposition to make with regard to the establishing of an affiliated branch; let us say, of such a school in Scotland?—I would rather not say anything about that, because I have not been in Edinburgh lately, and I could not speak from practical knowledge. But I think that the Scotch must take it up, because it is naturally too far to bring Scotchmen of the forester class to Cooper's Hill. But, as I have said all along, you cannot have proper forest teaching unless you have a forest under your control to which you can send your people, and it would not be sufficient to have permission from the Duke of Buccleuch, or any other large woodowner, to go into his woods; because his manager would say, "No, I have my own ways of managing, and I cannot have you interfering."

131. With regard to larch, for many years after the importation of those forest trees into this country there was no disease at all, was there?—It was for that reason that Monsieur Boppe insisted so much that the seed should come from the Alps, because during the earlier years after the larch was brought to Great Britain trees were not old enough here to produce seed which could germinate; and as soon as they used the seed produced here it seemed to produce the disease.

132. In fact, your idea is that it is far more owing to the seed than any points of exposure of the trees planted that disease is germinated?—Certainly. I think that in many places where the trees are perishing (as I was saying just now of the larch woods in the Radnor Forest) there is no disease. I went with one of the French foresters into these woods. We could see no trace of disease, but the trees are withering away. Upon the Vron (one of these hills) the trees are from 40 to 50 years old, and they are dying away, and the owner is removing them as fast as he can sell them, which must be a terrible loss. In another place, facing the south-west, which is too dry, where the trees were planted 15 to 20 years ago, they are almost all dead already.

133. Is that from disease?—No; simply from withering away. Trees may die because they are not upon proper ground and under proper conditions, and also because they are attacked by disease. Now, the Duke of Athole's forests are perishing from the second of these causes, that is to say, from disease. But the Radnor trees are suffering from the first of these causes, or the want of proper conditions of vegetation, for I could see, and the forest professor who went with me could see, no sign of disease; the forests there are simply withering away.

134. Is it the case that in the south of England, or in the south of Scotland, the larch reproduces itself?—I do not think that the natural reproduction of the larch is found in the south of England. I have looked carefully for reproduction in the Smatcher Wood I have spoken about, but the trees are not old enough. I have seen it in the North, but I have no great English experience. I was 23 years in India; I was 11 years in France, and I have been home only two years; so that my home experience is not great.

0.108.

Mr. Mark Stewart—continued.

135. I suppose the French climate will mature a larch in less time than our climate will, or the Scotch climate will?—As regards the natural larch forests, yes, certainly. Yet I remember seeing some of Mr. Bankes' larches about 50 years old, which he was cutting down, and it would be impossible to see finer larch in the natural forests anywhere; that was five or six miles from Kington; I have seen some trees here that are quite up to the foreign point. I have a larch in my own garden which is 10 feet in girth, and from 60 to 70 feet high.

Sir John Lubbock.

136. In answer to Dr. Farquharson, you expressed, on the whole, a favourable opinion of the state of forestry in Scotland as contrasted with that in England; would you allow me to call attention to one or two paragraphs in Monsieur Boppe's return. In the Appendix to the Report of last year, on page 47, he says, "We were also struck by the monotonous regularity in the height and age of the trees, unmistakeable sign of their artificial origin and want of methodical management. The forest, here left to its own devices, continues growing just as the hand of man has planted it; the undergrowth is constantly grazed down by the sheep and cattle, and Nature, in spite of the immense resources at her disposal, is quite powerless to modify the work of the planter, or repair the errors committed by woodcutters." In that passage he seems to imply that, although Scotch forests may be superior to the English, there is great room for improvement?—What he desired was to see the system of natural reproduction introduced much more largely into the Scotch forests, considering that that would be the means of avoiding disease in the larch, and that, as Scotch fir reproduces itself so very readily, it would be a great saving in the expense as compared with planting.

137. If you will look to the 4th paragraph, upon page 47, he appears to imply that, in his judgment, the beech might advantageously be cultivated more in Scotland than has been the case; that it has been somewhat neglected?—In all my conversation with Scotch and other foresters in this country, their objection to the beech is that they have no market for it. In Buckinghamshire I have been to see the indigenous forests there; but there is a large manufacture of chairs carried on there. In foreign countries there are a number of little things which are made out of beech which nobody thinks of employing in this country. It is very difficult to get rid of beech. We do not use wood for firing, which is one large use of it in France.

138. When you say beech is difficult to get rid of, you mean difficult to sell?—Yes; in France it is one of the most valuable trees; in Germany, since the introduction of coal and railways, it is one of the great problems how to sell the beech, which has been always used for firewood.

139. What he means, if I understand his report rightly, is, that if you are growing oak or other trees, they would do very much better if you mixed them with a certain quantity of beech?—By "cultural reasons" he means that it is so valuable for mixing with other trees,

B 2

in

1 June 1886.]

Colonel PEARSON.

[Continued.]

Sir John Lubbock—continued.

in order to get satisfactory results. He thought, and I think, certainly, that larch, if it were mixed with beech, would not be attacked with disease. We all know that the beech is the best tree you can use to mix with the oak, for example.

140. I do not wish to ask you the reasons, but does not M. Boppe wish to imply in this sentence that it would be of advantage to the Scotch forests if beech were more largely used?—Undoubtedly.

141. Upon the next page M. Boppe suggests that sheep might be advantageously kept out for the first 40 years and the last 20 years, but that they might be admitted during the intermediate period of 60 years, and that the pasturage in that case would be very good; did he not intend to imply that, in his judgment, the Scotch foresters scarcely adopted what he considered to be the best rule with regard to the admission of sheep into forest lands?—Certainly; it is a very important thing. If you allow that the life of a forest is 120 years, you would have better grazing during 60 years of it if you kept them out during the first 40 years and the last 20 years; it would rest the land.

142. Then if you look a little lower down, on page 48, you will see that M. Boppe says: "It would certainly not be fair to hold the Scotch foresters responsible for the present regrettable state of repairs; for, though they have for the most part admitted the inefficiency of the present system, they are powerless to effect any improvement so long as the landowners and general public have not learnt to appreciate the manifold advantages to be derived from a regular and methodical management." That passage, again, appears to imply that, in his judgment, the Scotch management of woodlands might be very considerably improved?—I think in that case he was thinking of the shooting, because I remember Mr. Dewar saying, in Lord Lovat's forests, that he was prevented from going into the forest for seven months in the year, and that in the months he most wanted to be there; that he could only go into the forest for five months in the year, because it was the condition of the lease of the forests that he should not go into the forests while the does were there; it was a question not of the forests, but because the contiguous mountains were leased for deer forests.

143. Then, in that particular case you think he was merely regretting that the forests were sacrificed to the shooting?—I am quite sure of that.

144. Upon page 51 in the 4th paragraph he says, "It is, therefore, a matter of regret that, among all the forests visited by us in our travels, there is not a single one suitable for the teaching of silviculture." There, again, he implies, does he not, that, in his judgment, the Scotch woodlands might be much better managed than they are?—Undoubtedly; but he rather alludes to the teaching, does he not, in that paragraph?

145. But if a forest had been well managed it would be adapted for silviculture?—Yes.

146. He also was of opinion that there are very large tracts in Scotland which, properly dealt with, might be planted with advantage?—Yes, that is his opinion.

147. So that, while finding much to admire in the Scotch management, he also thought there

Sir John Lubbock—continued.

was much room for improvement?—I think he was of opinion that they knew how to get profit out of their forests very well; but that they did not cultivate them so that they might produce the greatest profit; that they rather sacrificed future profit to the present; but that will perhaps always be the case with private forests, more or less.

148. At any rate his opinion was that, however well they might be managed, there were many points in which the management might be improved under a better system?—Yes, he thought that instruction was much wanted by the bulk of the wood managers.

149. Then I should like to ask you a question with regard to Cirencester. Supposing that the Professor of Forestry at Cirencester was also in charge of a certain amount of forest land; would that, in your judgment, be as good an arrangement as having a Government school?—I went to Cirencester by the desire of the India Office to see what I thought about it as regards forest teaching. The principal reason why I thought it would not do was that, although there are beech woods or forests, there is no fir forest very handy to it, and the education at Cirencester is a rather expensive education; it would be difficult to dovetail the forest instruction with it. Still I think that at Cirencester it would be a very good thing to have a professor of forestry for the teaching of their own pupils.

150. Then your preference is not for the teaching of a Government school *per se*; but you do not see that in the case of Cirencester it would be easy to adapt their arrangements to the needs of a forestry school?—That is so.

151. Did I understand your reason for thinking that it would be necessary to have a separate school for Scotland was on account of the distance?—Yes, quite so.

Sir Edmund Lechmere.

152. In answer to a question put by Sir John Lubbock, with reference to the expense of Cirencester, I think one of your objections to Cooper's Hill last year was, the great expense of attending there, and that you thought that on account of the expense Cooper's Hill would hardly provide a school, which was very essential, namely, one for wood-reeves and wood-bailiffs?—The arrangement I contemplated in my memorandum was only to have the instruction near Cooper's Hill for them, but in no way connected with it, except so far as that the professor would have the charge of the forest and also of the education, and that practical education should be given by the officer in charge of the forest, but subordinate to the professor. I would not advocate the sending of the forest pupils to Cooper's Hill for any other instruction.

153. But that education would be quite distinct from the education given at Cooper's Hill, which is given to engineers?—Certainly. The only thing is, that there being a professor of forestry already there, by giving him a few hundreds a year extra, you ought to be able to secure his services for giving instruction to other people.

154. Supposing that the woods could be got and placed under the control of the professor of a forest

1 June 1886.]

Colonel PEARSON.

[Continued.]

Sir Edmund Lechmere—continued.

a forest school, would not a forest school at Cirencester be more appropriate, that being an agricultural college, than to attach it to a college which is intended primarily for engineering?—But you have not got a forestry professor at Cirencester.

155. But you suggested just now that you might have a forestry professor at Cirencester?—But it is a long way from London, and therefore I look upon it that the bulk of these land agents, though there are some of them at Cirencester, yet the bulk of them get their education in London; and I think there is a great advantage in having your school as near the metropolis as you can.

Mr. Biddulph.

156. You stated just now, with regard to the School of Forestry in Scotland, that you did not consider a distance of 120 miles too far off for the purpose of teaching forestry, in connection with the school at Edinburgh?—But I also contemplated that they would get into the Duke of Buccleuch's, or some of these woods round about Edinburgh, for the purpose of daily education.

157. I suppose you would be aware that the Forest of Dean is very accessible from the Cirencester College?—It is so, I believe.

158. It is only a few miles by rail?—But I prefer Cooper's Hill. I think you would get more pupils at Cooper's Hill than you would at Cirencester.

Chairman.

159. You came here more especially to give the Committee information as regards the establishment of a school of forestry; and I do not think we have had information exactly before us as to how long the School of Forestry has gone on at Cooper's Hill?—I think the Professor went there last September; it is only just commenced; the pupils are doing their last year at Nancy now.

160. Then I must go further back, and ask you what steps the Indian Government took to have men educated for forest purposes?—I suppose it was in 1864 when pupils were first sent to Nancy. Dr. Brandis organised a system of instruction upon the Continent, sending half the pupils to Germany, to Minden, I think, one of the German forest schools, and the other half to Nancy.

161. Was that under the orders of the Indian Government?—Yes.

162. They entrusted him with the carrying out of the plan?—Yes, they entrusted him with the duty of organizing a system of education. When I came home at the end of 1872 the pupils had got idle, and there was not much work being done. They were getting out of hand; and very soon after I came home, at the end of 1872, the Indian Government sent me to Nancy, to look after the pupils and superintend their education, and they transferred all the pupils very shortly afterwards from Germany to Nancy; so they were all immediately under my control, and there I remained 11 years.

163. How many pupils had you under your charge?—At first I had not more than three a year; but they increased very shortly afterwards, when six, seven, and eight were sent to me each year; and of late years I had as many as 20 going through the three years' course.

0.108.

Chairman—continued.

164. Did they go free?—At first the Government used to give them 50 *l.* a year to pay for their education, lately they had to pay 3,500 francs, which they paid entirely themselves.

165. Are you speaking of the English or the French?—Of both; the French had to pay for instruction there.

166. They were admitted by competition?—Yes, and the English pupils were admitted by competition, and after their examination (they generally had an examination in January) they were sent to me at Nancy about the 1st of March, and from the 1st of March to November they were going through a sort of probationary course under one of the professors, who took them into the forest; they learnt French, and they got into the way of following the lectures. At the end of two years they passed out by a final examination, for which a certain standard was exacted.

167. They paid how much each?—The English pupils paid 144 *l.* a year, and the French paid 120 *l.* a year, which went entirely for their maintenance in the school, because they paid nothing for their education. The professors were paid by the Government.

168. The men going in for this education have to pay at Nancy about 130 *l.* a year for two years?—For 2½ years; we used to calculate the whole expense incurred as somewhere about 500 *l.*, including journeys and the expense of the previous education.

169. The French were also admitted by competition?—Yes, the French were also admitted by competition.

170. Would they also have to pay a sum of 500 *l.*?—It was rather less for the French, because they were lodged in the school, and the school buildings were the property of the Government; they got in minus their lodging, but it was pretty expensive for them, because they were charged for their uniforms, and for the furniture of their rooms, and there were great complaints about it.

171. Is the Nancy school self-supporting?—There are two establishments in France, one at Les Barres for subordinates, while the Nancy school is for the superior grade. The Government grant was about 150,000 francs, or from 5,000 *l.* to 6,000 *l.* annually for forest education, but it did not appear from the accounts how much of the grant went to each school; sometimes the Government favoured one and sometimes another; the professors were paid, and the school buildings kept up out of the grant.

172. Have the Indian Government ever made a suggestion to meet this difficulty of the want of a practical training station for their pupils?—Since I left the Government service two years ago I have not been consulted by the India Office at all; I know nothing except what I have heard from my friends.

173. Do you believe that they have considered it?—It is absolutely necessary they should do it; but the present plan is that they should go abroad into the French or German forests for the practical study.

174. Do you think that the Indian Government might be expected to contribute towards the establishment of a practical training station?

B 3

—If

1 June 1886.]

Colonel PEARSON.

[Continued.]

Chairman—continued.

—If they benefit by it, I do not see why they should not contribute.

175. You suggested Windsor Forest as the most practicable station for learning forestry; would there be in the area that might be allotted for that purpose varying conditions of climate, aspect, and altitude, sufficient to make it a good practical training garden?—You would have to supplement it, undoubtedly; but what is absolutely necessary for the purpose of practical explanation would probably be found there. I do not see how you can get on without something of the sort.

176. And you think it might be found for practical purposes in the Windsor Forest?—I believe in the forests round about there it might be found.

177. And, although 130 miles is possible to be

Chairman—continued.

reached from the school, it would be far better to have something you could see in the course of an afternoon's walk?—It would be absolutely necessary that the pupils should be able to go into some woods within an easy walk.

178. With regard to this very interesting tour of M. Boppe, in Scotland, have you any idea how the expenses of that were met?—The Indian Government paid for everything; we were met everywhere by carriages, and we were sent about very well indeed.

179. There was nothing to show in the Paper that was handed in that it was entirely organised by the Indian Government?—It was certainly organised by the Indian Government entirely. I was desired to go with M. Boppe.

The Rev. JOHN CRUMBIE BROWN, LL.D., called in; and Examined.

Chairman.

180. You are the author of an interesting work on Forest Science, I believe?—I am the author of several works upon that subject.

181. And you have kindly come here to give the Committee your idea of how or under what conditions a school of forestry might be established?—Yes. The particular point upon which I can supply information to the Committee is this: I know a good deal of the waste that is going on in our colonies. I have made myself acquainted with the most advanced forest economy of the day; and I am also acquainted with most of the schools of forestry upon the Continent; I have visited several, and I am prepared to state how I consider Scotchmen can be most efficiently, and at the least expense, trained up so as to manage our colonial forests advantageously. That is the particular point to which I have given attention.

182. But the Committee are principally interested in our home forests?—I am aware of that; but the point upon which I can give information principally is with reference to colonial forests, which are a large part of the British possessions, as much as India is, upon which much evidence has been already given.

183. The Committee looked forward with great interest to hear your evidence upon this subject; but I think we ought to try and confine ourselves as much as possible first, perhaps, to the necessity of such a school in view of the waste that is being committed daily; and, secondly, as to what practical steps should be, and are possible to be, taken to make up for that waste, and to raise up a class of men who will enable us to deal with our forests better than they have been dealt with hitherto?—I will endeavour to give my evidence upon that aspect of the case.

Sir John Lubbock.

184. You have had a great deal of experience in South Africa with regard to the forests there, have you not?—Yes; I know the waste which has been going on, and the consequences which have followed that waste.

185. I believe that when the Cape authorities were in want of a forest officer they had to obtain the services of a French gentleman?—

Sir John Lubbock—continued.

They got a French gentleman to look after their forests, who, when he went to the colony, could not, it is said, speak a word of English.

186. Naturally they would have preferred to have appointed an Englishman if they could have found one competent?—Decidedly; but there was not such an Englishman to be found.

187. And that would be the case, I daresay, at the present moment?—It would be the case at the present moment, excepting that there are officials from India who have returned to this country, who might be disposed to go to the Cape as being a healthy settlement; but there is not, so far as I know, an English forester capable of taking the management of the Colonial forests.

188. And there are only a very few Indian officials who are at any time available?—Apparently.

189. And these the Government would be sorry to lose?—I have no doubt of it.

190. So that there is great need for trained foresters in this country?—Very great need.

191. You are of opinion, are you not, that the management of our forests and woodlands would be much more successfully carried on if there were properly trained foresters to do the work?—I am satisfied that they would be, but simply upon this ground: according to the advanced forestry science of the day, there is no hard and fast rule laid down for the management of any forest; but the students in the various schools upon the Continent are thoroughly instructed in all that pertains to the healthful growth of trees, and then they make their own application of the science to the circumstances in which they may be called to act.

192. In fact, the establishment of a forest school would, in your judgment, be a great advantage, not only to the Colonies of which you were speaking just now, but also to the mother country?—Very great.

193. You think that a scientific education and a regular course of training on the part of those who have the management of them would very much improve the condition of our woodlands?—Very much.

194. Do you consider it would be necessary to have

1 June 1886.]

Rev. J. C. BROWN, LL.D.

[Continued.]

Sir John Lubbock—continued.

have a tract of woodland closely contiguous to such a school?—Not at all.

195. But you would be of opinion, would you not, that it would be necessary to have control of a tract of woodland, although it need not necessarily be immediately on the spot or contiguous?—I may state my opinion, and that is the opinion of the majority of the forest officials, forest administrators, and professors of forest science on the Continent—

196. That the management of this particular tract of forest should be under the control of those who were charged with the instruction in the forest school; is that so?—No, not at all. The question has come up on the Continent in this form: a conference of German foresters, forest administrators and professors of forest science, was held when the question was discussed: Is it desirable to have schools of forestry as separate and special institutions, or to have them connected with the higher schools and universities of the Continent. It was only incidentally that the question of forests came up in that connection. There were only three or four in favour of maintaining the old special schools in connection with the forests; the rest, to a man, were opposed to it.

197. Then you do not think it necessary that the management of the woodlands in which the instruction is given should be under the control of those who give that instruction?—Although it is not necessary that it should be under the control of those communicating the instruction, it is desirable that there should be forests to which the students along with the professor may have access. They may be in the neighbourhood of the school; if in the neighbourhood so much the better; but they may be 100 miles off, or they may be 200 miles off. It is desirable that they should have forests to which they have access, but it is not necessary that those should be under the control or direction of those communicating the instruction.

198. Supposing, for instance, the Cirencester College were to take up forest instruction if it had access to the Forest of Dean, that you think would be sufficient for the purpose?—The principle would lead me to say so. I do not know the details of the Cirencester College, and therefore I cannot commit myself beyond that; but the principle involved would lead me to say so.

199. What do you think would be the most suitable situation for a forest school?—Edinburgh.

200. Do you think it would be desirable to have one forest school for England and Scotland, or do you think that the conditions of Scotland are so different that it would be desirable to have two?—My belief is that such tuition might be followed in Edinburgh as to fit English foresters for the management of English forests; but if, from national feeling or from disposition, it is considered better to have such a school as Cooper's Hill, which is founded upon a very different model from that of our Scottish educational institutions, by all means let us have it; but my opinion is that we could do all that is required perfectly well in Scotland.

201. You think that one forest school would be sufficient?—One would be quite sufficient, and there is an advantage in having one

O.108.

Sir John Lubbock—continued.

thoroughly equipped and thoroughly efficiently conducted institution.

202. How far do you think a forest school for the use of Great Britain should be formed upon the model of the modern Continental schools?—I am acquainted with every school upon the Continent, and have visited several. There are many upon the type of which a British school might be formed; there is no one to which, as a type, the British school should be conformed, much less any one which would serve as a model.

203. Which of their forest schools, upon the whole, do you think would be the one most nearly adapted to our requirements?—If in Edinburgh, I should think the school in Spain.

204. If the school were established in Edinburgh what arrangements do you suggest should be made with regard to it?—It depends very much upon the form that it may take. If it were a private enterprise, managed by the Arboriculture Society, or the Highland Agricultural Society, one form; if it were connected with the Watt Institute, another; if connected with the University, a third; if connected with the Museum of Art and Science under the Committee of Council on Education, a fourth.

205. Which, upon the whole, do you think would be the best?—I have a very strong conviction that, upon the whole, it is best that it should be connected with the Science and Art Department of the Committee of Council on Education, if it were founded upon some such model as the School of Mines in London, or the School of Science in Dublin.

206. You think, then, it would be better that it should be a Government school rather than be left in any way to private enterprise?—It would be very much better that it should be a Government school.

207. Would you be prepared to give the Committee a rather more definite sketch as to how you would propose to arrange the system?—One great advantage of its being in connection with the Committee of Council on Education is this: it is desirable to have young Scotch foresters thoroughly educated. They are fitted by heredity, and by early training, for giving themselves entirely to forest work; it is, therefore, desirable that they should be specially trained. In connection with the School of Mines in London, and the School of Science in Dublin, there is ample provision made for the support of any of the students who require support, and yet it is not given as a dole, or as an alms, but as the result of competitive examination and merit.

208. Did you hear the evidence given by Colonel Pearson as to the staff he would think desirable for a forest school?—I did.

209. Do you concur with that evidence?—No. He speaks of Cooper's Hill College; I speak of a school in very different circumstances. The idea of having it in connection with the Committee of Council on Education rather than with the university is, that there is a possibility of a gradual development in the former case, whereas if it were in connection with the university you would be tied to one professor. Now, it seems to the student of forest science as ridiculous to speak of one professor of forestry as to speak of one professor of medicine, or of one professor

B 4

1 June 1886.]

Rev. J. C. BROWN, LL.D.

[Continued.]

Sir John Lubbock—continued.

professor of theology. If it were in connection with the School of Science there might be one individual, such as Colonel Pearson referred to, at first taking the whole management; and there might be, at comparatively little expense, specialists obtained from the Continent to take particular branches of study for three weeks, or six weeks, or three months at a time, until it was seen from the results produced that it would be desirable to incur increased expenditure in getting a larger staff of officers and instructors.

210. Have you prepared a detailed curriculum which you would suggest. I assume a three years' course of study?—I have. My suggestions are as follows:

First year. In the Winter Session let instruction be given in the structure and physiology of trees and shrubs, and in the geographical distribution of forests; in the treatment of forests by Sartage, by Jardinage, by *à la et aire*, by *les compartiments*, or the *Fachwerke Methode* of Germany; in the application of this to coppice wood, with a view to securing, along with other advantages, a sustained production of wood; and in the application of it to timber forests, according as the object may be to secure from these a maximum size of timber, or a maximum produce of wood, or a maximum pecuniary return, along with natural reproduction, sustained production, and progressive improvement of the woods; and in measures to be employed in the conversion of coppice wood into timber forest, of timber forest into coppice wood, of mixed woods into either, and of either into mixed woods.

With attendance on the classes in the University for the study of natural history, of mathematics and of engineering; or, with attendance on the classes in the Watt Institution and School of Arts for the study of mechanical philosophy, and of mathematics.

Summer Session. Attendance on the classes in the University for the study of botany and vegetable histology; and of practical natural history, and of practical engineering; or attendance on classes, if open, in the Watt Institution for the study of botany, and of mechanical and geometrical drawing.

Autumn Months. Tours of observation, with or without the teacher, in woods and forests in Britain, in France, in Germany, or in the north of Europe.

Second year. Winter months. Instruction in regard to forest economy, forest legislation, and forest literature in Britain; in France and in Germany, countries in advance of all others in forest science, and in the practical application of it to the management of forests; in Russia, where arrangements are being made to introduce and to carry out extensively the improved forest management practised in Germany and in France; in Finland, where arrangements have been made to manage the forests in accordance with the requirements of forest science; in Sweden, where the latest arrangements suggested by forest science are being carried out with vigour; in British colonies; in America, and in India, where have been introduced many of the suggestions of modern forest science, and the

Sir John Lubbock—continued.

forest economy practised on the Continent of Europe.

With the attendance of the classes in the university for the study of theoretic chemistry and practical chemistry, natural philosophy, and the practical application of the same; or with attendance at the classes in the Watt Institution and School of Arts for the study of chemistry and practical chemistry, of engineering, and of geology.

Summer and autumn months: practical experience in the management of woods, or in the management of nurseries, to be acquired under the direction of approved foresters, or approved nurserymen.

Third year: winter session only. Instruction in the chemistry of vegetation and of soils; in the meteorological effects of forests on moisture, on temperature, and on constituents of the atmosphere; in sylviculture, as applied in Belgium, &c., to utilise waste lands; in the lands of France, to arrest and utilise drift sands; in the Alps, the Cévennes, and the Pyrenees, to prevent the disastrous effects and consequences of torrents; on the Karst, in Illyria, to restore fertility to land rendered sterile by the destruction of trees; in the United States of America, to prevent anticipated evils; in India, to secure desiderated good; in Britain, to increase amenity, covert, and shelter; and instruction in the injurious effects of cattle, insects, and various diseases on trees.

With attendance on the classes in the university for the study of geology; of agriculture; and, if it be desired, any of the following: for the study of political economy, of conveyancing, or of bandaging and surgical appliances; or with attendance on the classes in the Watt Institution for the study of animal physiology, of German, or of French. I may add, that in connection with the above studies I would advise that a course of instruction should be given in forest botany, in forest mycology, or the study of fungi, in forest entomology, in forest ornithology, and in forest masology.

211. Hitherto I have asked you questions with regard to the advantages which might be derived from the instruction given to the students; would you suggest that in such a school, if established, there should be any opportunity for research as to the different circumstances affecting forest products?—I consider that it would be exceedingly desirable. There are now established at the seats of several of the schools of forestry upon the Continent stations for research; they are not connected with the school, they are supported by the Government, but placed at the seat of the school in order that the students may have the benefit of the professor there; and in some of the schools I have referred to, as in that in Spain, where they have failed to secure such an experimental station, very great advantage has resulted from the students being encouraged by the professor to engage in research upon a smaller scale.

212. Would you propose that such a school should likewise make any experiments with regard to the suitability of particular soils, exposure, the combination or association of different trees one with another, and other similar problems?—There are no objections to their doing so. These stations for research, to which I have referred,

1 June 1886.]

Rev. J. C. BROWN, LL.D.

[Continued.]

Sir John Lubbock—continued.

eferred, have an international connection; when one is formed they communicate with the others, and state the particular department to which they intend to give their attention, and they leave the rest to the others, so that no two of them shall be occupying the same field of research.

213. So that, although that might not be the primary object of the school, you think it would be a very considerable advantage?—Certainly.

Dr. Farquharson.

214. This elaborate course of study that you suggest, I presume, was only for those foresters who are to be employed abroad in public work?—My view is that the students should be trained as students, and, if necessary, fitted for any appointment in India and the colonies, or at home, for their being thoroughly qualified scientific students of forestry, with the full knowledge of the practical application to be made of the science.

215. What interests proprietors in Scotland more is the kind of smaller education to be given to the foresters to whom we pay, say, from 80 £. to 100 £. a year; have you any plan to suggest which would lay down the principles for the systematic training of such men?—I consider that if such an idea as I have thrown out were followed such students could attend the Watt Institute at comparatively small expense. They might attend one year or more, and arrangements might be made for giving them instruction in the evening, so that they might support themselves by working in the nurseries in the neighbourhood of Edinburgh. If it were considered undesirable that they should go through a two and a-half years' course, there could be no difficulty in the professor giving a short summary of forest science in its application to practical forestry in 50 lectures, or in 100 lectures; and the attendance upon such lectures, of course, would clearly meet the case of such persons as you have referred to. I have been long desirous that forestry should be introduced into our primary schools. The arrangements made at Kensington are such as would facilitate this being done at very little expense, and thus there would be raised up a body of well-instructed woodmen, forest labourers, and others.

216. Colonel Pearson told us that he thought a sufficiently practical course might be given to foresters of this stamp in three months; do you agree with that?—I do not believe it; referring to the views that are entertained by foresters, forest administrators, who are Government officials, and professors of forest science, their general impression appears to me to be that it is desirable that, when students are at college they should be at college, and that when they are in the forest they should be in the forest; that they should be at the school the whole time, except on Saturday afternoon excursions to the forest, and then spend some time, say three months, six months, or whatever time may be allowed them in practical work in the forests.

217. Where would you propose that they should go for their practical work from the Watt Institute?—For practical work there are a number of forests which are conducted in an excellent way, and the foresters there, I have no doubt, would be willing, with the consent of the proprietors, to make arrangements for reference.

Dr. Farquharson—continued.

ceiving such students for three months if there be a winter and a summer session, or six months if they have only a winter session. But, apart from that, an idea thrown out by Captain Mackenzie, who has charge of Epping Forest, was that a school should be established in connection with Epping Forest. And he suggested that the students should be engaged in practical work in Epping Forest, and that, after a year there, the students should go on to Windsor Forest for twelve months, or to some other of the Crown forests. I asked him if he would be willing to engage students from Edinburgh, paying them wages and engaging them in the same way as students from the home college, and he said, "Certainly."

218. Would the training in England be sufficient to enable a forester to carry on a Scotch forest with the different kind of trees and the different climate there?—It is alleged that it would not. A meeting of the British Arboriculture Society was held in Newcastle a month ago, and one of the members spoke very decidedly upon the importance of having a school of forestry in the North of England and some extensive forest at command. There is, obviously, an advantage in enlarging as much as possible the experience of foresters. Speaking of the Scottish foresters I would say that I think it would be a very great advantage for them to be able to see a little of English forests, along with what they see in the management of private forests in Scotland.

219. Then you think the general principles acquired, wherever the school might be, could be made applicable to the forests in which they were working?—Yes.

220. Have you any experience of the present working in Scotch forests?—No.

221. You cannot give an opinion as to whether they are scientifically managed enough to render them available for instruction?—The management in this country is so different from that which is followed in India, and upon the Continent, that, with the exception of gaining general information, and skill and handicraft, it would not suffice.

222. It would not suffice for a man who had to go to India, but would it not suffice for a man in a Scotch forest?—It would not enable him to manage a forest in the Colonies.

223. But would it enable a man to manage a Scotch forest?—It would be a very great advantage to a Scotch forester to have some months' instruction in a college; there can be no question about that; but it would be also desirable to have training in Scotch forests to learn the application of the principles he had acquired to the woods he had to deal with.

Mr. Mark Stewart.

224. In regard to the waste that is going on abroad, is it your opinion that the value of wood will increase in this country?—Much will depend on the value of iron, and the extent to which it can be used instead of wood. One reason why so little attention has been given to scientific forestry in Britain, as compared with the Continent, is that we have fuel apart from wood at command, which they have not. We have timber brought

1 June 1886.]

Rev. J. C. BROWN, LL.D.

[Continued.]

Mr. Mark Stewart—continued.

from all countries, and valuable woods from all nations freely introduced; and therefore there has been no necessity for the same amount of attention being given to the subject here. With regard to the relative price of home-grown timber and foreign timber, that is largely dependent upon the expense of transport. In illustration of the expense of transport to the Cape of Good Hope, I may mention that we could get timber from the Baltic at less expense than we could bring it from Table Mountain at the back of the city.

225. May we take it as a fact that good wood, whether from our Colonies or elsewhere, is decreasing very rapidly?—It is decreasing very rapidly, and the effect is not only loss of wood, but also an injurious effect upon the humidity of the atmosphere.

226. Is it your opinion that in a few years, if iron is produced very much at the rate it is now, and other things *pari passu*, wood will become very much more valuable in this country than it is now?—I have no doubt it will, from the diminished supply; and there are many purposes to which wood can be put to which iron is not now applied.

227. You spoke about various places where a school of forestry might be started; for example, you mentioned the Agricultural Society of Scotland; would you think that that was the best institution to which to affiliate a branch of the School of Forestry; would it be better than the University of Edinburgh?—My idea is, that the School of Forestry in Edinburgh does not require for the benefit of the students to have any other affiliated with it; there would be no difficulty in getting all the experience and observation that is required in those forests without there being a separate school of forestry established elsewhere.

228. Then do I gather from you that you do not consider that it would be of advantage to ally a school of forestry with the Highland Agricultural Society?—I do not think it would. I do not think that a school of forestry can be established in Scotland at present by private individuals; it is necessary that some corporate body should take it up. On many accounts I think it would be advisable that the Government should take it up rather than the Highland Society or the Agricultural Society, or any existing organisation.

229. Have you formed any idea as to the probable expense of such an undertaking; how much the Government would be called upon to contribute?—I consider that the cheapest arrangement would be one connected with the Watt Institute, towards which the Government would not be called upon to contribute anything; but then there is the want of prestige, and I refer to the effect of prestige in preventing distinguished teachers getting pupils, and getting employment for the pupils when once they have passed through the course. The cheapest arrangement, combined with prestige, would be the establishment of a professorship in the University, because then we would have a definite sum, and we could not go beyond it. It would be more expensive, I believe, having a school of forestry organised in connection with the Committee of Council on Education; but it need not be much more expensive at first. The great expense would be, when once it

Mr. Mark Stewart—continued.

has been seen, as I have no doubt it will be seen in a year or two years, that it is desirable to go on increasing the training staff.

230. But you have no doubt that a professor in the University of Edinburgh would answer the present purposes?—A great deal would depend upon the professor. You have no security that you would have a professor with the necessary encyclopædic information to succeed the first or the second professor, and there is very great danger of the professorship degenerating into a mere respectable sinecure. There is less risk of that, I consider in connection with the Council of Education.

231. You would hardly expect, from a practical point of view, a forester who had not had any great training in this way, except practically, to attend classes in Edinburgh over a space of three years?—Hence the advantage of having what I may call an experimental or tentative course of lectures for one year and seeing what could be done, and then entering upon a larger course subsequently if this be found successful.

232. It is your opinion that they could get sufficient information in the course of one year's lectures independently of the practical experience in the forest?—They would get the scientific information with illustrations of its practical application.

233. Then you propose that they should go into the practical work of forestry at a subsequent period of their education?—Yes, and if they would attend the summer course they might keep the autumn free for this. The autumn should certainly be spent in practical work; and if there is not a summer course they should spend the whole summer in practical work. But, as has been mentioned by Colonel Pearson, on the Continent the students go great distances with the professors; they frequently go into other countries, and if they had a professor qualified to take them to any of the countries upon the Continent of Europe, and acquainted with the languages, I have no doubt that this might be satisfactorily arranged. In the last number of "Forestry" it is suggested that they should go even to Canada.

234. Your view would be that these young men should attend classes at the college, as they attend other classes for the purpose of general education?—Yes; I consider that if in connection with the Museum of Science and Art it is only necessary to have classes in forestry, all the accessory studies can be pursued either at the University or at the Watt Institute according to the means of students. If a student be able to go to the University and attend the University classes he can do so; if he have not the means or the disposition to attend the University he can go to the Watt Institute and get a thorough instruction upon the accessory subjects, leaving no necessity for anything more being done but to provide for what are strictly forest professional studies.

235. But you assume that the student would have to give up both time and attention to that particular study while at the University?—That would be exceedingly desirable; but there are many young men who support themselves by teaching while at the University; and if the arrangements of the hours were such, and a forester wished to support himself by engaging in work

1 June 1886.]

Rev. J. C. BROWN, LL.D.

[Continued.]

Mr. Mark Stewart—continued.

work in the nursery, he might then attend the evening classes of the Watt Institute for all the accessory subjects, mathematics, geology, road-making, and everything of that kind.

236. Then he could pursue his course of instruction during the ordinary curriculum of his University education?—Yes.

Chairman.

237. I would just ask whether, in view of this book of yours, entitled, "Schools of Forestry in Europe," you agree with this remark of Dr. Hooker's, where he says, "Forestry, a subject so utterly neglected in this country that we are forced to send all candidates for forest appointments in India to France or Germany for instruction, both in theory and practice, holds on the Continent an honourable, and even a distinguished, place among the branches of a liberal education"?—I agree with that fully.

238. Do you agree also with this: "Wherever the English rule extends, with the single exception of India, the same apathy or, at least, inaction prevails"?—Yes. Now, however, there is an interest taken in the subject in South Africa: there is also interest taken in it in South Australia, and a movement has been made in New Zealand since that was stated by Sir Joseph Hooker; so that I cannot say that everywhere there is the same apathy now prevailing. There has been also a movement more or less important in Canada, and a very widespread movement in the United States of America, but at the time that statement was made by Sir Joseph Hooker it was the case.

239. Is it the fact that in Poland, Russia, Austria, Finland, Sweden, France, and everywhere in Germany, there have been established by the Government schools of forest science or classes in connection with existing universities?—That is generally the case, and many of them I have visited.

240. That has, to some extent, arisen, I think I gather, from the fact that from the situation of those countries the supply of timber for the purposes of fuel, and also for other purposes, has not been so accessible as it has been to us in Great Britain?—It is very largely so; but it is also the case in the United States of America, in Canada, and in many of our colonies, that the country is being ruined by the destruction of forests, owing to the effect produced upon the humidity of the climate. It is an open question—I have my opinion upon it—whether or no forests increase the quantity of rainfall: but whether they increase it or no they certainly do affect the distribution of rainfall, both in time and space. The distribution of the forests may have arisen from the distribution of the rainfall; but the forests once established, there is a very much more equable distribution of the rain in time, and of the rain in space. Besides this, great destruction has been wrought, and is still being wrought, by inundations; and it has now been proved, beyond all question, by expensive experiments, and not only by experiments, but by extensive operations with results which have fully justified the undertaking, that there is no more efficient way of preventing inundations than planting the basin of reception with trees; and it is the most thorough way of doing so.

O. 108.

Chairman—continued.

241. In regard to the school, supposing that the students were able to spend three years at it, would you suggest that some such curriculum as is given in your pamphlet would be a suitable one for the purpose?—It would.

242. I gather from your evidence that you do not attach the same importance that Colonel Pearson did to having a practical training station upon the spot?—No.

243. You think that facilities for lectures and study should be given, either in connection with the School of Art, or in connection with the University, if it were to be in Edinburgh?—I do, but in Edinburgh the Watt Institute is also known as the School of Art, and therefore I would say, or in the Museum of Art and Science under the direction of the Committee of Council on Education.

244. And that those who profited by these lectures should have the opportunity of taking excursions into the woodlands of the district to see what practical illustrations they could draw?—Yes, both weekly excursions into the immediate neighbourhood, and more lengthened excursions between the sessions.

245. I gather that you recommend Edinburgh as the best place for such a school from your knowledge of Scotland; do you recommend Edinburgh in preference to Cooper's Hill, or in preference to any other part of England?—In preference to any part either of England, Scotland, or Ireland. I may mention, with regard to Edinburgh, that the inhabitants have, at the expense of 20,000 £, purchased the arboretum with the view of its being made auxiliary to a school of forestry. In Edinburgh the first International Forestry Exhibition was held also with this in view, and some thousands of the articles sent to the International Forestry Exhibition have been transferred to the Museum of Science and Art. There we have an Arboricultural Society; all interest in Scotland in arboriculture seems to gravitate towards Edinburgh. We have extensive nurseries in the neighbourhood; we have woods at no very great distance, and an offer has been made of a cheap feu of extensive grounds, extending from the suburbs of Edinburgh to the top of the Pentlands, varying 1,200 feet in altitude, and including different descriptions of timber, all tending to point to Edinburgh as a place with peculiar advantages in this point of view. Then the circumstance of having an university, where students able to pay for an university education may go for the accessory studies, and at the same time the Watt Institute, where tradesmen, and those whose means are limited, can go through a similar course of study, adds to the importance of it.

246. But there are some similar advantages to be had in connection with Kew, are there not?—If the arboretum in Edinburgh were made what it should be (it is now in the hands of the Government), I believe that more might be done than is done at Kew with a view to the promotion of the study of forestry. The arboretum at Kew consists largely of young trees; but the arboretum at Edinburgh consists very largely of old trees, with every facility for making forestry a practical study.

C 2

Friday, 4th June 1886.

MEMBERS PRESENT:

Mr. Charles Acland.
Mr. Biddulph.
Mr. Evelyn.
Dr. Farquharson.
Mr. Gillhooly.
Sir George Grant.
Mr. Albert Grey.
Sir John Kennaway.

Sir Edmund Lechmere.
Sir John Lubbock.
Sir Herbert Maxwell.
Mr. Mulholland.
Colonel Nolan.
Mr. Northcote.
Mr. Seely.
Mr. Mark Stewart.

SIR JOHN KENNAWAY, BART., IN THE CHAIR.

Mr. W. SCHLICH, Ph.D., called in; and Examined.

Sir John Lubbock.

247. I BELIEVE you have given a great deal of attention to the question of forestry for many years past?—Yes, I have, since 1859.

248. Will you have the kindness to state to the Committee your exact position in connection with the Cooper's Hill School?—I am Inspector General of Forests to the Government of India, and, as such, I have been deputed by the Government of India, at the request of the Secretary of State, to make the necessary arrangements at Cooper's Hill for the starting of a forest school, as a branch of the college, at which officers for the forest service shall be henceforth educated.

249. How long have you been in the Indian forest service?—Close upon 20 years.

250. You succeeded Dr. Brandis at the head of the Forest Department?—Yes.

251. I will ask you, in the first place, a few questions with respect to the importance of the subject. I believe we import annually about 18,000,000 *l.* worth of wood, do we not?—Yes.

252. And we also import 14,000,000 *l.* worth of forest products, of which a very considerable proportion could not be grown in this country; but there is a certain quantity of that very large sum which might be produced in this country, such as wood pulp and that class of article. Could you form any estimate how much of the 14,000,000 *l.* value consists of products which might be obtained here?—I am afraid I could not do so upon the spur of the moment, but I could supply it approximately; at any rate, I might say it would be a considerable proportion.

253. At any rate, it would be a considerable deduction from the 14,000,000 *l.* which we pay for imported wood products?—Yes; but both the 14,000,000 *l.* and the 18,000,000 *l.* include a good deal which we could not grow.

254. Our main supplies are derived chiefly from Sweden, Norway, Russia, and North America?—Yes.

Sir John Lubbock—continued.

255. Do you think there is reason to anticipate that the supply from Scandinavia and Russia is likely to fall off in the future?—I think it is very difficult to make any positive statement upon the subject, because it is very difficult to get reliable information with regard to these matters. My personal opinion is that the supply is likely to fall off, but not very rapidly.

256. At present the supply from those countries is 3,700,000 loads; and you have, I believe, expressed the opinion that, although the falling off may not be so rapid as some writers have assumed, still that we cannot rely upon Russia and Scandinavia supplying us with so large a quantity of timber for any great length of time?—That is my opinion; that it is likely to fall off, though I do not think that it will fall off very rapidly. I believe that the rapidity of the falling off has, in many instances, been over-estimated.

257. Out of the grand total of 6,000,000 loads of timber, Canada supplies us with 1,500,000; and I believe you have stated that gloomy reports have been received of the extensive destruction of forests in that country, and that, of course, also we cannot reckon safely upon receiving such large supplies in the future as we have received in the past?—As far as I can gather from the means at my disposal, I am inclined to think that the falling off in the supply from Canada will be much quicker than that from Russia and Norway.

258. We know very little about the supplies from South America or Africa, but there is no reason to suppose that we should obtain anything considerable from those countries?—I could not get any positive information upon the strength of which I could say that we are likely to get anything worth mentioning from those countries.

259. And there is very little likelihood of any supply from Australia, of course?—I think very little.

260. At

4 June 1886.]

Mr. SCHLICH, Ph.D.

[Continued.]

Sir John Lubbock—continued.

260. At the same time the Indian supply has been almost entirely that of teak, and there is no reason to expect that we should receive any other supply of wood from that country?—The reduction of private forests in India has been so rapid of late years, that all wood which is likely to be produced in India is likely to be required in India itself, with the exception of a certain amount of teak, which will always be available for export.

261. Therefore, upon the whole, the probability is that the supply of timber will considerably diminish in future?—I believe it will, gradually.

262. And you have, have you not, expressed the opinion that, although you do not anticipate any panic as regards the timber supply, still here is every prospect that in the future the prices will tend to rise, and that woods now planted in Great Britain and Ireland may be fairly expected to be remunerative?—That is my personal opinion.

263. And that, in fact, having regard to the probable falling off in our present supplies, it is very desirable that steps should be taken to secure a better supply in the future?—I feel some difficulty in replying in a direct way to his question. The opinion I hold, personally, is that there is a fair field for investing a certain amount of capital in the production of timber. But whether I would exactly go as far as to say that it is desirable to do anything of that class would be another question. Still I think there is a fair field for investing in woodlands, provided the woods are planted upon surplus lands, that is to say, lands not required for agriculture. I do not believe that lands which are required, or could usefully be employed, for agriculture will under forest yield the same return on the invested capital as they would under agriculture.

264. I am coming to that immediately; but my question as it stood was rather of a more general character. Take, for instance, the case of Canada; you have expressed the opinion, in your very interesting memoir, that "it is high time to take energetic steps towards the introduction of proper forest conservancy measures" into the country; are you strongly of that opinion?—I am very strongly of opinion that it would, as regards the question here under discussion, be one of the most important measures which the British Government could take to introduce a proper forest conservancy into Canada.

265. Then, as regards planting in Great Britain, are you of opinion that the surplus area is so great that extensive tracts could be set aside for forests without trenching upon the land required for agriculture?—There is a considerable area of waste land, the details of which are given in his report.

266. And though you do not wish to put the matter too strongly, the impression upon your mind is that a fair field for judicious enterprise exists in the extension of the woodlands of Great Britain and Ireland?—Yes, provided it is done in an economic manner.

267. As regards Ireland, I believe you have expressed the opinion that there are probably 1,000,000 acres which might be advantageously

Sir John Lubbock—continued.

planted in that country?—That is a rough estimate; about 2,000,000, I should say.

268. Those 2,000,000 acres, as they stand at present, make a very small return; and you say that the "afforestation could, I have no doubt, be made to pay fairly, apart from the benefit which the people in the poorer coast districts would derive from the increase of work afforded near their homes, and the protection which the forests would give to the adjoining fields, and to cattle;" that is still your opinion, is it not?—It is my opinion.

269. You attach great importance to the planting of parts of Ireland, not only on account of the value of the products that would be derived from them, but also from the protection that would be given to the cattle?—Yes.

270. As regards England, you say, "The total area of all waste lands amounts to 41,890 square miles. I am not in a position to state, at present, what proportion of this area is fit and available for forests, but on the whole it may, perhaps, be estimated at one-half, or 20,000 square miles in round figures. At any rate it is evident that there is sufficient room for a considerable extension of the woodlands in Great Britain and Ireland." Is that still your opinion?—As far as the information at my disposal goes, that is still my opinion.

271. You said, very truly, that in expressing that opinion you think it quite necessary that the planting and management of the woodlands should be economically and judiciously carried out. I presume the establishment of a forest school would be a very important thing in that point of view, would it not?—There can be no doubt that the establishment of a forest school would be of importance, because it would be likely to disseminate better views with regard to the management of woods.

272. Are you prepared to state to the Committee what the present arrangements are at Cooper's Hill with regard to instructions in forestry?—The Secretary of State in Council selects every year a certain number of young men from among those who have qualified in an examination held by the Civil Service Commissioners. For instance, last year he selected five, and this year he has advertised for eight. There is a competitive examination held, and from those who stand at the top of the list he selects those whom he considers best suited for the appointment. Generally he begins at the top and takes those standing at the top, provided there is nothing against them; if there is anything against one of them he can strike him out and take one lower down.

273. Until now those young men have been sent abroad for their actual forest instruction. In the first place, I believe, a certain number were sent to France, and a certain number to Germany, but latterly they have been all sent to the forest school at Nancy?—Yes.

274. Is it proposed that they should still go abroad during any part of their instruction?—Yes; they enter the ordinary course at Cooper's Hill in September of each year. They go through the ordinary course, generally speaking, until Easter; and then at Easter they drop certain

4 June 1886.]

Mr. SCHLICH, Ph.D.

[Continued.]

Sir John Lubbock—continued.

tain subjects, such as mathematics and geometrical drawing, and we substitute for those subjects botany and instruction in the different branches of forestry. Then, at the end of the first twelve months, they drop most of the curriculum subjects, retaining only a few, as, for instance, surveying and physics; and their time is principally employed in the second year in the study of botany and the different branches of forestry, entomology, and, we hope, in acquiring also some elementary knowledge of law; but the arrangements for that have not yet been made, because we have not yet arrived at the second year. At the end of the first year the present arrangement is that the students are taken for a short trip to the Continent for about three weeks, to a particular forest managed in such a way as will be most useful or most instructive to our Indian forest officers. They have to study the system of management in that particular district as closely as it is possible to do in the time. That is the autumn of the first year; and then, in the second year, having completed their theoretical subjects, they would be taken for three or four months again to forests upon the Continent, to study forest districts in various places and their management, to see the way in which the principles which they had been taught in the classroom are practically applied. We also use the forest near Windsor; and I also expect that they will be taken on occasional visits to the New Forest, Forest of Dean, or to some forests in the Highlands of Scotland.

275. Are there any facilities given to students who are not intended for the Indian Forest Service to take the course at Cooper's Hill?—No actual orders have been passed by the Secretary of State upon the subject, but I may confidently state that every facility will be given to outsiders who want to join the course, and I have just heard that one young gentleman proposes to join in September, to study on his own account.

Chairman.

276. Has that been agreed to?—It only arose during the last two days; but I can confidently state that it is intended to encourage this study on the part of private individuals, although no positive orders have been given upon the subject.

Sir John Lubbock.

277. The arrangements under which they would ultimately do so, may I say, are under consideration, or has it not gone so far as that?—It has not gone so far as that, but I have talked the matter over with some of the gentlemen at the India Office, and also with the president of the college.

Dr. Farquharson.

278. Would the outside student join the whole course, including engineering, or would he join the forestry course only?—There are many who join the course on their own account; in fact, all who take the chance of obtaining an engineer's appointment at the end of three years. We propose that this school should be made use of by those who are not directly interested in Indian forestry. But the difficulty of not following the

Dr. Farquharson—continued.

same course as the Indian engineers is, that those who fail to obtain employment in the forest service of India have a difficulty in finding employment elsewhere; whereas an engineer can always find work if he has failed to get into the Indian service. Having gone through the whole engineering course, he can almost certainly get employment elsewhere, whereas if the arrangement for the forest service of the Indian Government were an open one, and a certain number of appointments were offered for employment in India, those who failed to obtain them would probably be perfectly unable to obtain employment.

Sir John Lubbock.

279. The Committee have been informed that, at the present moment, there is a large demand for gentlemen skilled in forestry, and that there is no means of getting them; that in the case of a colony requiring such persons to take charge of their forests they have been obliged to appoint foreigners, through not finding any properly qualified Englishmen to discharge the duty?—That is so to a certain extent; but as far as the Indian Department goes, which has been mentioned in connection with that point, I should be anxious to correct a slight misapprehension by stating that the Indian Government has been most anxious throughout to assist the various Colonies in that direction; and we have sent Indian officers to various parts of the world, to the Cape, the Mauritius, Ceylon, and Cyprus, for example; but those men are always returned to us again, for this simple reason, that the Colonies will not offer proper conditions. They want to have the men, and be able to discharge them again at their will and pleasure. At the same time, the Government of India, although ready to help the Colonies, says, "We cannot let you have experienced men for the best portion of their working time, and then take them back again when they are becoming due for pension; that is not fair. We will help you, but you must offer those men proper conditions, and if you want them for any length of time you must take them on permanently." The result up to the present day, with one single exception, has been that the men always return to us; but we have been always ready to let the Colonies have the men if they will take them on permanently.

280. Has the Indian Forest Service at the present day a larger number of officials than it requires?—It has not; but it has always been considered good policy to help the Colonies in this way. We have a staff of about 160 superior officers, and if we let one of the officers go away, we can do with 159 until we replace him. The young men sent out from England are supernumeraries until they are absorbed into the regular scale, so that we can fill up a vacancy in the course of a short time.

281. I am quite aware that the Indian Government have been always anxious to assist the Colonies as far as they reasonably could; but my point is, that although they were desirous to help the Colonies they had not surplus officials whom they were anxious to get rid of?—

No;

4 June 1886.]

Mr. SCHLICH, Ph.D.

[Continued.]

Sir John Lubbock—continued.

No; we were not anxious at all to part with them. Those who were sent were generally taken from our best men.

282. Therefore you did not mean to imply, by the answer which you gave a short time ago, that there was a greater number of skilled foresters than you could employ, and that you had a difficulty in obtaining employment for them?—No, we have work for all our officers. There are certainly no English forest officers, except those employed by the Government of India, who could take up appointments of that class; there is no doubt about that.

283. The Indian Government have no more men than they require?—We have no more men than we require; but we have been always willing to give men when asked for them.

284. That has been as a matter of courtesy and consideration to the Colonies; but you yourselves have not had more men than you required for your own purposes?—I state distinctly that we do not wish to give those men up, but that we have been always ready to do so when asked under reasonable conditions.

285. Do those preparing for the forest service take the engineering course at Cooper's Hill, or any part of it?—They have of engineering proper only one lecture a week upon what is called "descriptive engineering;" that is to say, a knowledge of the materials used for building, one of which is timber. They take part in the ordinary instruction given in mathematics, surveying, physics, drawing, &c.

286. Have you been made acquainted with the evidence which Colonel Pearson gave before the Committee at their last meeting?—I only heard the last part of it.

287. And you are not prepared to state how far you concur or otherwise with the opinions he expressed?—No, I could not; I did not hear more than the latter portion of it.

288. On the whole, do you think it would be better, if a forest school were organised for this country, that it should be a Government institution, rather than that the endeavour should be made to induce a private institution to develop a course of forestry instruction?—I should think, generally speaking, it would hardly make any difference whether it were a Government or a private institution, provided instruction were given upon the right lines.

289. Colonel Pearson expressed strongly the opinion that, whether it were a private or a Government institution, it was necessary for it to have access to a certain amount of woodland of a character suitable for the purpose; do you concur in that view?—To train a real forester it is absolutely necessary.

290. Dr. Brown, if I understood him correctly, was rather of opinion that the instruction might be given mainly from lectures and books; but I gather that you agree with Colonel Pearson that it would be necessary to have access to, and control over, a suitable extent of woodland?—Will you let me explain what I mean a little in detail? If it is a case of officers of the class we educate for India, or if it is a case of educating practical wood managers for this country, then it is absolutely necessary to have access to some

Q.108.

Sir John Lubbock—continued.

forests in the vicinity which are managed in such a manner that they are fit to serve as training grounds. If, on the other hand, it is a question of giving some general ideas of forestry to land agents, as I have heard mentioned, that is to say, to gentlemen who manage large estates, but are not supposed themselves to carry out the real forest work, then a course of lectures might be arranged with occasional visits to some more distant forests. I should like to make a distinction in that respect.

291. As a matter of fact, the Continental forest schools have in most, if not in all, cases tracts of woodland open to them for the purpose of instruction?—Yes, that is true; in most cases they are immediately attached to a school.

292. Is it the invariable rule, or are there exceptions?—It is not the invariable rule. I went last year to look specially at three of the principal forest schools in Germany. In the case of two of them, namely, those at Giessen in Hesse Darmstadt, and at Tharand in Saxony, the schools are in immediate connection with forests. A third, which is probably the principal forest school in Germany, is that at Munich. There the forests are not immediately attached to the school; but there is a reason for that. The forest school there is part of the University, and the students who study there are expected to have already spent two years at another forest school of a class where there is a forest attached to the school, that is to say, the aspirants to forest appointments in Bavaria go to Aschaffenburg, where they study for two years, and there are forests immediately connected with that school. Having done that, they proceed for two more years to Munich to study forestry from a more general point of view, with the view of obtaining ultimately the highest appointments in the forest service of the country. I wished to explain that there was a special reason why there are no forests attached to this great forest school at Munich, where there are six professors of forestry, apart from the ordinary university professors.

293. And even in that case the students are expected to have passed a part of their course in schools which have a forest attached to them?—Yes; to do the thing properly, it is absolutely necessary to have control over a certain area of forests in the vicinity of the school.

294. Now with regard to the lower class of those who are employed in the management of woodlands, say, the bailiffs and wood-reeves, would you consider that in their case also a certain amount of forest instruction would render them much more valuable as forest officers?—I have no doubt it would.

295. You think that even if they went for a three months' course that would give them, though not complete instruction, still an amount of instruction which would be extremely valuable?—Whether a course of three months would do that, I am not prepared to say. The curriculum for men of that class would have to be to a very large extent of a practical nature; we would do best for that class of men by letting them work, as it were, in a sort of sample or pattern forest, and augmenting that by a series of simple lectures

c 4

upon

4 June 1886.]

Mr. SCHLICH, Ph.D.

[Continued.]

Sir John Lubbock—continued.

upon the most important subjects; as, for instance, a certain amount of botany, and a certain number of lectures on the principal silvicultural subjects and the system of management generally. What I mean to say is, that it would be essential that a great portion of their training should be of a practical turn, and that therefore to do it without a forest immediately accessible would be simply impossible.

296. Are you aware that there are a great number of landowners in this country who have a certain amount of woodlands, but not a very extensive amount, and that therefore it would not be worth their while to employ any person at a high salary, but who yet have to employ wood-reeves and wood-bailiffs; and I gather from the answer you have just given that the practical instruction to which you have referred would be of considerable value?—Yes. If I were an owner of woods in England myself, and wanted a man of that class, I should, in the present state of affairs, probably send him as an apprentice for some time to one of those shrewd Scotch wood-managers; or if there were a suitable school to which a forest was attached, which was managed in a satisfactory way, I should send him there for a time, so as to let him get a certain amount of theoretical instruction.

297. Would you kindly supply the Committee with a rather more detailed statement as to the mode in which you would suggest that a forest school should be organised, having regard in the first place to the higher grade, and secondly, to the requirements of wood-reeves and wood-bailiffs?—I shall be most happy to supply that.

Sir Herbert Maxwell.

298. You have spoken on the subject of the wood supply in Russia and Scandinavia; do you know that steps have been taken by the Governments of those countries to replenish the forests?—I have followed the subject generally from what I have seen in the scientific forestry papers which we have upon the Continent; that is to say, the information which has from time to time been published there; and I also know that there are various forest officers trained in Germany who have from time to time gone to Russia and taken part in the administration of the forests there; but I cannot say that I am specially acquainted with the subject in detail.

299. What I wanted to bring out was, whether you were aware of any provisions made by the Governments of those countries for the purpose of preventing the deterioration of existing forest lands, and the falling off of the supply of the wood from them?—There are arrangements made, but I fear that I could not detail them.

300. Are there any regulations to the same effect in Canada?—In Canada, I believe, as far as I am acquainted with the matter, that it is under discussion at the present moment; I do not think they have gone much further than that. I believe there has been a set of rules made, but the making of rules is very easy; I do not think that it has been attempted to carry them out.

301. You have spoken of an area of 2,000,000 acres in Ireland as suitable for planting; what is

Sir Herbert Maxwell—continued.

the general nature of that ground; does it include bog?—Yes, to a considerable extent.

302. There is a great deal of bog which is unsuitable for planting, is there not?—Yes, there is, but there is also a great deal that is suitable; anything that can be drained is suitable.

303. Of course you are aware that a great deal of the Irish bog could not be drained from want of fall?—That is so. I was only a short time in Ireland, and this report, from which the figure is taken, was written at the request of the Lord Lieutenant of Ireland. I could only make a guess to the effect that probably half of the available area is fit; I could not go further than that.

304. Have you formed any estimate of the amount of waste land available for planting in Scotland?—I believe the area is very much larger than it is in Ireland; practically 70 per cent. of Scotland is waste land.

305. But it is not all suitable for planting?—Not all, but I should say a very good proportion was.

306. Have you estimated the effect of climate and of violent gales, especially in the north part of these islands, upon the value or the profitable nature of planting?—The violent gales will, no doubt, affect the returns where the woods are directly exposed to them, but I do not think that the loss would be so great as is generally assumed.

307. I will ask you if your Continental experience has enabled you to observe an instance such as this: the late Duke of Buccleuch spent a great many years in planting a large extent of the south of Scotland; and a year or two ago, in 1883, two successive gales came, and it was estimated that 1,250,000 trees went down; have you any knowledge of a similar occurrence on the Continent?—I was, last September, in a large forest district called the Bavarian Forest, which does not mean the forest of Bavaria, but is a particular very extensive district running near the boundary between Bavaria and Bohemia. I was not prepared for this question, and I could not give the exact area, but it is a very extensive forest district. In the year 1870, if I remember rightly, they had a gale in this large extent of forest which threw down so much timber that, in spite of the efforts of the officers in charge (and the management is a very good one), all the available labour had not removed all the timber in 1885 when I was there; that was 15 years afterwards; some of it was entirely rotten.

308. That of course would entail a very great loss?—A very considerable loss.

309. You alluded to our Scotch foresters, and you were kind enough to call them "shrewd;" do you think there is a more practical knowledge of forestry in the north than in the south?—I do not know that; but I think there are more extensive forest lands in Scotland in the hands of one owner, and therefore, probably, there are better forests there. There is more appearance of development in Scotland.

310. I suppose all over the country your observations lead you to the conclusion that there is a great deal of waste by ignorant planting and subsequent ill-management?—I should be afraid to give a precise answer in a few words to

4 June 1886.]

Mr. SCHLICH, Ph.D.

[Continued.]

Sir Herbert Maxwell—continued.

to that. In my opinion, the best forest management of any area is that which is most in accordance with the wish and desire of the owner of that forest. Now the intentions and the wishes of owners of woodlands in England are often peculiar. One man may simply desire to produce beautiful trees; another may desire to produce timber of a certain class; a third may desire to produce the greatest possible quantity of timber that can be obtained from a certain area. Another may desire the highest annual return in money; another may wish to have the highest possible interest upon the invested capital; and another may make it subservient to shooting purposes. Those are all different aims and objects; and I maintain that the man who manages the forest most in accordance with the intentions of the owner is the best forester.

Mr. Seely.

311. The ultimate profit of woodlands depends very much, does it not, upon the way they are originally planted; whether the trees are suitable to the soil and the situation?—Very much indeed.

312. Do you think that there is a considerable want of men in England who are capable of advising owners of land as to that matter?—I think there are a good many wood-managers in England and Scotland who are very well able to manage their business properly if permitted to do so.

313. The usual men who advise owners in England are land agents, and, as a rule, as far as my knowledge goes, those gentlemen have but small opportunities of acquiring a knowledge of forestry; do you think it would be a great advantage generally that they should have an opportunity of obtaining a certain amount of knowledge of forestry, and the management of woodlands?—I should think that would certainly act very beneficially.

314. And there would be no difficulty in making arrangements for that knowledge being given to land agents and others of that class, if there were a forest school attached to Cooper's Hill?—It would require special arrangements for gentlemen of that class.

315. Do you think those arrangements could be made?—Yes, they could be made.

316. Colonel Pearson, in his evidence, said that he thought an amount of about from 3,000 to 4,000 acres would be the proper amount of forest to be attached to a school of forestry; would you concur in the observation that that would be about the amount that should be so attached?—If I am permitted to do so, I would put it in this way: the area attached should offer some variety of conditions; it all depends upon what space that variety is found; but I should say, generally speaking, an area of from 3,000 to 4,000 acres would be a sufficient area.

317. I think Colonel Pearson suggested that some of the woods outside Windsor would be convenient for the purpose of the school of forestry at Cooper's Hill; do you think that would be so?—There are Crown lands at Windsor which would be suitable; the question is whether the Lords of the Treasury are willing to make them available for the purpose.

0.108.

Mr. Seely—continued.

318. But if the Lords of the Treasury consented, there would be no doubt that they would be proper and suitable lands to be attached to the school of forestry at Cooper's Hill?—There would be some difficulty, but I should think that suitable land could be found.

Dr. Farquharson.

319. I suppose there is no doubt that the present low price of wood does not afford much encouragement to the landowner investing in planting operations?—The present low price would not.

320. I think you expressed your opinion that the causes which produced this would be of a temporary character; in other words, that the price might improve in the future?—Yes; I have said that, as far as I can arrive at a conclusion, the supply from outside is likely to fall off, and that consequently the price will rise. Imported timber is at present so very cheap compared with home-grown, for two reasons; first, that the labour in England is more expensive than it is in Norway or Russia.

Sir Herbert Maxwell.

321. But not in America?—No. But I will come now to the second point, which will answer for America. The second point is the intermittent manner in which home-grown timber is thrown on to the market in England. If timber were available in sufficient quantities from English forests year after year, and the enterprising public who went in for the English timber business could rely upon so much being cut every year, they could make arrangements for working and converting the timber at a cheaper rate; but they cannot now rely upon it. If they make arrangements one year to work out the wood, the next year, perhaps, there might be nothing to do; and in order to make those things cheap it must be done systematically. Now a timber man in Canada has a large forest before him, and he has nothing to do but to walk in and cut; and he knows that, unless it is his own personal wish, he will not be stopped the next year, or the next year after that, though of course he may be in 20 years; and he can therefore make arrangements to deliver at a much lower rate at his seaport.

Dr. Farquharson.

322. Is it not the case that the demand for timber is diminishing very rapidly in this country?—I am not aware of that.

323. Colonel Pearson told the Committee last year: "Formerly matured timber was much more wanted than it is now; iron and steel now supply the wants for which large timber was formerly wanted;" what do you say with regard to that?—I went over a series of statements showing the import of timber, but I am afraid I could not mention the exact number of years. It certainly did not occur to me that the imports were falling off; and as for the home products, I think it is only possible to make a very rough estimate of what it comes to. The value of the home-grown timber has been estimated at 3,000,000 £. a year.

324. Iron to a large extent supplies the place of the wood that was formerly supplied for ship-building?

D

4 June 1886.]

Mr. SCHLICH, Ph.D.

[Continued.]

Dr. Farquharson—continued.

building?—Yes; but at the same time a much larger quantity of iron and wood together is required than was required 20 years ago.

325. The largest demand we have in Scotland is for railway sleepers: I suppose it is quite upon the cards that iron and steel may supersede wood for these purposes?—That is quite possible.

326. That would not spoil the market for wood, you think?—A similar process has been going on for many years past, but still, as far as I can make out, the total quantity of timber used has not decreased. It strikes me that the total quantity of both iron and wood would increase at the same time.

327. But, for instance, you find it much cheaper, if you are building a farmhouse, to get a ready-made window sash over from Germany rather than to have it made from wood grown upon your own property; that knocks away another demand for the supply of home-grown wood. Taking all these things together, would you think that there is in the future very much hope for a remunerative return from English woods?—As far as the total quantity of timber required for the country is concerned, I should not hesitate to say that there would be a fair chance for it, because I do not believe that the total quantity of the timber used will fall off, even if the demand for timber for sleepers is supplanted by the use of iron or steel.

328. I think you stated that you would not recommend ground fit for agricultural uses to be used for planting purposes. Of course you are aware that a great portion of the waste land in Scotland is used for game purposes; do you think that wood could ever compete with game for remunerative purposes to the proprietors, because, if you planted a hillside, you would destroy it for grouse, at all events?—I look on these matters, in the case of Great Britain, from a financial point of view. If I can get more for the shooting, I should let the land for shooting, most certainly.

329. There is no doubt you would; therefore that shrinks up the area, probably, available for the cultivation of wood in Scotland. Then there would be a great deal of bog unsuitable for planting in the United Kingdom. Now I will ask you generally whether you approve of the theory which is now current in Germany, that is to say, of not allowing woods to grow to absolute maturity, but to cut them down at intervals, so as to grow more frequent crops?—That is a purely financial question; the older I allow my trees to grow, the larger is the capital I employ in my forest. If I let my trees grow to 150 years, and then get, say, 100*l.* an acre; and if I have another forest and cut them down at 75 years, and get 50*l.* an acre for my crop, probably I shall do much better financially under the short rotation, because I work with a very much smaller capital. The capital in a forest consists not merely of the soil, but of the soil plus the growing stock. I cannot commence to work a forest straight off. I must wait for a good many years, during which time the ground rent and the initial cost of planting piles up at compound interest and forms my capital. Therefore, the higher the rotation, the higher

Dr. Farquharson—continued.

the invested capital. Although the actual money returns in the case of a high rotation may be larger, it does not follow that the interest on the invested capital is also higher; on the contrary, beyond a certain limit it becomes lower.

330. It would also depend upon what class of tree you got the best market for, would it not?—Yes.

331. That enters into the consideration very largely, does it not?—Yes.

332. And if it is true, as Colonel Pearson says, that they cannot get so good a market in this country for matured wood, it would be better to cut early, would it not?—It would depend upon the state of the market.

333. I think you stated that it might be well to send students to the Highland forests to study planting there; that would indicate your belief that the woodlands are sufficiently well managed to make them available for instruction?—I would take the students there, because there are a great many things for them to see, but they could not see everything. I am now speaking of the pupils I am directly interested in training for the Indian service; they could not see everything in Scotland.

334. The reason I asked the question is that M. Boppe expressed an unfavourable opinion of the management of the woodlands in Scotland, and said that they were not managed upon scientific principles; have you any knowledge of their management in those parts?—I spent a fortnight there last year; I went into some of the Highland forests, and came away with a very high respect for some of the wood-managers I saw there. If the forests are not in every respect managed upon so perfect a system as gentlemen accustomed to look at it from a different point of view and under different considerations might think desirable, the reason generally was that the forester had to give way to other considerations than those of merely scientific cultivation. I came across certain men who knew very well how to manage forests, and whenever I criticised and said I would not have managed a wood in the way it was actually done, I always found that they knew how and where the mistake was; but they were also invariably able to give the explanation that it was the result of different considerations upon the mind of the owner. At present the foresters have to acquire their knowledge by a very laborious, and to the owners of the land a very costly, process; that is to say, by experience spread over a large period of years; whereas if we had a suitable forest school we could, by gathering the experience gained in various parts of the country together, teach them in a couple of years what, perhaps, it takes men of their class 20 years to acquire by personal observation. That is the principal advantage of a forest school; that it enables us to teach a young man in a limited space of time what he may otherwise spend half his lifetime in finding out.

Sir John Lubbock.

335. During which time he may make a number of expensive mistakes?—Precisely so.

336. I wanted

4 June 1886.]

Mr. SCHLICH, Ph.D.

[Continued.]

Dr. Farquharson.

336. I wanted to know whether, in your opinion, Scotch forests were sufficiently well-managed to make them available for the instruction of those gentlemen?—As they stand now they are not.

337. Then why do you recommend they should go there?—I can show my men many points there; I can show them how in the most admirable manner to plant forests; and they probably would see that better in Scotland than elsewhere; they might go a long way on the Continent before they would see planting so excellent as they would see in Scotland.

338. Then what is the defect?—That the management becomes irregular afterwards.

Mr. Albert Grey.

339. I understand, from your answer to Dr. Farquharson, that you are of opinion that the price of wood is likely to go up in future?—I meant, to speak more correctly, that the supply from outside was likely to fall off, and that therefore home-grown woods were more likely to find a ready market at home.

340. But in the timber-growing countries from which we import the wood, do you suppose more timber is cut down annually than is grown?—It is very difficult to show a thing like that by figures, because the reports are of a very general character, and one can only form a very general opinion; but I think, upon the whole, that the supply is likely to fall off. I believe the countries which at present principally send their timber to England are overworking their forests, and that the present supply cannot last.

341. And the price of timber will go up, seeing that the area of forests easily accessible to the English markets is diminishing?—Yes, that is to say, the area of timber-producing forests is.

342. You think that while the foreign supply will decrease the English demand will increase, as, for example, in the substitution of wood for other materials for certain purposes, such as the paving of streets?—Even if the price of timber remained stationary there would be an opening for the utilisation of home-grown wood, that is to say, if outside sources fell off.

343. Supposing you were to utilise your capital in the planting of trees during, say, 30 years, what trees would you be inclined to plant?—There are few forests which would yield you much after 30 years. If the soil and situation were suitable, and you wanted to cut them down in 30 years, you might, for instance, grow larch; that tree is generally mentioned in the first rank for short rotation.

344. How long would the planter have to lie out of his money?—A very considerable time; if he wanted to make it really profitable, a great deal more than 30 years; he certainly could not count upon any substantial return under 50 years. I mean not a large return. If you plant upon a blank area you must first form your capital, and it is only when you have got a certain stock on the ground that you begin to get your interest. It is because it is necessary to make arrangements so long beforehand that it is necessary to proceed with skill and forethought in forest management.

0.108.

Mr. Biddulph.

345. With regard to what you said about the foreign timber trade, are you aware of the difference in price between the English and foreign oak at this moment?—I am afraid I could not give it you exactly.

346. Are you aware of the proportions of foreign and English timber that is consumed, say, by the large railway companies?—No.

347. You are not aware that the railway companies buy almost entirely foreign oak instead of English oak?—I am not aware of that.

348. It is the fact, I believe, that they use almost entirely Stettin oak instead of English oak; could you give any reason why that is the case?—It is quite possible that it is taken from trees which are grown in close woods, and therefore are straighter; but I have not made any inquiries upon the subject.

349. It is used for building railway carriages?—I think it is probable that it is of straighter grain, being grown in close woods, whereas the British oak, which is grown in more open forests, does not grow so straight as in the Continental forests, where we are in the habit of growing the trees during the first half of their life much closer to each other, so as to force them to shoot up and form straight stems; and it is only after attaining the half of their life that we begin to thin out more heavily, and encourage their growth in diameter. Possibly that is the reason.

350. Are you aware of there being any difference in quality between the English and foreign oak which would make a difference in the value; for instance, is the English oak more sappy than the foreign oak?—Am I to understand that foreign oak fetches a higher price?

351. It is more in demand, certainly?—If there is a difference in price, the slower-grown oak would be better; that would all depend upon where the oak came from.

352. You are not acquainted with the properties of Stettin oak, as to whether it is of slower growth than English oak?—"Stettin oak" is a very general term.

353. It comes from that quarter?—Yes, around there; but where it exactly comes from is quite problematical.

354. Then with regard to foreign deals, you can buy foreign deals converted, that is to say, cut up, at a lower price than you can cut down your timber upon your own estate for?—I think I have attempted to explain that a little while ago. It is principally owing to two things, namely, the higher cost of labour in England, and the intermittent character of the supply of timber. It is not possible to make a systematic and steady arrangement to do the work in a regular and cheap manner in England, because the man who undertakes the timber business never knows how long he will be able to continue in that line, and he cannot make proper arrangements to reduce the cost of the work.

355. Still I believe it is the fact that there is a large quantity of English oak ready to come into the market in the event of the prices rising?—If the owner of oak timber is waiting for that, he may have to wait some time.

D 2

356. The

4 June 1886.]

Mr. SCHLICH, Ph.D.

[Continued.]

Mr. Biddulph—continued.

356. The price of oak has fallen in the last 40 to 50 years in England, has it not?—Yes. I doubt if the rise in price will come quickly, but I believe the supply from outside sources will fall off, though it will be a slow process.

357. I presume that, in addition to the forest ground that you would set apart for the use of the school, you would acquire ground for experiments in planting as well as in the treatment of trees?—That we should do in that area.

358. Of course there are many parts of the country in which certain trees are better adapted to the soil than others?—We could not grow everything; we could only in an area of that class show the treatment of a few species. But the object would be to teach the pupils the general principles on a few species; and then, understanding the treatment of a few species thoroughly, they would be easily able, by taking them to some other localities where other species of trees are grown, to understand in a short time how to treat others.

359. So that you would have to take the students not merely to Scotland to show them the treatment of trees, but to take them to other parts of England?—We could not transform the present area which might be made over to us into a suitable area in a hurry; it would be a slow process.

360. Are you acquainted with Ireland at all?—I spent three weeks in Ireland last year. I went to Cork and Bantry, and across to Killarney and Tralee, and thence to Limerick, thence to Galway and Clifden, and thence I went *via* Westport to county Mayo, Bangor, and Belmullet, to county Sligo, through Donegal, along the north to Coleraine and Londonderry. I went round Lough Neagh, Belfast, and county Down, and then to Dublin.

361. You did not see many trees, comparatively speaking, upon the coast?—No.

362. You are aware that in Queen Elizabeth's time the country was densely afforested?—So I understand.

363. You, perhaps, know that it was densely afforested; you could see the axe-marks upon the stumps?—I did not see that; but I have seen stumps of trees in many of the peat mosses; there is no doubt that there were forests there.

364. Then there is no doubt that it would be capable of growing trees if it were properly planted?—There are proofs to that effect in the woods now standing there; I have seen even beech growing upon the west coast of Ireland within half a stone's throw of the coast.

365. I may take it that the forests in Ireland have almost entirely disappeared?—There is a very small proportion now under forest.

366. That is from sheer neglect and waste?—It has been cut down for various purposes and never been re-planted.

Mr. Evelyn.

367. You spoke a short time ago about the growth of timber. Now, is it the case, as a general rule, that the slower the timber grows the higher its value and its quality?—I meant that ordinarily timber, slowly grown under fairly suitable conditions, would be likely to be more

Mr. Evelyn—continued.

lasting than quick-grown timber; but I would not like to make a positive statement to this effect.

368. Is it not the case that in Scandinavia the deal from the timber in the north of Scandinavia, from the more slowly-growing fir trees, is of a better quality than the deal from the timber in the south of Scandinavia?—I am afraid I have not followed that out.

369. Then, again, as to the difference between English oak and French oak. The oak tree of the southern climes would be quicker growing, would it not; would not the English oak be of a better quality, being of slower growth on account of the difference of climate?—But it does not follow that the English oak is of slower growth than the French; the English climate, upon the whole, is much moister than that of France. For example, with reference to larch, I do not think it is possible to find larch growing so fast in its own home as you find it in some parts of England.

370. You suggested that it would be well for English landowners who own woodlands to send their wood-reeves to a Scotch forestry to learn something of forestry?—Perhaps I should be careful not to put it quite so generally as that; to a good Scotch forester, I would say.

371. Would it not be the case that the instruction there would be somewhat imperfect, in view of the difference in the climate and the flora of Scotland from that of the south of England; for instance, the Spanish chestnut would not be found in the north of Scotland?—The statement I made was to this effect, that I should send him to a Scotch forester in the absence of a forest school; but, if there were a proper place for training, I should send him to the forest school.

372. Do you think it would be better to have a school for England, and a separate school for Scotland?—I do not think the climatic difference between Scotland and England is so great as to make it necessary to have two schools for the two countries.

Sir Herbert Maxwell.

373. Would there not be a great difference geologically?—That opens a very large question. It is generally found that, with few exceptions, most of our timber trees do not mind what is the geological origin of the soil, so long as it has certain physical qualities; so that the geological question would hardly come into consideration.

Mr. Evelyn.

374. In the paper handed in last year, containing the report by M. Boppe with regard to English and Scotch forests, it is stated that "in the low-lying districts at an altitude of from 250 to 300 feet we found growing, both singly along roadside and collectively in forests, magnificent specimens of oak, maple, elm, ash, beech, and lime." And again, "The mountain vegetation," I suppose that means the fir and the birch, "commences at about 400 feet above the level of the sea;" now, in the county of Surrey would it not be the case that the deciduous vegetation, if you may call it so, the beech, the oak, and other trees, would

4 June 1886.]

Mr. SCHLICH, Ph.D.

[Continued.]

Mr. Evelyn—continued.

would grow at a higher altitude than they would in Scotland?—If I correctly understand the drift of the question, I do not think that M. Boppe meant to say that that was exactly the limit; I believe that the distribution is to a very large extent quite artificial, according to what has been planted. I believe that in Scotland they plant the beech in the lower parts near the parks and places of that sort, and that in the mountains they plant more fir. At the same time it is quite correct that the oak in Scotland will not grow at so high an elevation as it will in England, nor in England will it grow so high as it will in France.

Sir George Grant.

375. Talking of the surplus lands which in your opinion are suitable for planting, you exclude those lands which would be more valuable for agricultural purposes?—I would exclude those that were required for agriculture.

376. Or which, as I understand, would pay better used for agricultural purposes than for timber purposes?—Up to a certain limit they would probably pay better for agriculture. If you go below a certain quality the land might pay better as forest.

377. At the present time when agriculture is not, I think I may say, in a very flourishing condition, the price of land for agricultural purposes, as a matter of fact, is falling; therefore, in your judgment, I presume the amount of land available for planting for forestry purposes is likely to increase?—Of course if the value of land for agriculture should fall, in the same proportion the area which might be better under forest would increase.

378. Therefore if there is such a large quantity of land now suitable for forest purposes, the probability is that the quantity of it is likely at all events to increase in proportion as the value of land for agricultural purposes is falling?—But of course there are several other elements which may more than compensate for that; in fact, the population may increase.

379. Do you think that the increase of the population of this country is likely very much to affect the value of agricultural produce?—I think it is likely to increase the cultivated area.

380. You were good enough to give the Committee a rough estimate of the amount of acreage of waste land in Ireland and in England. In Scotland you said that 70 per cent. of the land was waste; you have not stated how much of that was suitable for planting?—That would require a very detailed inquiry. I gave a rough estimate for the three countries together, and then I dealt specially, at the request of the Lord Lieutenant of Ireland, with Ireland. The one estimate of 20,000 square miles refers to England, Scotland, and Ireland.

381. May I ask whether of the 70 per cent. in Scotland which is waste, according to your statement, you have made any estimate of what is really suitable for planting; have you considered in any way how much of the 70 per cent. of waste land is at such an altitude that it is not likely to pay for planting at all?—There is a portion above a certain altitude which cannot be planted, but I cannot say at present how much that is.

O.108.

Sir George Grant—continued.

382. Would you give the Committee any idea of the limit where you have seen the larch in Scotch forests?—I think the larch in Scotland does fairly well up to 2,000 feet; above that it does not pay. I have seen it planted up to about 2,500 or 2,600 feet, and I thought that it did fairly well up to about 2,000 feet. Probably it would have been better if they had stopped at about 1,800 feet; in some parts they might go up to 2,000 feet. It depends a great deal upon the locality, but I do not think it would pay generally to plant it above 1,800 feet to 2,000.

383. In the event of a forest school being established in connection with Cooper's Hill, would you recommend that all young men from Scotland should be obliged to come so far as to the south of England in order to obtain the information and knowledge which I understand you to say is desirable upon that subject; because the distance from the north of England or Scotland, where we want a number of young men trained in forestry, would be a considerable element?—I should say, it is a matter of expense. If you have money to establish the two forest schools, I should say, it would be better to start the two; if you have not the money, and, what is also a very important thing, if you have not yet a sufficient number of people to select your teachers and professors from, it is probably better to begin with one school.

384. Upon the whole, if the conditions were favourable, you think it would be more satisfactory to have, in addition to the school at Cooper's Hill, a forestry school in Scotland?—I am not prepared to subscribe to that statement. There would probably be a great deal of difficulty in making satisfactory arrangements in one place, and if you start with two or three places the difficulties would be doubled and trebled. It is however principally a matter of expense; if you can have two schools so much the better.

385. We have been told in this room that it would be desirable, in addition to there being a forestry school in England, that there should be a similar establishment, or possibly two similar establishments in Scotland. I want to ask you whether a similar establishment, if it could be arranged, would be as desirable in Scotland as it would be at Cooper's Hill?—To begin with, I do not think there would be a sufficient number of men to fill two schools.

386. But the amount of the woodlands in Scotland being so large, are we not likely to require the advantages of education in forestry quite as much as those who are further south?—No doubt; it is simply a matter of expense; of course it would be desirable for the Scotch Foresters to have the school nearer home.

387. We have heard that if it is desirable that there should be one school of forestry in Great Britain, it is highly desirable that it should be upon the other side of the Tweed and not upon this?—There may be a practical reason for its being at Cooper's Hill. Seeing that we have already got an establishment at Cooper's Hill, and that the Government of India will probably always select the best men they can find to conduct that business you have already offered you there conditions which you might not be able to find elsewhere, therefore it would

D 3

be

4 June 1886.]

Mr. SCHLICH, Ph.D.

[Continued.]

Sir George Grant—continued.

be probably easier at starting to make a beginning here than in Scotland. But I will go so far as to say this, that if Cooper's Hill was at Perth, and the Government of India had made arrangements for training their officers at Perth, it would be certainly better there than that it should be at Cooper's Hill. The forests round there could be much more easily brought into condition for teaching than round about Windsor.

388. If the thing were first starting, you think that Perth or somewhere in the neighbourhood of the large Scotch forests, would be better than the establishment of a forest school in the south of England?—If I started with everything blank before me, I would have the school in Scotland.

389. With regard to the low price of home-grown timber, you mentioned the intermittent character of the supplies from our woods; I think Sir Herbert Maxwell asked you a question with regard to the destruction of the Duke of Buccleuch's woods in 1833; I do not know whether you could suggest any way in which we could avoid these intermittent sales of timber, which, as you say, diminish our profits. I know myself a wood in which, in 1883, 60,000 trees were blown down; the markets in that way became glutted, and much of the timber has never been carted away; it is not worth it; could you tell the Committee any way in other than by casual operations we can increase our sales?—I believe the large Scotch forest owners would very considerably increase their returns from the forests if they decided to work their forests systematically. Supposing those lands were in the hands of the State, and the State were to say, we will make a working plan of operations; we will cut down so much every year for the next 30 years. Suppose the Government made an announcement of that sort, the result would be that enterprising people would take to trading in timber, because they could rely for a series of years upon a stated quantity being thrown into the market. Under present circumstances a Scotch owner one year cuts down perhaps a 1,000 acres, and the next year perhaps some other consideration arises; perhaps he does not want money, or somebody gives him 1,000 £ for the right of shooting the deer upon the forest; then the merchant will be left high and dry.

390. You suggested the possibility of somebody giving the Scotch landowner 1,000 £ for the privilege of shooting deer in the forest; did you ever hear of anything of that sort?—I was told of one case in which a man pays something like 20,000 £ a year for deer shooting.

391. But a deer forest, as you are aware, may not contain a single tree?—But there are generally some woods thrown into the run, in which the deer stay during a certain portion of the year. I know in Lord Lovat's property there were certain timber forests which were accessible to the deer.

392. But did you ever know such a sum given for a forest of trees to shoot deer in?—No, it is not that the money is given for the trees, but that there are certain woods thrown into the large area. If you exclude the wood, the man

Sir George Grant—continued.

might not give that price for the shooting, because there would be no shelter for the deer; however, my proposition was only made for the sake of illustration.

Sir Edmund Lechmere.

393. I think you made a distinction, as regards the management of woods, between woods managed upon commercial principles, and woods managed according to the express views and tastes of the owner?—I made that distinction.

394. Looking upon this question purely in a commercial light, do you think that the establishment of a school of forestry would tend to increase the value of our woodlands by drawing attention to the defects in the management of our woodlands as a question of commerce, quite apart from the treatment of timber according to the views or tastes of the owner?—I think it would; it would be a saving of time if nothing else.

395. Do you think it would form one of the features of such a forest school, that advanced pupils from the school might be sent at the expense of owners of forests to report upon and advise as to the defects of management; could that be combined with the forest school to a certain extent, their fees forming part of the income of the school of forestry?—I am afraid it would be difficult to say that; there might be successful students who might set up as advisers, but I do not see how it could be done in any other way; the head of the school might recommend such men.

396. Would the professor be able from time to time to go himself for such purposes?—He might recommend certain persons, but it would be a risky thing to employ such young men to give opinions as to management.

397. I rather had in my mind not young pupils, but pupils who had passed the school who should be able to advise and report?—Perhaps some of the professors might in their vacations be able to visit and report.

398. Would not such a power tend to increase the usefulness of the school, and make it more known and appreciated?—As far as I can gather the point of the question, any result of that kind could only act beneficially.

Mr. Mark Stewart.

399. Can you speak from practical knowledge with reference to the continental schools in Germany, Switzerland, and France?—I have myself studied at a continental school; and last year, specially with the view to the work that was before me, I went and visited three of the forest schools in Germany.

400. How long do the persons receiving forest education require to remain at those institutions to get a fair knowledge of the instruction?—Perhaps the best plan would be to give an instance. When I studied myself in Hesse Darmstadt, I was obliged to remain three years, the forest school being part of the University; and after that we had to work for two years practically.

401. With regard to getting a more superficial knowledge of the question by a man in a humble position in life, how long a time do you think it would be necessary for him to remain under

4 June 1886.]

Mr. SCHLICH, Ph.D.

[Continued.]

Mr. Mark Stewart—continued.

under training?—May I ask if you are referring to what are generally called wood reeves?

402. Yes?—It all depends upon whether a man knows something already about the practical part of the business. Assuming him to be a man who had already worked in a forest, I do not think I would undertake it in less than ten months. I say ten months, because that would exclude in our case the two months' vacation towards the end of the year.

403. That would have nothing to do with practical work?—I think I have already given evidence to the effect that the tendency of their instruction would be to a very considerable extent practical.

404. Could you state to the Committee what has been the practical result of the instruction given in the Continental schools with regard to the increase and the better culture of forests their?—That dates back a good long time. The first forest schools in Germany, I think, were established at the end of the last century, and the thing has come on gradually. The forests are managed now very much better than they were; and considering other circumstances, there is not the slightest doubt that there is a more profitable use made of them.

405. Is the production of wood increasing in Germany, Switzerland, and France through the action of these forest schools?—Yes, the production of wood has largely increased in Germany, very largely indeed.

406. In that case would it not compensate for any deficiency of the growth of wood in this country?—I have stated in this report that probably the export from Germany might increase to some extent; but I do not think it would be anything like making up the deficiency that is likely to occur in the other countries.

407. Could you speak at all as to the *pinus Aletia*, or Corsican pine, taking the place of the larch and Scotch fir?—I am afraid I could not say anything about that.

408. Or the *Montana*?—The *Montana*; it is a miserable tree useful to stock the tops of hills. I should not think it was likely to take the place of the larch on Scotch pine.

409. Have you any districts of country in your eye which you would say it would be most advantageous to place under wood?—I have not taken that particular line at all.

Sir John Lubbock.

410. Sir Herbert Maxwell asked you some questions with regard to the great destruction of forests in Scotland by the storms of two or three years ago. When I was at Nancy five years ago I remember my attention being particularly called, as one of the drawbacks of the management of the Scotch forests, to the fact that they did not plant belts to protect the taller trees so much as was the case in Germany; has your attention been at all called to that? Do you think the remark I made has had any foundation and that more success would be attained if greater care were paid to planting protection belts round the conifers?—There are some plants which are flat-rooted and some deep-rooted. Upon the Continent they pay great attention where there is danger anticipated from storms, to having

0.108.

Sir John Lubbock—continued.

deep-rooted species upon the windy side. There is no doubt more attention is paid to that on the Continent than there is in Scotland; I have seen in the Thuringian Forest mixed forests of spruce and silver fir; the trees were standing in rows; and upon the windy side, where they had for the leading tree a silver fir, they stood well, and where the leading tree had been a spruce they were all blown down.

411. Do you think much of the damage which now occurs might be prevented by the adoption of some such principle?—Yes, very much; but damage by storms will always occur.

412. As to whether there should be one or two schools of forestry, that would depend upon the number of students that would be likely to go there. In your opinion it would be better, would it not, to have one well equipped school than to have two not so well provided?—Yes, certainly; I believe that for some years to come there will not be more students than could be properly taught at one school.

413-14. With regard to the present facilities for teaching, you do not think that the distance the students would have to come would be so important a consideration as that of having a forest school thoroughly well equipped?—I think not.

415. I ought to have asked you whether you think that one advantage of a forest school would be that there might be a certain amount of research into different questions, as to the habits of insects and other matters of that sort, bearing upon the management of woodlands?—That is a matter I attach special importance to; it will form a centre of research upon questions connected with all departments of forestry; the facts as they are observed in different parts of the country will be brought together.

416. You think we have a great deal to learn which even the most experienced foresters are not acquainted with?—A very great deal indeed.

417. And you would attach great importance to the mere fact of teaching young men what we ourselves have observed?—I would attach very great importance to that.

418. At Cooper's Hill you are proposing to utilise, for the purpose of instruction, certain portions of Windsor Forest?—If they can be made available.

419. That is the idea?—Yes.

420. Have you visited the Forest of Dean?—I have spent a couple of days there.

421. The Windsor Forest has been chosen mainly as being nearer Cooper's Hill?—It has.

422. Would the Forest of Dean be as suitable?—The Forest of Dean in its present state is very uniform; there is not much variety; it is principally oak.

423. Then it would be good as far as the oak is concerned, but not good in other respects?—I do not think the Forest of Dean is of a specially suitable character for our purposes; it is too uniform.

424. Are there any other woodlands in this country that you think would be suitable?—I should say that even the New Forest would be a better field of instruction than the Forest of Dean, because there is more variety.

D 4

425. You

4 June 1886.]

Mr. SCHLICH, Ph.D.

[Continued.]

Sir John Lubbock—continued.

425. You think that there are in the New Forest woodlands which might be suitable for the purpose?—To a certain extent.

426. Reverting for a moment to the questions I asked you just now with reference to belts of hardwood trees as a protection to the growing firs; would trees, such as the birch, for instance, grow up quickly enough to give protection, because that protection is required mostly when the firs have grown to a considerable height; would the birch be suitable for that purpose?—It would be suitable to a very fair extent; but it is not one of the best. The birch is not a very deep-rooted tree, but it has a thin crown, and consequently it is not often thrown. There are other trees which would stand more firmly, but in many places the birch in this respect is a very useful tree, where perhaps it would not be possible to grow another tree that would stand more firmly.

Dr. Farguharson.

427. The beech would be suitable, would it not?—Where the birch would come in the beech would probably be out of the question; the birch is a much harder tree, and it has an enormous power of accommodation; it will accommodate itself to almost any circumstances.

428. What sort of height would you consider that a tree would require to grow to be a protection to the firs; because the time of great danger to our Scotch woodlands would be when they were from 30 to 40 years old?—Old trees are much more liable to be thrown than young trees; the fringe would grow up with the rest of the forest.

429. In one case you would have a slow growing hardwood tree and a very fast growing softwood tree?—No doubt.

Sir John Lubbock.

430. But the birch answers very fairly as a belt, and breaks the wind to a very considerable extent?—It does break the wind to a considerable extent.

Chairman.

431. I gather from what you say that there would be a limited demand for men who have acquired technical knowledge in regard to this question after two or three years study; there would not be a very great demand for them?—I understand you to mean men who have gone through an extended course of two or three years?

432. Yes?—I do not think that outside the Indian Forest Department the demand would be very large.

433. If there were such a class of men as independent men in private practice, it seems to me that they would fulfil the want referred to by Sir Edmund Lechmere of going out and advising landowners in regard to private properties?—I had a difficulty in replying to that question, for this reason, that even men who have been trained

Chairman—continued.

in a course of two years or so, would not be the proper persons to be employed as advisers upon such a matter as forest management; generally speaking, they would be good managers of a forest estate; but for giving advice after an examination of a limited duration, nobody should be employed who had not had some years of practical experience himself in a forest; owners would probably save a good deal of money by attending to this.

434. In view of the forests of this country being in the hands of private owners, is not there a great need that those who manage those forests for the private owners should have an opportunity of acquiring technical instruction in forestry with a view to their conducting the business of their employers?—I have no doubt that there is a certain demand for that talent.

435. Do you think that that instruction could be given by the School of Forestry?—All those things are matters of expense; that could certainly be arranged.

Sir John Lubbock.

436. With regard to what you have said as to their not being a large demand for forest officials, we have in our colonies an enormous tract of woodland, have we not?—Yes.

437. And none of them have any forest school at all at present?—No, I do not think so.

438. Would it not be likely that if there were a class of English speaking officials, the colonies would be very glad to avail themselves, and they would be very wise to avail themselves, of their services?—They would be very wise indeed. I think I have heard of almost every case of that class which has turned up, where a man was wanted for the colonies; and I think it is a melancholy fact that I could count them almost on the fingers of one hand. At the same time I have no doubt that many of the colonies are waking up to the importance of the matter now, and that some years hence the demand for men of that class will very much increase.

439. The attention which has been called to the question will probably lead the colonies to pay more attention to their woodlands in the future than they have done in the past?—I have no doubt it must come to that.

440. Do not you think that large landowners would be willing to get the services of men who have been thoroughly trained rather than to take the advice of men who had gained their experience through a series of 20 years of expensive mistakes?—If they consulted their purse no doubt they would.

441. You think there would be a considerable desire to gain that training?—I think it would be a very good step to do so; but whether we should secure at first a large number of pupils I doubt. It was in regard to whether there should be two schools that I said there would be at first but a small demand, but after the school had been established and successfully carried on I have no doubt there would be a large demand for the education.

4 June 1886.

Mr. JULIAN C. ROGERS, called in; and Examined.

Chairman.

442. I THINK you are here to state the position of the Surveyors' Institution with regard to forestry?—The Surveyors' Institution, I may state, is a body which has been established about 18 years, and was incorporated by Royal Charter about five years ago. It numbers altogether something like 1,200 or 1,300 members and students, and out of that number there are probably 500 land agents engaged in the management of the principal estates in England; the remainder of the 1,200 or 1,300 represent other classes of surveyors, such as building surveyors and valuers. The subject of forestry has been very considerably before the Institution from time to time with a view to the better education of the class of land agents; and it was one of the terms on which we obtained our Charter that something should be done to further the training of that class of professional men. As the result, we established some six years ago a system of examinations in which forestry forms a considerable ingredient; we do not assign quite the importance to the subject in our curriculum as a matter of distribution of marks that we probably should do, if there were an opportunity for the class of young men who come up for the examination to obtain a practical knowledge of forestry. As a matter of fact, we find that their knowledge is mainly theoretical, and I believe that to be due entirely to the want of opportunity of obtaining a practical knowledge of forestry in the woods.

443. Yours is a purely examining body?—It is a purely examining body.

444. You find the men come up with a theoretical knowledge, but with no practical knowledge of forestry?—With very few exceptions. It is very difficult for an outsider whose family has had nothing to do with land agency to get into business as a land agent; so that a good many of our candidates are sons of land agents. Some of these young men display some practical knowledge of forestry; but as a class the knowledge displayed by them is theoretical, such as might be obtained from a careful study of Brown's book, or some other recognised work upon the subject.

445. What is the nature of your examination; how often are the examinations conducted?—The examination is held annually, under three divisions for three different classes of men, but certain subjects are common to all three; but for the purpose of the Committee it is perhaps enough if I state the nature of the examination for land agents.

446. What are the other two classes for?—For valuers and building surveyors. The land agent candidates bring up agriculture in all its branches; surveying and levelling, agricultural chemistry, the nature and composition of soils, geology, forestry, land drainage, and the construction of farm buildings.

447. Are there two or three Papers set in forestry?—There is one Paper in forestry and one in timber measuring.

448. Are the marks gained in that counted up with the other marks towards the result of the

0.108.

Chairman—continued.

examination?—Yes, the marks gained in forestry are counted in.

449. You give no separate certificate in forestry?—We give no separate certificate in forestry.

450. You, I think, will agree with the evidence, of which we have had so much, that the question of the condition of our forests is an important national question, and that it ought not to be left so much to chance as it is at present?—I think it is almost entirely a national question, and a national question of the very gravest importance. Some years ago, I think in 1878, I prepared a report, which has already been referred to before the Committee, and which was published as a Parliamentary Paper, which gave a general view of the timber resources of the British dependencies. I was perfectly astounded at the evidence brought together in that publication of the extermination of the forests in the colonies, and the reckless way in which they were being used. It appeared, taking the province of Ontario, which is an extreme case, that 87½ per cent. of the timber cut annually was exported. In some other colonies from which we have been in the habit of obtaining a considerable supply, the amount of timber cut was shown to be very excessive. I found that in Prince Edward's Island the amount of timber cut annually was said to exceed by 17 times the amount which could be prudently cut, for home use and for export. Again, it appeared that in the colony from which we could hope to obtain the largest supply of timber, British Columbia, all the timber in accessible situations had been cut and exported.

451. I suppose the opening of the Central Pacific Railway would bring in a great deal more timber?—There was an immense consumption of timber for that railway.

452. But apart from that, it would facilitate the transit of timber?—It would facilitate the transit of timber. Some of the colonies appear from that return to have been absolutely denuded of timber, so that they are obliged to import timber from other colonies, which are in their turn becoming denuded; and a very serious question arises as to what, in the event of a maritime war, would be the position of some of these colonies even as regards fuel.

453. Then having spoken of the colonies, what is your view of the waste of timber in England?—Speaking generally, and premising that I do not speak as an expert, but from general knowledge, and being in contact with land agents in England generally, I should say that a great deal of the wood in England is very extravagantly used and managed. Much of it is grown for purposes of ornament, and not for the purposes of timber supply at all. There have been large tracts of land, up to about 1870, disafforested, and no doubt very wisely in view of the price that cereals were then fetching; but a great deal of that land, I imagine, could be again put under timber, and in time, I have no doubt, with very great advantage of the owner. I believe it was about 1864 or 1865, I am not quite certain of the

E

the

4 June 1886.]

Mr. ROGERS.

[Continued.]

Chairman—continued.

the date, that Wychwood and Delamere Forests were disafforested, and thrown into arable cultivation.

454. Do you think that in view of the present price of timber, and the possibility of the increase of the price of timber, it would pay landowners to direct their attention to the subject?—In view of the present prices of timber, I do not think it would, at present, pay landowners to restore land to forest; but in view of the future price, which I think it is tolerably certain that timber will fetch, I believe it would ultimately pay them to do it. Unfortunately one generation of landowners would sow, and another generation would reap; and considering the immense losses of capital which landowners have undergone in recent years, and the general sense of political insecurity, I think it is extremely doubtful whether many landowners would be inclined to invest capital in re-afforesting any portion of those denuded lands.

455. Do you think the matter is so important that the Government should assist in any way?—I think it is a purely national question. It is perfectly hopeless to expect the landowners to expend a large amount of capital in view of remote contingencies; consequently, I think it is from beginning to end a national question. As I said before, if a maritime war were to arise, the slow sailing timber ships would never reach this country; they would be at the mercy of fast cruisers, and we should practically be confronted with a timber famine. That is a remote contingency; but still it is necessary to make provision for such a state of things, and that provision can only be made, of course, many years in advance of the real necessity.

456. The same thing would happen with regard to our grain imports, would it not, unless we had the command of the sea?—It would hardly arise to the same extent, because timber is a very much more bulky class of cargo than grain, and it comes in a very different class of vessel, and under very different circumstances.

457. In what way do you think the Government could give encouragement to private planting?—I think, in the first place, that a great point would be gained if the present race of land agents, who are the only possible foresters, were provided with some means of acquiring scientific information with regard to the management of woods. That, I think, would tend to the conservation, and more prudent management of our existing woods; but how the Government could assist landowners I am hardly prepared to say. It is tolerably obvious that there are large tracts of country which could be re-planted; but the Government only could afford to wait the length of time that would be necessary to realise a profit; whether there is any other way in which it could be done, I do not know. I have sometimes wondered whether something analogous to a system which prevails in Australia would be possible. There for every acre re-planted, the Government gives a grant of land. That would not be possible here; but a plan is conceivable whereby waste lands might be planted by the Government, who could reserve a royalty upon the ultimate produce sufficient to recoup the outlay, the owner receiving in the meantime a small rent per acre,

Chairman—continued.

and certain rights of underwood, to represent his share of the bargain. I do not know whether that is practicable or not.

458. But what is more immediately desirable is, that surveyors and land agents should have the means of obtaining better information and practical knowledge than they have at present?—I think that is unquestionable. There are, at the present time, three classes in want of forest education. There is the Indian Forest Department, which is probably sufficiently provided for at Cooper's Hill. Then there are certain of the colonies in which there is some demand for expert foresters; but the principal demand is for forestry education in this country, and if a school could be founded upon the most modest lines which would provide for the two latter classes (not for the Indian Forest Department), I think it would be a great public advantage.

459. Do you think that land agents and surveyors could afford to give up three years of their educational period to studying forestry?—I think considering that the land agents' necessary acquirements, say, for the purpose of our examinations, are already very large, that to add such a burden as that would render the whole thing impracticable; in fact, residence at a forest school is out of the question for land agents, whether Cooper's Hill or Edinburgh. The most that could be done for them would be to institute a system of lectures; and I venture to think that lectures in London in the winter upon purely theoretical subjects, and a course of lectures upon the Saturday afternoons in the summer at Kew, with one or two excursions for the purpose of practical instruction, would meet all requirements; but residence is totally out of the question.

460. Lectures in London and at Kew; and of course the lectures might be anywhere else, whether in Edinburgh or Glasgow?—Certainly.

461. That would not give any practical acquaintance with forest management, such as has been so much insisted upon on the last occasion, at a practical training station?—I question whether that would be practicable so far as young land agents are concerned, or whether it would be worth their while to go through a course of that character. I think a course of lectures on theory, with occasional practical visits to forests, say, a forest reserve at Windsor, which Colonel Pearson advocated, and a general pass enabling them to visit the reserve for purposes of study, would probably furnish all the education which would be necessary for young land agents.

462. It might be possible to arrange for such a course of lectures as you indicate to be given by the professor at Cooper's Hill?—Certainly; I think that the staff at Cooper's Hill should be utilised as much as possible for the purpose; and if, as I understand, there is a great want of opportunity at Cooper's Hill of practical study, the wants of that class of students, the colonial students if there were any, and the land agents, might be met by a forest reserve of 2,000 or 3,000 acres at Windsor under the management of some competent body, to which the students of all classes might be taken for practical training upon the ground.

463. Have

4 June 1886.]

Mr. ROGERS.

[Continued.]

Chairman—continued.

463. Have the land agents at present, or those who are studying for the position of land agents, no other means at present of obtaining such information as you have pointed out would be given by the lecturers?—Except, as I have said, that many land-agent students are the sons of land agents, and would have in that way some opportunities of seeing work in the woods. With that exception, I think land agents are utterly without the means of practical training in forestry.

464. But your remark points to practical knowledge rather than the theoretical training which would be given by those lectures?—There are no opportunities of theoretical knowledge at present. I think an attempt was made by the City of London College to start a course of forestry lectures last year, and I believe it fell through for want of candidates.

465. Was that from a want of information on the part of the students that such lectures were to be available?—I think it is possible that was so to some extent. The lectures were to be given by a very competent man. As a matter of fact, I believe they were not given at all; the idea was dropped.

466. That is the very idea that you are proposing as a way of meeting this difficulty?—The lectures were not for the general body of land agents, but for the students at the City of London College, who presumably are not very numerous, at all events not students of the class who were likely to be able to take the position of land agents.

467. It was only open to the City of London College?—Yes.

468. But in the case of such lectures being open generally, would they be only open every Saturday, or would there be some studying in London?—Many of the candidates would be countrymen. The bulk of our candidates are from the Midlands and the south of England; there are comparatively few from the north. And I think that, if the courses of lectures were for certain definite periods of the year, there would be practically no difficulty as regards the attendance of candidates; they are generally pretty well to do, and the expense of travelling is not a very important matter to them. If eight elementary lectures were compressed, say, into a period of one month, and eight advanced lectures into a period of another month, there would, in the majority of cases, be no difficulty in getting candidates to attend them.

469. But, in addition to those lectures, I believe you contemplate the establishment of something more permanent in the shape of a forest school for England?—I think that a forest school, if established, should be very little more than a skeleton organisation. I should not be sanguine that there would be many candidates for admission to such a school for some years to come. For a time at all events, the school would probably be conducted at a considerable loss; but I think the school should be established upon very well considered lines so as to be capable of expansion to meet all possible future needs. I would have nothing like an establishment for the school of forestry; probably a secretary's office

O.108.

Chairman—continued.

would be all that would be requisite in that respect; but I think there should be a board, and that that board should be representative of all the interests which are identified with forestry in this country.

470. Have you seen Colonel Pearson's evidence given before this Committee?—No; I have not seen his evidence, but we have exchanged views upon the subject. The Board might comprise two delegates, say, from the Royal Agricultural Society, two from the Surveyors' Institution, two from the Highland Society, and one from the Scottish Arboricultural Society, a Commissioner of Woods and Forests, the Surveyor to the Office of Woods and Forests, and possibly the Professor of Rural Economy of the University of Oxford. If associated with that board there were four or five landowners each owning, say, 1,000 acres of woodland (two of them should be Scotch landowners), holding office for three or four years, they would be able to afford opportunities for study to the students in the forestry school which would not be otherwise available.

471. And what course would this skeleton board, do you think, carry out?—As far as the land agents are concerned, it would be sufficient if there were eight elementary lectures in practical forestry, and eight advanced lectures; eight elementary lectures in what has been called physical botany (I do not quite understand the term), and eight advanced. Then there might be, say, eight lectures by a land-agency professor; that is to say, there should be upon the staff some one who had a practical knowledge of estate management, who was not a pure theorist, who could deliver lectures upon cognate subjects such as land drainage, and soils, and also upon the preparation and the marketing of timber. Lectures of that description would form a valuable practical feature of the curriculum. Then I would have two forestry excursions for the students, one in the spring and one in the autumn; and, if possible, an excursion for all students to a place where practical land drainage works were being carried out. The forestry lectures might very well be held in London in the winter, and the botany lectures at Kew on the Saturday afternoons, or at Cooper's Hill, or wherever there were suitable collections. The land-agency lectures might well be given in London in the winter evenings. If those two schemes of lectures, the practical forestry and the land-agency lectures, were given in the winter, and compressed into a short space of time, say three weeks or a month, a student in that time would acquire a very considerable theoretical knowledge of his work. I think the practical work would probably have to be extended over a longer period to lay a really solid foundation of practical knowledge.

472. Would you have no examination as the result of these lectures?—I would have examinations from time to time (something like the college collections), to test the progress of the candidates. As regards the land-agent students, a system of exemptions from the elementary course would be very valuable, whenever it was found that candidates had passed an examination equivalent, say, to our associateship examination,

E 2

such

4 June 1886.]

Mr. ROGERS.

[Continued.]

Chairman—continued.

such candidates might be exempted from the elementary course, as a long course might in some cases deter candidates from entering at all. Those who hold the Diploma of the Royal Agricultural Society, the Certificate of the Highland Society in Forestry, graduates in science of the University of London, Associates of the Royal School of Mines, and Associates of the Royal College of Science in Dublin, might also be exempted from the elementary course, and that would shorten the course by one-half for them.

473. What cost do you think such a curriculum would involve?—I do not think the fees of such a course ought to exceed 20*l.* for each student, and the whole period over which the course extended should not exceed 12 months for land agents.

474. But if the lectures are only to take three weeks, how do you propose to occupy the remainder of the 12 months?—I propose two courses, the elementary and the advanced. I think the elementary might be compressed into three weeks, and the advanced into three weeks; but those two courses should be separated by a considerable interval of time, and in the interval excursions might be organised and other opportunities afforded for practical observation in the woods.

475. But at what cost to the country could this school be established?—I think upon the moderate scale I have suggested; that is, that there should be no establishment charges, nothing more than the secretary's office, the cost would be very small. The services of a Professor of Forestry from Cooper's Hill could probably be obtained for 200*l.* a year; that would be, no doubt, an acceptable addition to his salary. A Professor of Botany, from Kew, would receive, say, 200*l.* year; and the services of a lecturer on land-agency subjects could also probably be obtained for that amount. The secretary's work would not be heavy. About 250*l.* a year would probably satisfy him to begin with. Probably, for a total cost of 1,100*l.* or 1,200*l.* a year, the foundations of a thoroughly sound system of forestry education could be laid in this country. Against that 1,200*l.* a year would be the income from the fees of students, and, what I expect there would be no difficulty in obtaining, grants in aid from one or two of the societies immediately interested. I have no doubt that a grant in aid might be obtained from the Royal Agricultural Society; and I have still less doubt that the society of which I am secretary would be willing to make an annual grant for the maintenance of such a school. From these two sources, the 1,200*l.* might be reduced to 800*l.*, which would not be a very large charge to the country.

476. Have you thought whether it might be desirable and advisable to graft upon Cirencester and Downton any establishment for teaching such as you have indicated?—I do not think that either Cirencester or Downton are very suitable places for the purpose. If a school of forestry be established at all, it should be a national school upon an independent basis, not linked in any way with any existing organisation like Cirencester or Downton.

Mr. Seely.

477. You said that, in your opinion, residence at Cooper's Hill for students of forestry would be out of the question; might I ask why?—By residence I mean continuous residence for any such period as is required for the Indian forestry course, or at the foreign schools, of two to three years; this is out of the question.

478. What you meant was, if it were a question of residence for two or three years?—Or of continuous residence at all.

479. We had evidence from a witness that a residence of six weeks or three months at Cooper's Hill would be of great value; should you think that that would be out of the question?—As regards some of the candidates, there would be no difficulty about a residence of six weeks, but as regards the bulk of the candidates I think there would be considerable difficulty, knowing what I do of the class from which they come; in fact, I think residence at all would imply an expense which very few of this particular class of candidates would care to incur.

480. But why should residence at Cooper's Hill be much more costly than residence in London?—As a matter of fact I believe the cost of residence in Cooper's Hill is at the rate of something like 200*l.* a year.

481. That is, if it were for a whole year; but I think it was Colonel Pearson whose idea was that the students should attend during six weeks or three months to go through a sort of practical course, not a course that you would consider would make them thorough foresters, competent to take the management of large forests, but a course which would give them a great amount of knowledge of woodlands, which would be of great use to them as land agents, wood bailiffs, or whatever you please to call them, and that there would be no great cost in a residence for that time at Cooper's Hill?—I should be very sorry to oppose my opinion to Colonel Pearson's upon a question upon which he is so eminently qualified to speak; but it is my experience, as far as professional education is concerned, that better results are obtained by distributing the teaching over a more lengthened period with considerable intervals, than by condensing it into one brief period of intense study of five or six weeks. I think very little good would result from the latter course.

482. You do not think it would be at all necessary that there should be a great amount of woodland attached to this forest school?—I think it would be of the highest value if 2,000 or 3,000 acres could be attached to the school at Cooper's Hill to which the Indian students could resort, as well as the land-agent students to whom I have referred. It would afford that opportunity for practical study which is now wanting.

483. The students in London you would send to that piece of woodland for practical instruction?—Yes, but I had rather more in my mind than a mere excursion; I had in my mind a visit of a week or a few weeks to the woods in the spring and autumn of the year.

484. Could you give the Committee an idea of how many students you think would attend a school of that sort?—It is difficult to say; we have on the average about 100 students of all kinds on our list. About a third of that number

are

4 June 1886.]

Mr. ROGERS.

[Continued.]

Mr. Seely—continued.

are of the land agency class; and, of course, it would only be a certain per-centage of that number who would be in a position or who would care to go through the forestry course, so that, I should say, if there were eight or ten students in a year for the forestry course, that would represent the extreme number coming from us.

485. What amount of fees do you think they would be inclined to pay?—I think I have stated that it should not exceed 20*l.*

Mr. Mark Stewart.

486. The suggestions you have made seem chiefly to apply to better educated men than the class of practical working foresters?—Wholly to the land agent class.

487. Have you any scheme by which working foresters could improve themselves, whether theoretically or practically?—I think that if a forest reserve were set aside, as has been already suggested by one or two witnesses, at Windsor Forest, it would afford a very excellent opportunity for any large landowners who wished their woodreeves to have a better type of forestry training to send them there, and keep them there a few weeks, but I can see no way of associating a system of education for these men with a national school of forestry; the school would afford an excellent opportunity for those men to work under proper teaching.

488. Do you think that a few weeks would satisfy to qualify them?—I have not had sufficient experience to say that, but I think it would be of very great value.

489. Does it ever occur to you that a certain amount of theoretical training might be given in board schools to young persons?—I have never thought of that, but I have no doubt it is possible.

Sir Edmund Lechmere.

490. Do you think it would be possible to connect with this school the province of inspection of woods, so that in cases where landowners and others wished to have a practical opinion upon the management of their woods they might secure the services of somebody at the school of forestry, they paying all expenses?—I am afraid that would be difficult. I should be very sorry to let it be supposed that I think there are not most eminent and most skilful foresters among the general body of land agents; they are the right men to have recourse to for advice as to the management of woods, but I see no advantage in seeking from the National School of Forestry advice of the kind to which you refer.

Sir John Lubbock.

491. When you spoke of the expense at Cooper's Hill being about 200*l.* a year, that would be the entire fee for the higher class of students; but it would be quite possible, would it not, to arrange with regard to woodreeves and wood bailiffs that they should be admitted to the practical part of the course for a much lower sum than that?—Undoubtedly it would; the difficulty is that the type of instruction at Cooper's Hill, and the purposes for which that instruction is given, are so essentially different from the pur-

0.108.

Sir John Lubbock—continued.

poses and the type of instruction which we require in England. I question whether it would be easy for the learned professors of Cooper's Hill to give instruction which was intelligible to the class of woodreeves. I think that their theoretical instruction should be as little as possible, but that their practical knowledge might be enlarged by means of this forest reserve at Windsor, or wherever it was established.

492. You have indicated, if I correctly understood you, courses of lectures to be given at various times and places; but do you not think it would be a great convenience to landowners if they could send their woodreeves to a definite place for a special time, say two or three months, for practical instruction rather than to have to make arrangements for their attending different lectures?—I was hardly contemplating the sending of woodreeves to attend the lectures. I have associated the lectures in my mind entirely with land agent candidates; but there would be no difficulty in giving upon the ground in connection with this forest reserve instruction of a strictly practical character, in which the various features of wood management might be pointed out to the woodreeves. This would be of very much greater value than technical lectures in London to the class of woodreeves.

493. It would be necessary then to be carried out upon the spot, in the forest?—Certainly.

494. You referred to the lectures proposed to be given in the City of London College; but are there not a number of students in that college who are mainly clerks in the City of London?—Yes.

495. They are persons who have already devoted themselves to a different sphere of life, and they would not be likely to seek for instruction in forestry?—Certainly. I merely refer to it as the only case within my knowledge in which an attempt had been made to give lectures upon the subject.

496. In your mind it would in no way tend to discourage any attempt elsewhere?—Not the least.

497. Colonel Pearson and Dr. Brown on the last occasion expressed the opinion that if we had a forest school it would be a place in which with advantage experiments might be carried on, and research might be conducted upon various questions connected with forest economy; do you also think that would be an advantage in a forest school?—I think it would be a very good thing; but, in my opinion, it should come later. If the scheme were encumbered with expensive features of that kind it would probably not survive the first few years; but as it grew and began to feel its way, research would be a most valuable feature of such a school. Of course the great difficulty is that for purposes of research it is necessary to embark upon large establishment changes, whereas I venture to suggest that this school should start at first as a mere skeleton arrangement, leaving all special features to be filled in at a later date.

498. You think it would be a most valuable outcome of the school when developed?—Most valuable. When I was referring to the constitution of a forest school, I intended to suggest that

E 3

in

4 June 1886.]

Mr. ROGERS.

[Continued.]

Sir John Lubbock—continued.

in addition to a board constituted in some such way as I have indicated in England, it would be a very useful thing if there were associated with it a board of something like the same character in Scotland, as the nucleus around which a forest school might ultimately be formed in Scotland. I have suggested that there should be upon the board in England two delegates from the Highland Society, and one from the

Sir John Lubbock—continued.

Scottish Arboricultural Society. These three delegates would form a nucleus for a Scotch board. There should be associated with them the Professor of Agriculture of the University of Edinburgh, whose assistance and advice would be of the utmost value for the conducting and organising of expeditions of English students to Scotch forests; I would also place on the board one or two large Scotch landowners.

Mr. ALEXANDER MACKENZIE, called in; and Examined.

Chairman.

499. You have had a good deal to do with timber all your life?—I have.

500. I think you are of opinion that we in England have not paid that practical attention to the matter that the subject deserves?—I have a very strong opinion to that effect, and have had all my life.

501. I think you have had your attention called to, and are acquainted with, a large amount of woodlands which are very much neglected, and which produce nothing compared to what they might be expected to do; could you give the Committee any practical suggestions for awakening public attention to the improvement and alteration of the system which is in vogue?—I do not think I can give any better suggestion than this: that there is a teaching required of the young, it cannot be better begun than in early life, with regard to the importance of timber and the whole subject in all its branches.

502. Would you begin as early as an honourable Member suggested; in the board schools?—I would. I think it is a capital idea; the sooner the teaching is begun the better. I do not think it should be confined to a class. I am strongly of opinion that the prevailing ignorance with regard to timber of all kinds and the growth and management of it is lamentable, and discreditable to the times in which we live.

503. How can we mend it?—I do not think we can mend it any better than by teaching the young in a forestry school.

504. You have heard the suggestion of the last witness in regard to the lectures; do you think that that is a practical suggestion?—Yes, I like the suggestion very well, but I do not think Mr. Rogers is so enthusiastic about it as I am, he does not quite know the wants, and has not seen so much of the neglect as I have. My life has been devoted to practical reform in regard to timber in a very great measure.

505. Have you had to do with buying and selling timber?—I have had a great deal to do with buying and selling timber for the last 30 years; it is a branch of my business that I have almost always attended to personally, very seldom by deputy. I have always kept myself up in a knowledge of the various woods in which I have sold timber.

506. Were you acting for landowners?—Yes; I have been acting for many of the landowners in the neighbourhood of Hertford and the east side of Hertfordshire.

507. Have you had to value timber?—I have

Chairman—continued.

usually had to sell, and sometimes to select and mark the timber.

508. In so doing you have been impressed with the great neglect which you have seen?—I have been very much impressed with the way in which the woods have been left to manage themselves, I may say.

509. Do you think that if opportunities were offered such as has been suggested, the surveyors and land agents would be glad to avail themselves of them?—I do think so; I can hardly imagine but what there would be a large number of gentlemen who would send their sons to attain that special knowledge which could not be attained so well anywhere as it could be in a school specially devoted to it.

510. Is there a want felt by landowners at the present time of competent land agents, whom they could consult as to the condition of the timber on their estates, and obtain advice as to their future management?—My experience is that there is a very great want among gentlemen of that class, there being so few land agents who understand the matter.

511. You have no special recommendations to make beyond the general feeling of the necessity of some special education being provided?—I know well the different kinds of timber that I think would be most profitable; but that, I think, is a matter of detail.

512. Do you think planting would pay the landowners?—I am sure it would pay the landowners much better than they have any idea of, if it were done with proper judgment.

513. Have you formed any idea what the return might be, to which a man could look?—I have not formed an idea of any particular percentage of return; I can only speak comparatively. I believe the land properly planted would grow crops of stuff that would really pay better than land does at the present time under agricultural crops.

514. Do you know a pamphlet by Mr. Beattie upon management of woods in Cumberland, in which he states that he paid to his principals, after deducting all expenses, 18 s. 7 d. an acre upon 200 acres of plantations upon land which would not have been worth more than from 5 s. to 7 s. an acre for agricultural purposes?—I can quite believe it.

515. You believe that to be possible?—I do.

516. And that that might be the case over large areas?—Yes, I believe so, by planting the timber in the different soils that were suitable.

517. Would

4 June 1886.]

Mr. MACKENZIE.

Continued.

Chairman—continued.

517. Would you advise any particular timber?—I am very fond of oak, and I am very fond of Spanish chestnut, and I am very fond of ash and larch.

Sir John Lubbock.

518. With regard to the percentage of return, you have just stated in reply to the honourable Chairman, that you could not go into details upon that point; could you form any impression of what the difference would be upon woodlands, if they were properly managed; would they return half as much more than they do at present?—Yes, I should say that woods properly managed would return just double what they do at present.

519. Do you think that if our woodlands had been better managed than they have been, they would return half as much again?—Yes, in many cases they would return double as much; not always so, but as a general principle I would say they would return double as much prospectively, especially with regard to oak plantations, and the training up of young oak trees.

520. We have a number of works upon forestry, but you are of opinion that we cannot obtain a satisfactory knowledge of forestry merely from book-learning?—No, I know where the best learning is to be got, and that is out of doors.

521. You have no suggestion to make to the Committee upon the subject?—No, I have not thought out the subject, because I thought there would be gentlemen examined as witnesses whose profession it is to initiate the teaching of the young, who would be better able to devise the teaching than I should be able to do, but I think it is very important that the forest school should be within easy access of the metropolis, and that it is most important that those who attend it should have access to a forest, and be able to watch the management of tree planting, the growth of trees, pruning, and all those things appurtenant to forest culture. It is quite impossible that people can be taught forestry without seeing all parts of the work in daily exercise.

522. What length of time do you think would be required for a bailiff or woodreeve to get a

Sir John Lubbock—continued.

good sound instruction in forest management?—I do not think it would take long if a man of average intelligence has had some estate training by some one who knows better about it than himself. If he goes to the school of forestry with a foundation of useful knowledge already laid, I do not think it would take him very long. I should have thought six months' attendance, or even less than that, would be quite as much as he would want.

523. You think that three months would give him, at any rate, an amount of information which would be extremely valuable?—I do indeed, if he were to work.

Sir Edmund Lechmere.

524. You stated that you had great experience of woodlands, and had noticed defective management; what are those defects?—The greatest defect which I have noticed is this, that when gentlemen cut down trees they do not plant again as they ought to.

Mr. Mark Stewart.

525. When a wood has been cut down, how many years' rest would you give that wood; when would you replant?—Immediately; I do not think there is any occasion for any delay about it.

526. Do you think that could be done with any good effect?—Do you mean to rest the land?

527. Not only to rest the land, but to clear it of fungus, and to let the roots decay?—Except in special cases, I do not think that would be necessary.

Sir Edmund Lechmere.

528. The defects you mentioned were rather defects of treatment, I gathered, than of the defective means employed by the landlord; do you find generally that there is a want of intelligence on the part of wood-bailiffs?—Yes, I do, very great indeed. I have very seldom been able to stir up anybody's attention to the management of timber. I may be an enthusiast; but I think those gentlemen who do not take it up miss a very great pleasure, and can have no idea what is in store for them.

1793
REPORT

FROM THE
SELECT COMMITTEE

ON

F O R E S T R Y;

TOGETHER WITH THE

PROCEEDINGS OF THE COMMITTEE,

AND

MINUTES OF EVIDENCE.

*Ordered, by The House of Commons, to be Printed,
18 June 1886.*

[Price 6 d.]

202.

11.—9. 7. 16.

Under 6 oz.

I N D E X

TO THE

R E P O R T

FROM THE

SELECT COMMITTEE

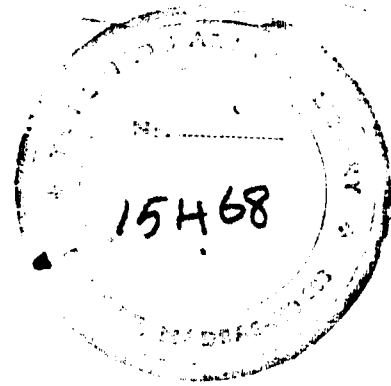
ON

F O R E S T R Y.

*Ordered, by The House of Commons, to be Printed,
3 August 1887.*

LONDON:
PRINTED BY HENRY HANSARD AND SON,
AND
Published by ERAM and SPOTTISWOODE, East Harding-street, London, E.C.,
and 32, Abingdon-street, Westminster, S.W.;
ADAM and CHARLES BLACK, North Bridge, Edinburgh;
and HODGES, FIGGIS, and Co., 104, Grafton-street, Dublin.

55



2

I N D E X.

ANALYSIS OF INDEX.

LIST of the PRINCIPAL HEADINGS in the following INDEX, with the Pages at which they may be found.

	PAGE		PAGE
<i>Athole, Duke of</i> - - - - -	143	<i>Larch</i> - - - - -	158
<i>Board or Council of Forestry</i> - - - -	145	<i>Management and Cultivation of Woodlands</i> -	161
<i>CIRENCESTER AGRICULTURAL COLLEGE</i> - -	147	<i>New Forest</i> - - - - -	162
<i>CONNEMARA</i> - - - - -	149	<i>Practical Instruction</i> - - - - -	164
<i>COOPER'S HILL</i> - - - - -	150	<i>Price of Timber</i> - - - - -	165
<i>Dean Forest</i> - - - - -	151	<i>Profitable Results</i> - - - - -	165
<i>Douglas Pine</i> - - - - -	151	<i>SCHOOLS OF FORESTRY</i> - - - - -	166
<i>DOWNTON AGRICULTURAL COLLEGE</i> - -	151	<i>SCOTLAND</i> - - - - -	167
<i>Foreign Competition</i> - - - - -	154	<i>Soil</i> - - - - -	168
<i>FORESTERS AND WOODMEN</i> - - - - -	154	<i>Spain</i> - - - - -	168
<i>IRELAND</i> - - - - -	157	<i>United States</i> - - - - -	170
<i>LAND AGENTS</i> - - - - -	158		

I N D E X.

[N.B.—In this Index the *Figures* following the Names of the Witnesses, and those in the Analysis of Evidence of each Witness, refer to the Questions in the Evidence; the Figures following *App.* refer to the Pages in the Appendix; and the Numerals following *Rep.* to the Pages in the Report.]

A.

AGRICULTURE. Advantage of forestry as well as agriculture being taught at the colleges at Cirencester and Downton; suggestions for further utilising these institutions in this direction, *Wrightson* 276-281. 316, 317. 328. 342-346; *Sir J. D. Hooker* 2191-2194. 2201. 2207-2210—Expediency of forestry being taught in conjunction with agriculture and the kindred sciences, and of land agents being instructed in it, *M'Clellan* 413-433; *Earl of Duff* 444, 445. 456.

See *Cirencester Agricultural College.* *Downton Agricultural College.* *Schools of Forestry.*

Alder. Suggestions by Mr. Barnes Price for the planting of alder trees in Ireland, as growing rapidly, especially in low and swampy land, *App.* 141.

American Timber. See *United States.*

Area of Woodlands. Belief that in Great Britain there are about two and a-half million acres in wood, *Clutton* 1983, 1984.

Total area of 2,788,000 acres of woodlands in Great Britain and Ireland, *Rep.* iii.

Ash. Prospect of profitable results from the planting of ash, *Powell* 2134.

Athole, Duke of. Situation of the Duke of Athole's woods entirely in Perthshire, there being about 20,000 acres, consisting chiefly of larch and fir, *Macgregor* 870-874—Practice of thinning out the least valuable trees in the woods; greatly decreased value since the markets were glutted by the large fall of timber in the sales of 1879; *ib.* 882-884. 1136-1139.

Satisfactory result as regards some 3,000 acres recently planted chiefly with Scotch fir, *Macgregor* 886—Satisfactory results also in the case of 366 acres of larch planted in 1817; *ib.* 887-905. 987-991. 997-999. 1077-1079—Offers obtained from wood merchants, through advertisements, whenever a quantity of timber is to be cut down, *ib.* 943. 971-979—Very good spruce fir on the Athole Estates; sale for pit props when the trees are about fifteen years old, *ib.* 992-996.

Paper submitted by Mr. M'Macgregor containing sundry particulars respecting the Loch Ordie Plantation, planted in 1815-18; *App.* 128—Particulars also respecting the Loch Holsen Plantation, as planted in 1825 and 1826, *ib.*

Austrian Firs. Value, in exposed situations, of some rows of Austrian firs as affording better shelter than Scotch firs, *Barron* 189-201—Reference to the Austrian pine as growing very well in Connemara, *Flannery* 1522.

Dissent from certain evidence of Father Flannery respecting the Austrian pine, witness' experience being that it is not a desirable tree to plant in this country, and that the timber is very useless, *Viscount Powerscourt* 2283-2286—Utility of the Austrian pine when planted for the shelter of other trees, *ib.* 2299.

B.

Barron, William. (Analysis of his Evidence.)—Long and extensive experience of witness in the planting and management of woods; reference more especially to the Elvaston and Gainsworth Estates of Lord Harrington and to the Sennowe Estate in Norfolk, 1-10—He has also been frequently consulted on the subject, professionally, in all parts of Great Britain, 11.

Barron, William. (Analysis of his Evidence)—continued.

Very unscientific and wasteful management of the woodlands generally throughout the country, 13, 14, 22, 23, 29, 39-41, 84, 148—Importance attached to the selection of seeds from the very finest specimens, 13, 14, 62—Very little knowledge of forestry possessed by land agents, 15-17, 23—Strong approval of the establishment of schools of forestry in England, Scotland, and Ireland; suggestions in detail as to the scientific and technical instruction to be given, 18-37, 64-93, 111-126.

Great mistake in planting extensively on inferior ground and unsuitable soil, though with proper management and selection of trees good results may be produced, 27, 42-45, 61, 155-158, 175, 176—Illustration of the advantage of foresters knowing something of arboricultural botany, as by an operation for largely increasing the number of small shoots upon pine trees, 28, 29, 38-41—Advantage of the larch and pine for planting on inferior ground, 43-45, 164-168—Several kinds of pine best fitted for planting in this country, the Corsican pine being one of these, 45-48—Special value attached to the Douglas fir; very high and exposed altitudes at which it thrives, 48-50, 52, 54-59.

Large areas of land in England which might be advantageously and profitably planted on an improved system; reference more especially to land where rubbishy trees are now grown, 60-63, 70-75, 95-104, 127, 128, 155-160, 171-174—Want of a combination of scientific knowledge with practical instruction in the forests, 63-68, 76-83, 112-126—Expediency of plants for a permanent forest being first proved in a nursery, whence they should not be planted out till they are from four to five feet high, 63, 148, 149, 202-207—Illustration of the importance of men possessing naturally the organisation for first-class foresters before they are put under training, 67-69.

Conclusion that railway sleepers and other timber now largely imported might be profitably produced at home if there were a better system of instruction in forestry, 70-75, 93, 94, 129-135, 161-163—Opinion that when a sufficient supply of trained and specially qualified foresters has been provided the proposed schools of forestry need not be permanently continued, 78-83, 86-93—Very few men throughout the country who now possess the required knowledge and qualifications, 84, 85, 169.

List of the trees which could be grown most profitably, 93, 94—More profitable results from Lord Harrington's woods if they had not been mismanaged formerly, 105-110—Fault of management rather than of soil that better timber is not produced in much larger quantities in successful competition with the foreign timber now imported, 127-135, 171-174—Better facilities for competition with foreign timber if improved sawing machinery were used in this country, 136-147.

Very limited extent to which the bad condition of plantations is due to the preservation of game, 149-154—Equal facility of successful cultivation of the larch and other trees in England as in Scotland, except that the supply of good foresters is more restricted in England, 164-170.

Further statement as to the merits of the Douglas pine and the expediency of its extensive introduction into this country, 177-181—Advantage also of cultivating the Sequoia (*Wellingtonia gigantea*), and of pruning it carefully, 182, 189-191.

Suggestions as to the thinning and pruning of forest trees and as to the distance to be allowed between each when planted; advantage of pruning every two or three years, the cost of labour being well repaid, 185-203—Value, in exposed situations, of some rows of Austrian firs as affording better shelter than Scotch firs, 199-201—Mention of some of the best books (notably "Brown's Forester") for use in forestry schools, 208-211.

Large extent to which the woods under witness' charge are cultivated and managed for commercial purposes; ornamental purposes also had in view, 212-217—Reference to a specimen of the *Araucaria Imbricata* as illustrating the permanent mischief caused by plants being pot-bound, 217.

Bathurst, Earl. (Analysis of his Evidence.)—Witness is a member of the Council of Cirencester College, the college being situated on his estate, whilst his woods in the vicinity extend over an area of 2,500 acres, 542-545, 598.

Readiness of witness to give every facility to courses of lectures on forestry in his woods and to receive from students for practical instruction; objection to any interference with the management, 546, 548, 576, 586, 608, 615—Opinion that the required instruction in forestry should be provided by supplementing existing institutions, such as Cirencester College, instead of by founding a large National College of Forestry, at a great expense to the public; full approval, however, of Government aid in the matter, 547-554, 559, 573, 599—Information as to witness' staff of woodmen and workmen, and as to the qualifications of the former, 548, 557, 558, 565-567, 598-605.

Means of obtaining land in the vicinity of Cirencester College for nursery purposes; want rather of old-established woods for showing the results of experiments, 549-551—Doubt as to forestry having any greater claim to special Parliamentary grants than other branches of agriculture, 552, 554, 560-573—Very large debt at one time upon the college; steady diminution being effected, 553—Obstacles to the profitable cultivation

Bathurst, Earl. (Analysis of his Evidence)—continued.

cultivation of woods in this country, even if there were a supply of specially trained foresters; great depreciation in the price of timber, 554-556, 559-564, 568, 574-597.

Considerable expense in connection with witness' woods, which are not kept up solely for profit; particulars hereon as to the management and the results, 554, 555, 560-563, 576-581, 586-592, 594-605—Doubt as to the policy of the planting of waste lands by Government or of Government loans in aid of plantations, 574-576, 593—Heavy pressure of the Succession Duty in the case of timber, 582-585—Objection to home-grown timber for building purposes, 591.

Difficulty as to the teaching of woodmen or under-woodmen in forestry schools, 606-612—Eminent success of Cirencester College as regards agricultural education, 609—Value of special forestry instruction of land agents, or of chief foresters, whose knowledge might direct those under them, 610-613—Doubt as to much good resulting from the establishment of a Council of Forestry, as suggested by Colonel Pearson; willingness, however, of witness to accept advice from such a body, 616-619.

Beech. Much lower price of beech timber than in former years, *Earl Bathurst* 559-564—Less foreign competition with beech than any other wood, *Britton* 762—Instances of very flourishing beech plantations which have been self-planted, *ib.* 841.

Birch. Good return from birch, as not involving any cost for planting, *Thomson* 1327-1329.

Board or Council of Forestry. Favourable opinion of witness as regards Colonel Pearson's suggestions for the constitution of a Forestry Board for the whole country, *M. Clellan* 379-382—Doubt as to much good resulting from the establishment of a Council of Forestry, as suggested by Colonel Pearson; willingness, however, of witness to accept advice from such a body, *Earl Bathurst* 616-619.

Approval of the proposal for the establishment of a standing Council of Forestry, *Sir J. Campbell* 639, 640—Suggestions for the constitution of a Board of Advice, or examining board, to be presided over by a Government official, irrespectively of the National Forestry School, *Clutton* 1928, 1930, 1931, 1976-1979, 2014-2017.

Recommendation by the Committee that a Board of Forestry be established; suggestions as to its constitution, *Rep. v.*—Part to be taken by the proposed Board in considering the best mode of carrying out a course of instruction and examination in forestry, *ib.*—The Board should be presided over by a responsible official appointed by the Government, *ib.*

Various societies to be represented; also the Office of Woods and Forests, whilst the Director of Kew Gardens should be a member *ex-officio*, *Rep. v.*—The Board should also comprise three Members of each House of Parliament, and a certain number of owners and managers of large woodlands, *ib.*

Summary of the functions to be discharged by the Board, *Rep. v.*—Opinion of the Committee that the expense of secretarial staff and examiners need not exceed 500 *l.* a year, and that the cost might be considerably reduced by fees for diplomas, *ib. vi.*

Board Schools. Advantage if a good handbook of forestry were taught in the national or Board schools, and if there were practical training subsequently in the forests, *Sir J. Campbell* 641, 671, 709, 710, 734-737—Approval of elementary forestry being taught in Board schools, *Powell* 2069, 2165-2167.

Paper explanatory of the views of Sir James Campbell as to the expediency of a certain amount of forestry education at Board schools; that is, for woodresves, bailiffs, and under-foresters, *App.* 134.

Botany. Illustration of the advantage of foresters knowing something of arboricultural botany, as by an operation for largely increasing the number of small shoots upon pine-trees, *Barron* 28, 29, 38-41.

Suggestion by the Committee that botany be one of the subjects in which forestry students should be examined, *Rep. vi.*

See also *Kew Gardens*.

Britton, H. A. (Analysis of his Evidence.)—Witness is out-door manager and valuer for the firm of Richard Shelton and Sons, timber merchants at Wolverhampton; he is thoroughly conversant with the woodlands in the greater part of Wales and in the chief timber-producing counties in England, 756-758.

Very bad management, as a rule, of the woodlands in this country; exceptional instances of employment of foresters, 759, 760, 809, 810, 821-824—Very little, if any, prospect for the home timber trade, or for profitable planting and cultivation, in view of the extremely low prices of imported timber from Norway, America, and elsewhere; particulars hereon, 761 *et seq.*—Less foreign competition with beech than any other wood, 762—Very large import of Norway pine, nine-tenths of the mining timber used in South Staffordshire coming from Norway; exceedingly low price as compared with timber from South Wales, 762-768, 788-806.

Britton, H. A. (Analysis of his Evidence)—continued.

Exceedingly low price also of Canadian timber, though the forests in Canada have been much damaged, 768, 840, 841—Information as to the preferential rates charged by railway companies in this country in favour of imported timber; abuse as regards home-grown timber, the rates for which should be modified, 769-780, 790-800—Very few agents who know anything of forestry; expediency of facilities being provided for their instruction, theoretically and practically, so that they may be able to teach the woodmen as to management, soil, &c., 781-787, 827-836.

Low price at which oak and other timber is imported from America; very large supplies available, so that defective timber can be thrown aside, 807, 814, 815—Consideration of the relative quality of British and foreign timber and the relative demand for cash; preference for the latter mainly on account of the low price, 808-826—Almost exclusive use of foreign timber for building purposes, 816, 817.

Advantage of students in forestry going to the chief districts where larch or beech, &c., is grown, in order to obtain practical knowledge, 836—Want of more skilled workmen for felling timber, whilst very few agents know anything of this subject, 837-839—Instances of very flourishing beech plantations which have been self-planted, 841.

Brown, The Rev. John Crumie, LL.D. (Analysis of his Evidence.)—Witness is the author of several works on forestry, and has acquired much information in connection with schools of forestry on the Continent, 2238-2241.

Result of witness' inquiries that he considers Spain affords the best model for a forestry school in this country; particulars hereon as to the national school at Madrid, the staff, course of instruction, facilities for practical study, &c., 2242-2254, 2269, 2270—Comparatively little importance attached in Spain to practical instruction in the forests simultaneously with scientific training, 2249, 2250, 2269, 2270—Advantage of the system in Spain of adapting the training to the requirements of the country, 2254-2276.

Advocacy of the establishment of a national school of forestry at Edinburgh for the United Kingdom, India, and the Colonies, rather than of separate schools for England, Scotland, and Ireland, 2255-2266—Opinion that a forestry school in Ireland should be at the College of Science in Dublin, rather than at Glasnevin, 2261-2263—Grounds for the conclusion that scientific instruction should be given by itself at first, to be followed by practical study or instruction on the spot, 2267-2272.

Similar lines upon which the forestry schools in Germany are conducted, though the rules of management vary very much in different schools, 2273-2276—Conflict of opinion in Spain upon the question of preservation of the forests; value attached by the engineers to the retention of the forests on climatic grounds, 2277, 2278.

Diplomas in forestry given by the Highland Agricultural Society as an examining body, 2279-2281—Examinations in forestry also at South Kensington, the students coming from outside sources, 2281, 2282.

Building (Home and Foreign Timber.) Disadvantages of home-grown timber for building purposes, *Earl Bathurst* 591; *Sir J. Campbell* 682—Almost exclusive use of foreign timber for building purposes, *Britton* 816, 817—Competition in Scotland of foreign timber with home-grown for building purposes, *Macgregor* 975-979.

Small demand for home-grown as compared with foreign timber for building purposes since the extended use of improved machinery for conversion of the latter; illustration in witness' case, *Dundas* 1415.

C.

Campbell, Sir James. (Analysis of his Evidence.)—Management of the Forest of Dean by witness, under the Commissioners of Woods and Forests, 620.

Area of from 15,000 to 16,000 acres of woodland comprised in Dean Forest and the High Meadow Estate; very much larger area in former times, 621, 675, 676—Cultivation chiefly of oak, for the Navy, the plantations being mostly from twenty-five to seventy years old, though some are about 130 years old, 622-628, 658, 717, 718—Information as to the staff under witness, and their qualifications; practical training of the woodmen from their youth in the forest, 629-636, 656.

Evidence to the effect that there is not sufficient forest land in this country to require the establishment of a special school of forestry, or to justify large grants of Parliament for the purpose, 637, 641, 649, 660, 692, 699-709, 719-732, 742, 745, 751—Value of special instruction of land agents in forestry at institutions like Cirencester; great utility as to foresters or woodmen being specially instructed at any college, 637, 641, 643, 660, 719-723—Approval of a proposal for the establishment of a standing Council of Forestry, 639, 640.

ampbell, Sir James. (Analysis of his Evidence)—continued.

Advantage if a good handbook of forestry were taught in the national or Board schools, and if there were practical training subsequently in the forests, 641, 671, 709, 710, 734-737—Value of practical training under experienced foresters, rather than in a college, in the case of ordinary woodmen, 641—Preference for the forestry instruction at Nancy rather than at Cooper's Hill, as regards the Indian Forest service, 642, 704, 724-730, 733.

Suggestions as to the extent to which the Forest of Dean might be utilised in connection with the forestry branch at Cirencester College, as well as with the practical training of young men as woodmen, 643-646, 651-657, 683-691, 703, 711-716, 738-745—Doubt as to the expediency of planting oak or other trees on a very large scale as a national undertaking or by means of State loans, 658-660, 664-668, 693-695—Bad financial results from Dean Forest in the last two or three years; injurious effect of foreign competition, 661-663, 677-681, 697, 698.

Approval of the planting of certain tracts and classes of land now used as very poor pasture, as in Scotland, 667, 668, 693-698—Sufficiency of one forestry establishment for Scotland and England, witness further suggesting, however, that existing institutions be utilised in this direction, 669-674, 719-732—Disadvantages of home-grown timber for building purposes, 682.

Opinion that there is not sufficient reason for the endowment of a professor of forestry with reference merely to research, 742, 751-755—Explanation that witness strongly approves of extended scientific instruction in forestry, but for the financial difficulties, 742, 745—Statement showing the beneficial results from the transplanting of oak trees; satisfactory experiments on this subject in Dean Forest, 745-750, 752.

ampbell, Sir James. Letter from Sir James Campbell to the Chairman of the Committee with reference to the evidence of Colonel Pearson in 1886, and the best means of teaching forestry in this country, *App.* 134.

Canada. Exceedingly low price of Canadian timber, though the forests in Canada have been much damaged in recent years, *Britton* 768, 840, 841—Very little Quebec yellow pine now obtainable from Canada, *ib.* 2073.

Cedar. Valueless character of the cedar of Lebanon when grown in England, *Sir J. D. Hooker* 2223, 2224.

CIRENCESTER AGRICULTURAL COLLEGE:

Suggestions for further utilising, as regards forestry, the colleges at Downton and Cirencester in connection with a system of public examinations and of certificates to successful students, *Wright* 336-341, 316, 317, 338, 342-346.

Incorporation of the Royal Agricultural College at Cirencester in 1845; management by a committee, of which Lord Ducie is Chairman, *M. Clellan* 360-363—Explanation of the general objects of the college and the curriculum of the studies; extent to which forestry is included, *ib.* 364-368, 363, 364, 391-399—Total of fifty-seven in-students and of thirty out-students, their ages varying from seventeen to twenty-three, *ib.* 367-369.

Small proportion of the students who eventually became land agents, *M. Clellan* 360, 427, 428—Successful examinations passed at the Royal Agricultural Society and the Surveyors' Institution by students of Cirencester College, *ib.* 361, 362—Resources and capabilities of the college for instruction in forestry; botanic gardens, nurseries, and woodlands available for the purpose, *ib.* 363-366, 393-399, 404-407, 434, 435—Advantage if Lord Bathurst's woodlands and the Forest of Dean were available for instruction in connection with a national school of forestry at the college, *ib.* 364, 365, 426-428, 424, 436.

Instruction in forestry given by the professor of estate management; improvement if his services were available for the whole of the year, and if he had the assistance of a practical forester, *M. Clellan* 366, 370, 408-412, 435, 437—Estimate of about 600 l. a year as sufficient for a very valuable school of forestry at Cirencester College, whereas a grant of, probably 100,000 l. and a large annual outlay would be required for a National College of Forestry, *ib.* 369-371, 408-412.

Accommodation available locally for a large number of out-students if there were special instruction in forestry, *M. Clellan* 371, 385—The present fees are 135 l. a year for in-students and 75 l. a year for out-students, *M. Clellan* 390; *Earl of Ducie* 458.

Considerable importance attached by witness to the teaching of forestry at the college, *Earl of Ducie* 438-444—Facilities at Cirencester for both out-students and in-students; relative fees for the two classes, *ib.* 447-450, 458, 459—Heavy debt incurred by the college through the fees having at first been fixed too low, *ib.* 457—Natural facilities locally for the study of arboriculture, *ib.* 467.

CIRENCESTER AGRICULTURAL COLLEGE—continued.

Assistance derived by witness (as Professor of Estate Management and Forestry) from two practical foresters, practical instruction being given under his supervision to the students in certain neighbouring woods; particulars hereon, *Elliot* 472-487. 495—Course of lectures given by witness on estate management, including forestry; expediency of a considerable development of the forestry branch, *ib.* 474, 475. 495-505. 509-520. 540, 541—Improvement if a nursery were attached to the college, *ib.* 518. 538, 539.

Witness is a member of the Council of Cirencester College, the college being situated on his estate, whilst his woods in the vicinity extend over an area of 2,500 acres, *Earl Bathurst* 542-545. 598—Readiness of witness to give every facility to courses of lectures on forestry in his woods, and to visits from students for practical instruction; objection to any interference with the management, *ib.* 546, 548. 576. 586. 608. 615—Means of obtaining land in the vicinity of the college for nursery purposes; want rather of old-established woods for showing the results of experiments, *ib.* 549-551.

Very large debt at one time upon the college; steady diminution being effected, *Earl Bathurst* 553—Eminent success of the college as regards agricultural education, *ib.* 609.

Paper submitted by Mr. McClellan in further elucidation of his views as to the advantages of Cirencester College for forestry instruction, and as to the reasons for preferring it to Cooper's Hill, *App.* 128-133.

Insufficiency of evidence for enabling the Committee to judge as to the respective advantages which might be offered by Cirencester and Downton, *Rep.* iv.

See also *Dean Forest*.

Climate and Shelter. Belief as to the beneficial effect upon the climate where there are large plantations; doubt as to the rainfall being affected, *Macgregor* 1072-1076—Beneficial effect of woodlands as regards the climate and the moisture of the soil, *Thomson* 1229-1231—Great value of planting as a means of shelter; improved climate thereby, *Flannery* 1493. 1566.

Substantial enhancement of the value of adjacent property by the shelter afforded by plantations, the soil and climate being also much improved, *Gilchrist* 1704-1709—Value of planting as a shelter to adjoining land, *Viscount Powerscourt* 2326, 2327. 2376. 2403.

Valuable effect of woods in affording shelter and improving the climate, *Rep.* iv.

Clutton, John. (Analysis of his Evidence.)—Experience of witness for more than fifty years as a land agent and surveyor; management by him of the woodlands on the Crown property south of the Trent, 1909-1919—Survey by witness in 1848 and 1849 of all the forests and woodlands belonging to the Crown, 1917.

Very good management of many of the woodlands in the hands of large proprietors, whilst as a general rule the smaller woods are not well managed, 1918—Want of special instruction in forestry for land agents, but not for foresters; the latter class should be instructed by the former, or should be trained where they are at work, without going to any forestry school, 1919-1922. 1949-1952. 1980-1982. 1997-1999. 2007—Opinion that land agents could not afford the time or expense necessary for the course at Cooper's Hill, 1922, 1923.

Paper prepared by witness, in conjunction with Mr. Julian Rogers of the Surveyors' Institution, setting forth their joint views on the subject of a State Forestry School, 1924-1929—Decided preference for a National School of Forestry, instead of attaching professorships of forestry to existing institutions throughout the country, 1928, 1929. 1941-1948. 1963, 1964. 1994-2003—Suggestions for the constitution of a Board of Advice, or examining board, to be presided over by a Government official, irrespectively of the National Forestry School, 1928. 1930, 1931. 1976-1979. 2014-2017.

Considerable difficulty in rating woodlands justly; effect, moreover, of the liability to rates in rendering profitable cultivation still more uncertain, 1932. 1973-1975—Statement as to common woodlands having paid nothing of late years, there being no demand for the thinnings of young plantations, 1933, 1934. 1936. 2025-2028—Advantage in land agents being so instructed as to be able to grow the largest produce on the smallest quantity of land, 1935. 1959, 1960. 2039.

Probability that the imports of colonial or other foreign timber will in course of years diminish in quantity and increase in price; national importance on this score of encouraging forestry instruction and increased planting at home, 1935, 1936. 1955-1956. 2022-2024. 2039—Immense area of land now lying waste which should be planted; prospect of profitable results in course of time if the management be judicious, 1936. 1966-1974. 1985-1986. 2018-2030.

Question

Clutton, John. (Analysis of his Evidence—continued.)

Question considered whether the forestry course at Cooper's Hill might not be so rearranged as to be utilised by land agents at home as well as by students for the Indian Forest Service, 1937-1952—Different management required for trees and plantations in some counties as compared with others on account of the varying soil; necessity of practical knowledge being acquired on the spot, over and above scientific instruction at central school, 1953, 1954. 2031-2033.

Limited public expenditure contemplated by witness in connection with a National School of Forestry; that is, in view of the payments by students wishing to qualify as land agents, 1955-1966. 1990-2007. 2010. 2040-2042—Instances, within witness' knowledge, of woodlands, as distinct from forests, which are giving a fair return on the outlay, 1966-1973—Belief that in Great Britain there are about 2½ million acres in need, 1983, 1984.

Suggestions as to the character of the instruction to be given in the proposed Forestry School, 1994-2013—Comment upon the large area (some 40,000 acres) of uncultivated land in the New Forest, 2018-2021. 2034, 2035—Disafforestation of some 10,000 acres of woods by witness, which he would now like to see restored, 2029, 2030—Obstacles to utilising the New Forest for forestry instruction, 2036-2038.

Competition. See *Foreign Competition*.

CONNEMARA (WEST OF IRELAND):

Great deficiency of timber in Connemara, and of drift wood, for the wants of the people, *Flannery* 1473-1475. 1495-1498. 1506. 1605, 1610—Practice of planting for shelter near the houses of large proprietors, there being very little timber except on the shores of Lough Corrib, *ib.* 1476-1482.

Several respects in which important benefits would result from extensive planting in Connemara, whilst there are extensive areas available, and there is evidence that woods existed in former times, *Flannery* 1483 *et seq.*—Facility as regards conveyance to market if a railway were made in the district, *ib.* 1490-1492. 1567-1569—Want of timber for boats; also of osiers for lobster pots, *ib.* 1495-1498. 1550. 1682-1588. 1624-629. 1656-1659.

Increased attraction to tourists if planting were carried out on the mountains, *Flannery* 1499-1501—Employment to be given at factories if sufficient timber were procurable in the district, *ib.* 1502-1505—Facility of obtaining 30,000 or 40,000 acres of land for planting at a rent of about 6d. an acre; entire absence of difficulty on the part of either of landowners or tenants, the latter being benefited in various ways, *ib.* 1507-1516. 1527-1531. 1533-1535. 1537-1539. 1541-1543. 1545-1547. 1549-1551. 1553-1555. 1557-1559. 1561-1563. 1565-1567. 1569-1571. 1573-1575. 1577-1579. 1581-1583. 1585-1587. 1589-1591. 1593-1595. 1597-1599. 1601-1603. 1605-1607. 1609-1611. 1613-1615. 1617-1619. 1621-1623. 1625-1627. 1629-1631. 1633-1635. 1637-1639. 1641-1643. 1645-1647. 1649-1651. 1653-1655. 1657-1659. 1661-1663. 1665-1667. 1669-1671. 1673-1675. 1677-1679. 1681-1683. 1685-1687. 1689-1691. 1693-1695. 1697-1699. 1701-1703. 1705-1707. 1709-1711. 1713-1715. 1717-1719. 1721-1723. 1725-1727. 1729-1731. 1733-1735. 1737-1739. 1741-1743. 1745-1747. 1749-1751. 1753-1755. 1757-1759. 1761-1763. 1765-1767. 1769-1771. 1773-1775. 1777-1779. 1781-1783. 1785-1787. 1789-1791. 1793-1795. 1797-1799. 1801-1803. 1805-1807. 1809-1811. 1813-1815. 1817-1819. 1821-1823. 1825-1827. 1829-1831. 1833-1835. 1837-1839. 1841-1843. 1845-1847. 1849-1851. 1853-1855. 1857-1859. 1861-1863. 1865-1867. 1869-1871. 1873-1875. 1877-1879. 1881-1883. 1885-1887. 1889-1891. 1893-1895. 1897-1899. 1901-1903. 1905-1907. 1909-1911. 1913-1915. 1917-1919. 1921-1923. 1925-1927. 1929-1931. 1933-1935. 1937-1939. 1941-1943. 1945-1947. 1949-1951. 1953-1955. 1957-1959. 1961-1963. 1965-1967. 1969-1971. 1973-1975. 1977-1979. 1981-1983. 1985-1987. 1989-1991. 1993-1995. 1997-1999. 2001-2003. 2005-2007. 2009-2011. 2013-2015. 2017-2019. 2021-2023. 2025-2027. 2029-2031. 2033-2035. 2037-2039.

Comparison of local labour for planting, some skilled foresters being required, *Flannery* 1517-1519. 1521-1523. Various kinds of trees which grow very well in Connemara, such as the Scotch fir, the larch, the American pine, and others, *ib.* 1520-1524. 1633-1637. 1552-1555. 1594. 1599. 1647-1652. 1660, 1661—Characteristics of the bog land in Connemara, which make it suitable for planting, *ib.* 1545-1557. 1616.

Evidence in support of the conclusion that Government should provide a scheme of planting in Connemara, and that the operations should in the long run be profitable; obstacle to the work being undertaken by the local proprietors, *Flannery* 1536-1545. 1566-1569. 1593-1596. 1609. 1663. 1664. 1688-1694—Advantages of Connemara as a locality in which to provide a branch school of forestry, *ib.* 1545, 1546. 1570-1577. 1607-1609. 1611. 1665-1668—Cheapness with which fences or bog ditches could be made around the plantations, *ib.* 1547-1549.

Comparison as to trees thriving well in Connemara, and at some distance from the coast, *Flannery* 1556. 1558-1563. 1608—Trees for which an acre of land could be planted, *ib.* 1593-1595—Facility for transporting the timber in the absence of a railway, large demand, however, for local wants, *ib.* 1604, 1605, 1607. 1610. 1631. 1632. 1653-1659. 1662—Statement as to the chief proprietor in Connemara being non-resident, and as to some owners not taking an interest in planting, *ib.* 1609. 1670-1675.

Special facilities for easier cultivation in Connemara; local benefits thereby, *Flannery* 1641-1643—Inconvenience as to which tenants would be deprived of pasture or would require compensation if land were taken for planting, *ib.* 1630. 1638-1642. 1670-1675. 1680-1687—Economy in planting in Connemara being undertaken directly by Government instead of by the landowners, *ib.* 1638-1694.

Conclusion as to the facilities for planting in Connemara, *Viscount Powerscourt* 2336. 2337.

Conservancy of Woodlands. Diminished amount of planting in this country as compared with the quantity of timber cut down; less attention paid to the conservancy of woodlands than in any foreign country, *Powell* 2055, 2056. 2147. 2169.

Opinion

CIRENCESTER AGRICULTURAL COLLEGE—continued.

Assistance derived by witness (as Professor of Estate Management and Forestry) from two practical foresters, practical instruction being given under his supervision to the students in certain neighbouring woods; particulars hereon, *Elliot* 472-487. 495—Course of lectures given by witness on estate management, including forestry; expediency of a considerable development of the forestry branch, *ib.* 474, 475. 495-505. 509-520. 540, 541—Improvement if a nursery were attached to the college, *ib.* 518. 538, 539.

Witness is a member of the Council of Cirencester College, the college being situated on his estate, whilst his woods in the vicinity extend over an area of 2,500 acres, *Earl Bathurst* 542-545. 598—Readiness of witness to give every facility to courses of lectures on forestry in his woods, and to visits from students for practical instruction; objection to any interference with the management, *ib.* 546, 548. 576. 586. 608. 615—Means of obtaining land in the vicinity of the college for nursery purposes; want rather of old-established woods for showing the results of experiments, *ib.* 549-551.

Very large debt at one time upon the college; steady diminution being effected, *Earl Bathurst* 553—Eminent success of the college as regards agricultural education, *ib.* 609.

Paper submitted by Mr. McClellan in further elucidation of his views as to the advantages of Cirencester College for forestry instruction, and as to the reasons for preferring it to Cooper's Hill, *App.* 128-133.

Insufficiency of evidence for enabling the Committee to judge as to the respective advantages which might be offered by Cirencester and Downton, *Rep.* iv.

See also *Dean Forest*.

Climate and Shelter. Belief as to the beneficial effect upon the climate where there are large plantations; doubt as to the rainfall being affected, *Macgregor* 1072-1076—Beneficial effect of woodlands as regards the climate and the moisture of the soil, *Thomson* 1229-1231—Great value of planting as a means of shelter; improved climate thereby, *Flannery* 1493. 1566.

Substantial enhancement of the value of adjacent property by the shelter afforded by plantations, the soil and climate being also much improved, *Gilchrist* 1704-1709—Value of planting as a shelter to adjoining land, *Viscount Powerscourt* 2326, 2327. 2376. 2403.

Valuable effect of woods in affording shelter and improving the climate, *Rep.* iv.

Clutton, John. (Analysis of his Evidence.)—Experience of witness for more than fifty years as a land agent and surveyor; management by him of the woodlands on the Crown property south of the Trent, 1909-1919—Survey by witness in 1848 and 1849 of all the forests and woodlands belonging to the Crown, 1917.

Very good management of many of the woodlands in the hands of large proprietors, whilst as a general rule the smaller woods are not well managed, 1918—Want of special instruction in forestry for land agents, but not for foresters; the latter class should be instructed by the former, or should be trained where they are at work, without going to any forestry school, 1919-1922. 1949-1952. 1980-1982. 1997-1999. 2007—Opinion that land agents could not afford the time or expense necessary for the course at Cooper's Hill, 1922, 1923.

Paper prepared by witness, in conjunction with Mr. Julian Rogers of the Surveyors' Institution, setting forth their joint views on the subject of a State Forestry School, 1924-1929—Decided preference for a National School of Forestry, instead of attaching professorships of forestry to existing institutions throughout the country, 1928, 1929. 1941-1948. 1953, 1954. 1994-2003—Suggestions for the constitution of a Board of Advice, or examining board, to be presided over by a Government official, irrespectively of the National Forestry School, 1928. 1930, 1931. 1976-1979. 2014-2017.

Considerable difficulty in rating woodlands justly; effect, moreover, of the liability to rates in rendering profitable cultivation still more uncertain, 1932. 1973-1975—Statement as to common woodlands having paid nothing of late years, there being no demand for the thinnings of young plantations, 1933, 1934. 1936. 2026-2028—Advantage in land agents being so instructed as to be able to grow the largest produce on the smallest quantity of land, 1935. 1959, 1960. 2039.

Probability that the imports of colonial or other foreign timber will in course of years diminish in quantity and increase in price; national importance on this score of encouraging forestry instruction and increased planting at home, 1935, 1936. 1955-1956. 2022-2024. 2039—Immense area of land now lying waste which should be planted; prospect of profitable results in course of time if the management be judicious, 1936. 1966-1977. 1985-1989. 2018-2030.

Question

Clutton, John. (Analysis of his Evidence—continued.)

Question considered whether the forestry course at Cooper's Hill might not be so rearranged as to be utilised by land agents at home as well as by students for the Indian forest service, 1937-1952—Different management required for trees and plantations in some counties as compared with others on account of the varying soil; necessity of practical knowledge being acquired on the spot, over and above scientific instruction at a central school, 1953, 1954. 2031-2033.

Limited public expenditure contemplated by witness in connection with a National School of Forestry; that is, in view of the payments by students wishing to qualify as land agents, 1955-1966. 1990-2007. 2010. 2040-2042—Instances, within witness' knowledge, of woodlands, as distinct from forests, which are giving a fair return on the outlay, 1966-1973—Belief that in Great Britain there are about 2½ million acres in wood, 1983, 1984.

Suggestions as to the character of the instruction to be given in the proposed Forestry School, 1994-2013—Comment upon the large area (some 40,000 acres) of uncultivated land in the New Forest, 2018-2021. 2034, 2035—Disafforestation of some 10,000 acres of woods by witness, which he would now like to see restored, 2029, 2030—Obstacles to utilising the New Forest for forestry instruction, 2036-2038.

Competition. See *Foreign Competition*.

CONNEMARA (WEST OF IRELAND):

Great deficiency of timber in Connemara, and of drift wood, for the wants of the people, *Flannery* 1473-1475. 1495-1498. 1506. 1605. 1610—Practice of planting for shelter near the houses of large proprietors, there being very little timber except on the shores of Lough Corrib, *ib.* 1476-1482.

Several respects in which important benefits would result from extensive planting in Connemara, whilst there are extensive areas available, and there is evidence that woods existed in former times, *Flannery* 1483 *et seq.*—Facility as regards conveyance to market if a railway were made in the district, *ib.* 1490-1492. 1567-1569—Want of timber for boats; also of osiers for lobster pots, *ib.* 1495-1498. 1550. 1582-1588. 1624-1629. 1656-1659.

Increased attraction to tourists if planting were carried out on the mountains, *Flannery* 1499-1501—Employment to be given at factories if sufficient timber were procurable in the district, *ib.* 1502-1505—Facility of obtaining 30,000 or 40,000 acres of land for planting at a rent of about 6 d. an acre; entire absence of difficulty on the part either of landlords or tenants, the latter being benefited in various ways, *ib.* 1507-1516. 1581. 1582. 1583. 1584. 1585. 1586. 1587. 1588. 1589. 1590. 1591. 1592. 1593. 1594. 1595. 1596. 1597. 1598. 1599. 1600. 1601. 1602. 1603. 1604. 1605. 1606. 1607. 1608. 1609. 1610. 1611. 1612. 1613. 1614. 1615. 1616. 1617. 1618. 1619. 1620. 1621. 1622. 1623. 1624. 1625. 1626. 1627. 1628. 1629. 1630. 1631. 1632. 1633. 1634. 1635. 1636. 1637. 1638. 1639. 1640. 1641. 1642. 1643. 1644. 1645. 1646. 1647. 1648. 1649. 1650. 1651. 1652. 1653. 1654. 1655. 1656. 1657. 1658. 1659. 1660. 1661. 1662. 1663. 1664. 1665. 1666. 1667. 1668. 1669. 1670. 1671. 1672. 1673. 1674. 1675. 1676. 1677. 1678. 1679. 1680. 1681. 1682. 1683. 1684. 1685. 1686. 1687. 1688. 1689. 1690. 1691. 1692. 1693. 1694. 1695. 1696. 1697. 1698. 1699. 1700. 1701. 1702. 1703. 1704. 1705. 1706. 1707. 1708. 1709. 1710. 1711. 1712. 1713. 1714. 1715. 1716. 1717. 1718. 1719. 1720. 1721. 1722. 1723. 1724. 1725. 1726. 1727. 1728. 1729. 1730. 1731. 1732. 1733. 1734. 1735. 1736. 1737. 1738. 1739. 1740. 1741. 1742. 1743. 1744. 1745. 1746. 1747. 1748. 1749. 1750. 1751. 1752. 1753. 1754. 1755. 1756. 1757. 1758. 1759. 1760. 1761. 1762. 1763. 1764. 1765. 1766. 1767. 1768. 1769. 1770. 1771. 1772. 1773. 1774. 1775. 1776. 1777. 1778. 1779. 1780. 1781. 1782. 1783. 1784. 1785. 1786. 1787. 1788. 1789. 1790. 1791. 1792. 1793. 1794. 1795. 1796. 1797. 1798. 1799. 1800. 1801. 1802. 1803. 1804. 1805. 1806. 1807. 1808. 1809. 1810. 1811. 1812. 1813. 1814. 1815. 1816. 1817. 1818. 1819. 1820. 1821. 1822. 1823. 1824. 1825. 1826. 1827. 1828. 1829. 1830. 1831. 1832. 1833. 1834. 1835. 1836. 1837. 1838. 1839. 1840. 1841. 1842. 1843. 1844. 1845. 1846. 1847. 1848. 1849. 1850. 1851. 1852. 1853. 1854. 1855. 1856. 1857. 1858. 1859. 1860. 1861. 1862. 1863. 1864. 1865. 1866. 1867. 1868. 1869. 1870. 1871. 1872. 1873. 1874. 1875. 1876. 1877. 1878. 1879. 1880. 1881. 1882. 1883. 1884. 1885. 1886. 1887. 1888. 1889. 1890. 1891. 1892. 1893. 1894. 1895. 1896. 1897. 1898. 1899. 1900. 1901. 1902. 1903. 1904. 1905. 1906. 1907. 1908. 1909. 1910. 1911. 1912. 1913. 1914. 1915. 1916. 1917. 1918. 1919. 1920. 1921. 1922. 1923. 1924. 1925. 1926. 1927. 1928. 1929. 1930. 1931. 1932. 1933. 1934. 1935. 1936. 1937. 1938. 1939. 1940. 1941. 1942. 1943. 1944. 1945. 1946. 1947. 1948. 1949. 1950. 1951. 1952. 1953. 1954. 1955. 1956. 1957. 1958. 1959. 1960. 1961. 1962. 1963. 1964. 1965. 1966. 1967. 1968. 1969. 1970. 1971. 1972. 1973. 1974. 1975. 1976. 1977. 1978. 1979. 1980. 1981. 1982. 1983. 1984. 1985. 1986. 1987. 1988. 1989. 1990. 1991. 1992. 1993. 1994. 1995. 1996. 1997. 1998. 1999. 2000. 2001. 2002. 2003. 2004. 2005. 2006. 2007. 2008. 2009. 2010. 2011. 2012. 2013. 2014. 2015. 2016. 2017. 2018. 2019. 2020. 2021. 2022. 2023. 2024. 2025. 2026. 2027. 2028. 2029. 2030. 2031. 2032. 2033. 2034. 2035. 2036. 2037. 2038. 2039. 2040. 2041. 2042. 2043. 2044. 2045. 2046. 2047. 2048. 2049. 2050. 2051. 2052. 2053. 2054. 2055. 2056. 2057. 2058. 2059. 2060. 2061. 2062. 2063. 2064. 2065. 2066. 2067. 2068. 2069. 2070. 2071. 2072. 2073. 2074. 2075. 2076. 2077. 2078. 2079. 2080. 2081. 2082. 2083. 2084. 2085. 2086. 2087. 2088. 2089. 2090. 2091. 2092. 2093. 2094. 2095. 2096. 2097. 2098. 2099. 2100. 2101. 2102. 2103. 2104. 2105. 2106. 2107. 2108. 2109. 2110. 2111. 2112. 2113. 2114. 2115. 2116. 2117. 2118. 2119. 2120. 2121. 2122. 2123. 2124. 2125. 2126. 2127. 2128. 2129. 2130. 2131. 2132. 2133. 2134. 2135. 2136. 2137. 2138. 2139. 2140. 2141. 2142. 2143. 2144. 2145. 2146. 2147. 2148. 2149. 2150. 2151. 2152. 2153. 2154. 2155. 2156. 2157. 2158. 2159. 2160. 2161. 2162. 2163. 2164. 2165. 2166. 2167. 2168. 2169. 2170. 2171. 2172. 2173. 2174. 2175. 2176. 2177. 2178. 2179. 2180. 2181. 2182. 2183. 2184. 2185. 2186. 2187. 2188. 2189. 2190. 2191. 2192. 2193. 2194. 2195. 2196. 2197. 2198. 2199. 2200. 2201. 2202. 2203. 2204. 2205. 2206. 2207. 2208. 2209. 2210. 2211. 2212. 2213. 2214. 2215. 2216. 2217. 2218. 2219. 2220. 2221. 2222. 2223. 2224. 2225. 2226. 2227. 2228. 2229. 2230. 2231. 2232. 2233. 2234. 2235. 2236. 2237. 2238. 2239. 2240. 2241. 2242. 2243. 2244. 2245. 2246. 2247. 2248. 2249. 2250. 2251. 2252. 2253. 2254. 2255. 2256. 2257. 2258. 2259. 2260. 2261. 2262. 2263. 2264. 2265. 2266. 2267. 2268. 2269. 2270. 2271. 2272. 2273. 2274. 2275. 2276. 2277. 2278. 2279. 2280. 2281. 2282. 2283. 2284. 2285. 2286. 2287. 2288. 2289. 2290. 2291. 2292. 2293. 2294. 2295. 2296. 2297. 2298. 2299. 2300. 2301. 2302. 2303. 2304. 2305. 2306. 2307. 2308. 2309. 2310. 2311. 2312. 2313. 2314. 2315. 2316. 2317. 2318. 2319. 2320. 2321. 2322. 2323. 2324. 2325. 2326. 2327. 2328. 2329. 2330. 2331. 2332. 2333. 2334. 2335. 2336. 2337. 2338. 2339. 2340. 2341. 2342. 2343. 2344. 2345. 2346. 2347. 2348. 2349. 2350. 2351. 2352. 2353. 2354. 2355. 2356. 2357. 2358. 2359. 2360. 2361. 2362. 2363. 2364. 2365. 2366. 2367. 2368. 2369. 2370. 2371. 2372. 2373. 2374. 2375. 2376. 2377. 2378. 2379. 2380. 2381. 2382. 2383. 2384. 2385. 2386. 2387. 2388. 2389. 2390. 2391. 2392. 2393. 2394. 2395. 2396. 2397. 2398. 2399. 2400. 2401. 2402. 2403. 2404. 2405. 2406. 2407. 2408. 2409. 2410. 2411. 2412. 2413. 2414. 2415. 2416. 2417. 2418. 2419. 2420. 2421. 2422. 2423. 2424. 2425. 2426. 2427. 2428. 2429. 2430. 2431. 2432. 2433. 2434. 2435. 2436. 2437. 2438. 2439. 2440. 2441. 2442. 2443. 2444. 2445. 2446. 2447. 2448. 2449. 2450. 2451. 2452. 2453. 2454. 2455. 2456. 2457. 2458. 2459. 2460. 2461. 2462. 2463. 2464. 2465. 2466. 2467. 2468. 2469. 2470. 2471. 2472. 2473. 2474. 2475. 2476. 2477. 2478. 2479. 2480. 2481. 2482. 2483. 2484. 2485. 2486. 2487. 2488. 2489. 2490. 2491. 2492. 2493. 2494. 2495. 2496. 2497. 2498. 2499. 2500. 2501. 2502. 2503. 2504. 2505. 2506. 2507. 2508. 2509. 2510. 2511. 2512. 2513. 2514. 2515. 2516. 2517. 2518. 2519. 2520. 2521. 2522. 2523. 2524. 2525. 2526. 2527. 2528. 2529. 2530. 2531. 2532. 2533. 2534. 2535. 2536. 2537. 2538. 2539. 2540. 2541. 2542. 2543. 2544. 2545. 2546. 2547. 2548. 2549. 2550. 2551. 2552. 2553. 2554. 2555. 2556. 2557. 2558. 2559. 2560. 2561. 2562. 2563. 2564. 2565. 2566. 2567. 2568. 2569. 2570. 2571. 2572. 2573. 2574. 2575. 2576. 2577. 2578. 2579. 2580. 2581. 2582. 2583. 2584. 2585. 2586. 2587. 2588. 2589. 2590. 2591. 2592. 2593. 2594. 2595. 2596. 2597. 2598. 2599. 2600. 2601. 2602. 2603. 2604. 2605. 2606. 2607. 2608. 2609. 2610. 2611. 2612. 2613. 2614. 2615. 2616. 2617. 2618. 2619. 2620. 2621. 2622. 2623. 2624. 2625. 2626. 2627. 2628. 2629. 2630. 2631. 2632. 2633. 2634. 2635. 2636. 2637. 2638. 2639. 2640. 2641. 2642. 2643. 2644. 2645. 2646. 2647. 2648. 2649. 2650. 2651. 2652. 2653. 2654. 2655. 2656. 2657. 2658. 2659. 2660. 2661. 2662. 2663. 2664. 2665. 2666. 2667. 2668. 2669. 2670. 2671. 2672. 2673. 2674. 2675. 2676. 2677. 2678. 2679. 2680. 2681. 2682. 2683. 2684. 2685. 2686. 2687. 2688. 2689. 2690. 2691. 2692. 2693. 2694. 2695. 2696. 2697. 2698. 2699. 2700. 2701. 2702. 2703. 2704. 2705. 2706. 2707. 2708. 2709. 2710. 2711. 2712. 2713. 2714. 2715. 2716. 2717. 2718. 2719. 2720. 2721. 2722. 2723. 2724. 2725. 2726. 2727. 2728. 2729. 2730. 2731. 2732. 2733. 2734. 2735. 2736. 2737. 2738. 2739. 2740. 2741. 2742. 2743. 2744. 2745. 2746. 2747. 2748. 2749. 2750. 2751. 2752. 2753. 2754. 2755. 2756. 2757. 2758. 2759. 2760. 2761. 2762. 2763. 2764. 2765. 2766. 2767. 2768. 2769. 2770. 2771. 2772. 2773. 2774. 2775. 2776. 2777. 2778. 2779. 2780. 2781. 2782. 2783. 2784. 2785. 2786. 2787. 2788. 2789. 2790. 2791. 2792. 2793. 2794. 2795. 2796. 2797. 2798. 2799. 2800. 2801. 2802. 2803. 2804. 2805. 2806. 2807. 2808. 2809. 2810. 2811. 2812. 2813. 2814. 2815. 2816. 2817. 2818. 2819. 2820. 2821. 2822. 2823. 2824. 2825. 2826. 2827. 2828. 2829. 2830. 2831. 2832. 2833. 2834. 2835. 2836. 2837. 2838. 2839. 2840. 2841. 2842. 2843. 2844. 2845. 2846. 2847. 2848. 2849. 2850. 2851. 2852. 2853. 2854. 2855. 2856. 2857. 2858. 2859. 2860. 2861. 2862. 2863. 2864. 2865. 2866. 2867. 2868. 2869. 2870. 2871. 2872. 2873. 2874. 2875. 2876. 2877. 2878. 2879. 2880. 2881. 2882. 2883. 2884. 2885. 2886. 2887. 2888. 2889. 2890. 2891. 2892. 2893. 2894. 2895. 2896. 2897. 2898. 2899. 2900. 2901. 2902. 2903. 2904. 2905. 2906. 2907. 2908. 2909. 2910. 2911. 2912. 2913. 2914. 2915. 2916. 2917. 2918. 2919. 2920. 2921. 2922. 2923. 2924. 2925. 2926. 2927. 2928. 2929. 2930. 2931. 2932. 2933. 2934. 2935. 2936. 2937. 2938. 2939. 2940. 2941. 2942. 2943. 2944. 2945. 2946. 2947. 2948. 2949. 2950. 2951. 2952. 2953. 2954. 2955. 2956. 2957. 2958. 2959. 2960. 2961. 2962. 2963. 2964. 2965. 2966. 2967. 2968. 2969. 2970. 2971. 2972. 2973. 2974. 2975. 2976. 2977. 2978. 2979. 2980. 2981. 2982. 2983. 2984. 2985. 2986. 2987. 2988. 2989. 2990. 2991. 2992. 2993. 2994. 2995. 2996. 2997. 2998. 2999. 3000. 3001. 3002. 3003. 3004. 3005. 3006. 3007. 3008. 3009. 3010. 3011. 3012. 3013. 3014. 3015. 3016. 3017. 3018. 3019. 3020. 3021. 3022. 3023. 3024. 3025. 3026. 3027. 3028. 3029. 3030. 3031. 3032. 3033. 3034. 3035. 3036. 3037. 3038. 3039. 3040. 3041. 3042. 3043. 3044. 3045. 3046. 3047. 3048. 3049. 3050. 3051. 3052. 3053. 3054. 3055. 3056. 3057. 3058. 30

COOPER'S HILL:

Opinion that land agents could not afford the time or expense necessary for the course at Cooper's Hill, *Clutton* 1922, 1923—Question considered whether the forestry course at Cooper's Hill might not be so re-arranged as to be utilised by land agents at home as well as by students for the Indian forest service, *ib.* 1937-1952.

Great value of instruction in forestry at Cooper's Hill and at existing agricultural colleges; suggestions in detail on this subject, *Sir J. D. Hooker* 2185 *et seq.*—Concurrence generally in Colonel Pearson's views as to the mode of utilising the Cooper's Hill establishment for the scientific instruction in forestry of land agents and others, *ib.* 2188-2190, 2197. *et seq.*

Explanation that the forest branch of the College has been established specially for the Indian forest service, there being no students who intend to become land agents in England, *Sir A. Taylor* 2414-2416, 2442, 2463, 2464—Facility of arranging for the attendance of the land agent class, by dispensing in their case with the preliminary examination on entrance, and by their coming as out-students to attend lectures at a moderate charge, *ib.* 2416-2429—Payment of 180 l. a year by the students, the fees being now about equal to the expenses, *ib.* 2420, 2451-2453.

Information respecting the forestry instruction given in the College, the staff employed and the accommodation; increased staff and accommodation necessary if there were a special course of lectures and instruction for a land agent class, *Sir A. Taylor* 2423-2450, 2454-2457, 2466-2478—Unfitness of the present course for men of the wood-reeve class; less scientific instruction required in their case, *ib.* 2431, 2432, 2475-2478—Statement to the effect that Cooper's Hill is only suitable for men wanting to learn forestry thoroughly, a modified and less expensive course and a much shorter term being necessary for men about to become land agents or head foresters, *ib.* 2443-2449, 2454-2463-2478.

Explanation that the educational course and the arrangements generally at Cooper's Hill are under a board of visitors, of which witness is a chairman; belief on his part that the board would give favourable consideration to any proposal for utilising the College in connection with forestry in this country, *Sir E. Temple* 2479.

Memorandum by Mr. McClellan on Colonel Pearson's evidence; conclusions of the former as to the advantages of the Royal Agricultural College over Cooper's Hill for forestry instruction, *App.* 129-133.

Paper submitted by Sir A. M. Taylor, showing the conditions of examination and of entrance to the College in order to undergo a special training for forest service in India, *App.* 139-141.

Conclusion of the Committee that in the first instance it might be well to establish one school only, and that the College at Cooper's Hill might be adopted as a nucleus for the proposed instruction, *Rep.* iv. vi—Prospect of the forest branch being made self-supporting, additional students being admitted for other than Indian service, *ib.* iv.

Corsican Pine. Favourable opinion as regards the Corsican pine, except that it is a very shy grower, *McCorquodale* 1407—Rapid growth of the Corsican pine in England, though the quality of the wood is not so good as that grown in Corsica, *Sir J. D. Hooker* 2221, 2222.

Cost of Planting. Estimate of about 2 l. an acre as the cost for which large areas in Scotland might be planted and fenced, *Macgregor* 1022-1024, 1093-1102—Reduced cost when planting is done on a large scale; enhanced cost if fenced against deer, *ib.* 1109-1116.

Much less cost of planting large than small enclosures, *Thompson* 1154, 1215—Particulars of cost of planting and fencing an area of nearly 900 acres, as carried out by witness at Strathspey; aggregate of 1,304 l. or about 30 s. per acre, *ib.* 1154, 1212, 1227-1204.

See also *Profitable Results (Planting)*.

Council or Board of Forestry. See *Forestry*.

Curriculum (Instruction in Forestry). Expediency of forestry being taught, together with kindred subjects, instead of there being a separate forestry school, *Wrightson* 232, 299, 252 *et seq.*; *Macgregor* 515, 516, 518; *Earl Bathurst* 547-554, 569-573—Want of a period of about two years for the curriculum advocated by witness, *Wrightson* 345, 349—Suggestions as to the branches of science to be included in the curriculum for forestry students, and as to the length of the course, *Sir J. D. Hooker* 2211-2219, 2233-2237.

Suggestions by the Committee as to the subjects in which the examiners under a Board of Forestry should examine, *App.* 15.

See also *Agriculture, Botany, Zoology, Practical Instruction, Schools of Forestry*.

D.

Dean Forest. Advantage if Dean Forest were available for practical instruction in forestry in connection with Cirencester College, *Elliot* 488-491.

Area of from 15,000 to 16,000 acres of woodland comprised in Dean Forest and the High Meadow Estate; very much larger area in former times, *Sir J. Campbell* 621, 675, 676—Cultivation chiefly of oak for the Navy, the plantations being mostly from twenty-five to seventy years old, though some are about 130 years old, *ib.* 622-628, 658, 717, 718—Information as to the staff under witness, and their qualifications; practical training of the woodmen from their youth in the forest, *ib.* 629-635, 656.

Suggestions as to the extent to which the Forest of Dean might be utilised in connection with the forestry branch at Cirencester College, as well as with the practical training of young men as woodmen, *Sir J. Campbell* 643-646, 651-657, 683-691, 711-716, 738-745—Bad financial results from Dean Forest in the last two or three years; injurious effect of foreign competition, *ib.* 661-663, 677-681, 697, 698.

Disafforestation. Disafforestation of some 10,000 acres of woods at the instance of witness, which he would now like to see restored, *Chilton* 2029, 2030.

Diseases of Trees. Expediency of better knowledge in forests as to the diseases of trees, and the effect produced by insects, *Macgregor* 880, 881, 945-951, 1016-1019, 1071.

Douglas Pine. Special value attached to the Douglas fir; very high and exposed altitudes at which it thrives, *Barron* 48-50, 52, 54-59—Further statement as to the merits of the Douglas pine and the expediency of its extensive introduction into this country, *ib.* 177-181—Advantage of planting the *Abies Douglasii* in masses rather than singly, *Earl of Ducie* 460-462—Value of the Douglas pine if planted in suitable land, *Macgregor* 1010, 1011.

Very satisfactory results in the case of plantations of the Douglas pine on Lord Mansfield's property; rapid growth of this tree, whilst it is exceptionally free from insects, *McCorquodale* 1367-1370, 1374-1377, 1393-1395—Advocacy of the planting of the Douglas pine in this country as not being liable to disease and being of excellent quality; very large dimensions attained by this tree in the States, *Powell* 2059, 2060, 2083-2087, 2142-2145, 2173-2177—Witness has great faith in this pine, which he looks upon as one of the trees of the future; prospect of its being grown at a profit, *ib.* 2059, 2142-2145, 2177.

Conclusion that the Douglas pine grown in this country will never be equal to that grown in Vancouver, *Sir J. D. Hooker* 2223, 2224—Strong approval of the Douglas pine; very promising results from a large number planted by witness on his property in Wicklow, *Viscount Powerscourt* 2285, 2293-2297.

DOWNTON AGRICULTURAL COLLEGE:

Enumeration of the chief subjects taught to the students at Downton College; instruction given not only in the science and principles of agriculture, but in its practice, *Wrightson* 220, 256, 257, 333, 334—Different pursuits in life for which students are sent to Downton, the average number of students being about fifty, some of whom are in training for colonial careers, some for land agency work at home, whilst others are the sons of gentlemen landowners, *ib.* 221-223, 309-315—Total of about 600 acres attached to the College, there being a botanical garden and a belt of forest trees about 500 yards in length, for special instruction in forestry, *ib.* 224-226.

Details as to the extent to which forestry is now taught in the College and as to the character of the instruction, there being a combination of practical and scientific teaching, *Wrightson* 237 *et seq.*—Explanation that forestry is part of the curriculum of the College but has not up to the present time been a leading subject; staff provided for this branch, *ib.* 227-236, 256-263.

Natural facilities at Downton for instruction in forestry, on account of the vicinity of the New Forest and of private woods; examination hereon upon the question of some 200 acres of the Forest being made available for experiments and for practical instruction, *Wrightson* 237, 238, 271-275, 294-304, 329-342—Means of rendering Downton capable of supplying much fuller instruction in forestry; great importance attached to facilities for experiments and to practical teaching, *ib.* 243-246, 252 *et seq.*—Consideration of the question of practical foresters being trained at Downton, as well as land agents and others; difficulty as to fees, *ib.* 264-276, 282-293, 305-315.

DOWNTON AGRICULTURAL COLLEGE—continued.

Suggestions on the subject of students in forestry being prepared at Downton or Cirencester for examination by a board of examiners in London: way in which such board should be constituted, *Wrightson* 276-281. 316, 317. 328. 342-346—Heavy outlay necessary in order to procure 200 acres of land near Downton, in the event of its not being feasible to obtain a grant of portion of the New Forest, *ib.* 318-322—Necessarily high fees charged, *ib.* 338—Instances of the practical character of some of the experiments, *ib.* 339.

Drainage. Enhanced value of the adjoining unplanted land as regards drainage if portions were planted, *Flannery* 1491. 1589, 1590. 1620-1623.

Ducie, Earl of. (Analysis of his Evidence.)—Witness has been Chairman for fifteen years of the Royal Agricultural College at Cirencester; considerable importance attached by him to the teaching of forestry at the College, 438-444—Expediency of forestry being taught in conjunction with the kindred sciences, and of land agents being instructed in it, 444. 455, 456—Highly qualified land agents who have passed through Cirencester; various classes in life whence they come to the College, 445-447. 457-459.

Facilities at Cirencester for both out-students and in-students; relative fees for the two classes, 447-450. 458, 459—Difficulty on the score of expense in training wood-reeves or foresters at the College; short course desirable for the instruction of this class, 450. 463, 464. 466—Probability that woodland in the west of England may be profitably cultivated with larch and other timber, 451-454. 460-462—Advantage of the *Abies Douglasii* in masses rather than singly, 460-462—Necessity of Government aid if a Forest School be established, 465—Natural facilities at Cirencester for the study of arboriculture, 467.

Dundas, Robert. (Analysis of his Evidence.)—Large interests of witness as a landowner and colliery proprietor in Scotland; he has about 800 acres of woods, 1411-1413. 1430-1432.

Great obstacle to the growing of timber for profit since the abolition of the duty on foreign timber many years ago and the consequent reduction in price, 1415—Further difficulty through the great increase going on in the substitution of metal for wood, 1415. 1466—Cheaper production in Norway than in Great Britain owing to the much lower wages in the former country, 1415.

Small demand for home-grown as compared with foreign timber for building purposes since the extended use of improved machinery for conversion of the latter; illustration in witness' case, 1415—Disadvantages of home-grown timber as compared with German timber, the latter being much straighter, cleaner, and better ripened, 1415. 1419. 1452.

Particulars as to the present prices of larch, Scotch fir, &c., witness submitting that at these prices it is not possible to grow wood in this country at a profit, 1415. 1421-1423. 1427-1433. 1447, 1448. 1466—Information as to the sale of timber by witness, the prices obtained, the rent or value of the land, &c.; unsatisfactory results as regards profit, 1415-1434. 1447-1452.

Ground for the conclusion that the want of a separate school of forestry in Scotland has been much exaggerated, and that it would be much better to provide the required scientific instruction in combination with the existing staff at Edinburgh and Aberdeen Universities, 1435-1446. 1453-1465—Valuable operation of the system of bursaries, or exhibition scholarships, at Edinburgh University; suggestion that by this means scientific forestry education can best be provided, subsequently to practical training on the woodlands, 1435-1444. 1453-1465.

Dyer, Thistleton. Concurrence of views generally between Mr. Thistleton Dyer and witness on the subject of forestry instruction and the facilities to be given thereto, *Sir J. D. Hooker* 2225.

E.

Edinburgh University. Advantage if there were a Chair of Forestry attached to the Professorship of Agriculture, *McCorquodale* 1357-1361—Valuable operation of the system of bursaries, or exhibition scholarships at Edinburgh University; suggestion that by this means scientific forestry education can best be provided subsequently to practical training in the woodlands, *Dundas* 1435-1444. 1453-1465.

Elliot, Thomas John, M.R.A.C., F.H.A.S. (Analysis of his Evidence.)—Witness is Professor of Estate Management and Forestry at Cirencester College; he is also a Fellow of the Royal Highland Agricultural Society of Scotland, 468-471.

Assistance derived by witness from two practical foresters, practical instruction being given under his supervision to the students in certain neighbouring woods; particulars hereon, 472-487. 495—Course of lectures given by witness on estate management, including

Elliot, Thomas John, M.R.A.C., F.H.A.S. (Analysis of his Evidence)—continued.

including forestry; expediency of a considerable development of the forestry branch, 474, 475. 495-505. 509-520. 540, 541—Advantage if Dean Forest were available for practical instruction, 488-491.

Conclusion as to the benefit derived by land agents from the forestry course at Cirencester; importance of land agents generally being specially instructed in forestry, 492-520—Disadvantage as regards forestry instruction through the preservation of game in woodlands, 505, 506. 524-526—Expediency of forestry being taught together with kindred subjects, instead of there being a separate forestry school, 510, 511. 516.

Improvement if a nursery were attached to Cirencester College, 518. 538, 539—Long and varied experience of witness in connection with forestry; suggestions hereon as to the qualifications and the instruction desirable for head foresters and managers of woodlands, 527-541.

Entomology. Advantage of instruction of foresters in entomology, *Macgregor* 945-949.

Suggested examination of forestry students in entomology, especially in connection with diseases and insects affecting the growth of trees, *Rep.* vi.

Examinations in Forestry. Suggestion that one of the functions of the proposed forestry board would be to make provision for examinations, *Rep.* v—Several subjects to be included in the examinations, *ib.* vi—Suggestion that certain inducements might be offered to the agricultural colleges and the Surveyors' Institution to send students for examination, *ib.*

See also *Board or Council of Forestry.* Cirencester Agricultural College. Edinburgh University. School of Forestry.

Experimental Planting. Belief as to the self-supporting character of an area of 200 acres utilised for the planting of trees under different systems; question hereon as to the institution in charge being guaranteed against loss, *Wrightson* 340-342.

See also *Cirencester Agricultural College.*

F.

Felling of Trees. Want of more skilled workmen for felling timber, whilst very few agents know anything of this subject, *Britton* 837-839.

Fences. Frequent neglect of plantations in the matter of fences, *Britton* 760.

See also *Cost of Planting.*

Fir. See *Austrian Fir.* *Coriican Pine.* *Douglas Pine.* *Scotch Fir.*

Flannery, The Rev. T. E. F. (Analysis of his Evidence.)—Witness, who is parish priest of Carna, county Galway, is well acquainted with Connemara, this district and large portion of the west of Ireland being of a mountainous character, 1467-1472.

Great deficiency of timber in Connemara, and of drift wood, for the wants of the people, 1473-1475. 1495-1498. 1506. 1605. 1610—Practice of planting for shelter near the houses of large proprietors, there being very little timber except on the shores of Lough Corrib, 1476-1482—Several respects in which important benefits would result from extensive planting in Connemara, whilst there are extensive areas available, and there is evidence that woods existed in former times, 1483 *et seq.*

Facility as regards conveyance to market if a railway were made in Connemara, 1490-1492. 1567-1569—Great value of planting as a means of shelter; improved climate thereby, 1493. 1566—Enhanced value of the unplanted land as regards drainage if portions were planted, 1491. 1589, 1590. 1620-1623—Want of timber for boats; also of osiers for lobster pots, 1495-1498. 1550. 1582-1588. 1624-1629. 1656-1659—Increased attraction to tourists if planting were carried out on the mountains, 1499-1501.

Employment to be given at factories if sufficient timber were procurable in the district, 1502-1505—Facility of obtaining 30,000 or 40,000 acres of land for planting at a rent of about 6d. an acre; entire absence of difficulty on the part either of landlords or tenants, the latter being benefited in various ways, 1507-1516. 1551. 1561. 1578-1581. 1612-1624. 1630. 1670-1675. 1680-1687—Cheapness of local labour for planting, some skilled foresters being required, 1517-1519. 1595.

Various kinds of trees which grow very well in Connemara, such as the Scotch fir, the larch, the Austrian pine, and others, 1520-1524. 1552-1555. 1591, 1592. 1633-1637. 1647-1652. 1660, 1661—Characteristics of the bog land in Connemara, which make it suitable for planting, 1525-1527. 1615—Large areas of land in different parts of Ireland, as well as in Connemara, suitable for planting, but not obtainable so cheaply, 1528-1535. 1546.

Flannery, The Rev. T. E. F. (Analysis of his Evidence)—continued.

Evidence in support of the conclusion that Government should provide a scheme of planting in Connemara, and that the operations would in the long run be profitable; obstacle to the work being undertaken by the local proprietors, 1536-1546. 1556-1569. 1593-1596. 1609. 1663, 1664. 1688-1694—Advantages of Connemara as a locality in which to provide a branch school of forestry, 1545, 1546. 1570-1577. 1597-1601. 1611. 1665-1668—Cheapness with which fences or bog ditches could be made around the plantations, 1547-1549.

Conclusion as to trees thriving well in Connemara, when planted at some distance from the sea, 1556. 1599-1603. 1608.—Very moderate cost for which an acre of bog in Connemara could be planted, 1593-1595.

Facilities for transporting the timber in the absence of a railway; large demand, however, for local wants, 1604, 1605. 1607. 1610. 1631, 1632. 1653-1659. 1662—Statement as to the chief proprietor in Connemara being non-resident, and as to former owners not taking an interest in planting, 1609. 1676-1679—Special facilities for osier cultivation in Connemara; local benefits thereby, 1624-1629.

Inappreciable extent to which tenants would be deprived of pasturage or would require compensation if land were taken for planting, 1630. 1638-1642. 1670-1675. 1680-1687—Economy in planting in Connemara being undertaken directly by Government, instead of by the landlords, 1688-1694.

Foreign Competition. Conclusion that railway sleepers and other timber now largely imported might be profitably produced at home if there were a better system of instruction in forestry, *Barron* 70-75. 93, 94. 129-135. 161-163—Very little, if any, prospect for the home timber trade, or for profitable planting and cultivation, in view of the extremely low prices of imported timber from Norway, America and elsewhere; particulars hereon, *Britton* 761 *et seq.*—Consideration of the relative quality of British and foreign timber and the relative demand for each; preference for the latter mainly on account of the low price, *Britton* 808-826—Probability of a decrease of foreign competition, and of better prices for home-grown timber, *Thomson* 1223, 1224. 1256-1258.

Ruin of the home timber trade by foreign competition, *McCorquodale* 1362—Grounds for the opinion that the present low prices will not continue, and that foreign competition will become less severe, *Gilechrist* 1762-1764. 1857-1861. 1867-1869—Probability that the imports of colonial and other foreign timber will in course of years diminish in quantity, and increase in price; national importance on this score of encouraging forestry instruction and increased planting at home, *Clutton* 1936, 1936. 1955-1966. 2022-2024. 2039.

Prospect that some considerable proportion of the timber now imported, to the value of 16,000,000 £ annually, may, under more skilful management, be raised at home, *Rep.* iii, iv.

See also *Building.* Canada. Norway. Price of Timber. Railway Rates. United States.

FORESTERS AND WOODMEN:

Illustration of the importance of men possessing naturally the required organization for first-class foresters before they are put under training, *Barron* 67-69—Very few men throughout the country who now possess the required knowledge and qualifications, *ib.* 84, 85. 169.

Supply of experienced woodmen in the country around Downton, *Wrightson* 323-327—Obstacles to the instruction of practical woodmen; question of fees adverted to hereon, *McClellan* 372-375. 383, 384. 386-390—Difficulty on the score of expense in training woodreeves or foresters at Cirencester College; short course desirable for the instruction of this class, *Earl of Ducie* 450. 463, 464. 466—Long and varied experience of witness in connection with forestry; suggestions hereon as to the qualifications and the instruction desirable for head foresters and managers of woodlands, *Elliot* 527-541.

Information as to witness' staff of woodmen and workmen, and as to the qualifications of the former, *Earl Bathurst* 548. 557, 558. 565-567. 598-605—Difficulty as to the teaching of woodmen or under woodmen in forestry schools, *ib.* 606-612—Value of practical training under experienced foresters, rather than in a college in the case of ordinary woodmen, *Sir J. Campbell* 641—Difficulty as to woodmen availing themselves of a scientific school, *Hon. G. Lascelles* 857.

Insufficient encouragement given by proprietors in Scotland to the instruction of foresters; advantage if the latter were certificated as to competency, *Macgregor* 933-939. 963-965—Difficulty as to the payment of fees by working foresters, for whom there should be free classes, *ib.* 967, 968—Further considerations as to the want of special instruction for foresters or woodmen in Scotland, and as to the means of supplying this want; advantage of some tuition on the subject in the elementary schools, *ib.* 1020-1027. 1045-1056.

Decided

STERS AND WOODMEN—continued.

Decided advantage if foresters in Scotland could have some scientific instruction at a school of forestry, in addition to practical training in the woods; difficulty on the score of expense and time, *Thomson* 1155-1160. 1166-1171. 1186-1190. 1205-1209. 1216. 127-1280. 1310-1318—Small expense necessary as regards staff, *ib.* 1189—Large number of young men trained under witness; competency of these in course of time to be charge of woodlands, *ib.* 1157-1159. 1204-1211. 1219-1221. 1239-1241. 1259-126. 1310. 1319-1321—Advantage of an extended system of local examinations for foresters, in the absence of a school of forestry, as by means of the Highland Agricultural Society, *ib.* 1172-1179. 1281-1287.

Considerable number of young men trained under witness on Lord Mansfield's estate as assistant foresters; competency of these after a few years to take the charge of woodlands, *McCorquodale* 1348-1353—Want of special instruction in forestry for land agents, but not for foresters; the latter class should be instructed by the former or could be trained where they are at work without going to any forestry school, *Clutton* 1919-22. 1949-1952. 1980-1982. 1997-1999. 2007—Encouragement desirable to be given to the instruction and training of students of a lower grade who may prove themselves competent to become land agents; consideration of the difficulty on the score of expense, *Sir J. D. Hooker* 2198-2200. 2212. 2215-2219. 2233-2237.

Opinion of the Committee that a certain amount of simple and practical instruction would be very useful for woodmen, *Rep.* iv.

See also *Cirencester Agricultural College.* Cooper's Hill. Downton Agricultural College. Management and Cultivation of Woodlands. Practical Instruction. Schools of Forestry.

G.

12. Very limited extent to which the bad condition of plantations is due to the preservation of game, *Barron* 149-154—Disadvantage as regards forestry instruction through the preservation of game in woodlands, *Elliot* 505, 506. 524-526—Considerable injury from game in some woodlands in Scotland, *Macgregor* 980-982—Great injury to plantations in Perthshire from game, *McCorquodale* 1371-1373.

many. Disadvantages of home-grown timber as compared with German timber, the latter being much straighter, cleaner, and better ripened, *Dundas* 1415. 1419. 1452—Very strict legislation in Germany for the protection of woodlands, *Powell* 2179—Similar lines upon which the various forestry schools in Germany are conducted, though the rules of management vary very much in different schools, *Brown* 2273-2276.

Christ, Andrew. (Analysis of his Evidence.)—Witness has been head forester to Lord Powerscourt for nearly ten years, having previously had many years' experience of woodlands in Scotland, 1695-1702.

Fairly good management of the larger woodlands in the eastern districts of Ireland, his not applying to the smaller woods, where skilled foresters are not in charge, 1702, 703—Substantial enhancement of the value of adjacent property by the shelter afforded by plantations, the soil and climate being also much improved, 1704-1709—Opinion that tenants in Ireland might plant very profitably, but that landlords are not likely to do so since the late Land Act, 1710-1712. 1770-1774. 1791, 1792. 1876-1878.

Description of the planting operations at Powerscourt, as carried out under witness, the practice as to thinning, disposal of the timber, &c.; conclusion as to the profitable results attained, 1713-1736. 1753 *et seq.*—Disadvantage to home-grown Irish timber through the preferential railway rates given to foreign timber, 1717, 1718.

Calculations in detail respecting the original cost of planting per acre on the Powerscourt estate, the original value of the land, the value as woodland, and the annual amounts realised; profits obtained from larch more especially, 1719-1736. 1753-1761. 1815-1821—Doubt as to it being profitable to grow hard wood, such as ash and oak, in large quantities, 1733-1736. 1795. 1864.

Importance attached to the establishment of several local schools of forestry throughout the three kingdoms, three central schools being quite inadequate, and involving too much time and expense; suggestions for utilising Board schools and night schools for the purpose, 1737-1752. 1775-1790. 1822-1130. 1879-1893. 1900-1908—Conclusion as to the insufficiency of one central school for Scotland, and as to the advantage of special forestry instruction in the Board schools, 1738-1744. 1775-1782—Advantage if the question of forestry instruction were taken up by the Royal Dublin Society; still greater advantage if Government took the matter up, 1745-1752.

Grounds for the opinion that the present low prices will not continue, and that foreign competition will become less severe, 1762-1764. 1857-1861. 1867-1869—Decreased demand for timber through the increased use of iron in lieu of wood, 1765-1767—Good quality of Irish larch, the soil being suitable for its profitable cultivation, as well as for that of Scotch fir, 1768, 1769. 1793, 1794. 1837-1863.

246.

x 4

Advantage

Report, 1887—continued.

Gilchrist, Andrew. (Analysis of his Evidence)—continued.

Advantage of a text-book on forestry for Board or national schools, 1779. 1785-1790—Importance of practical training in connection with special instruction in the local schools, 1777-1782. 1822-1830. 1865—Decided approval of Government acquiring large tracts in Ireland and planting them, 1783, 1784. 1814—Value of practical study in such woods as those of Lord Powerscourt and the Duke of Abercorn; expected facilities on their part, 1796-1799. 1885-1887.

Use of foreign as well as home-grown timber on the Powerscourt estate; relative quality and price of the two, 1800-1805—Explanation that witness has no experience as to the financial results of planting with borrowed money, 1806-1809—Fitness of the soil of Ireland for planting on a large scale; belief that profitable results would be obtained, 1810-1821. 1831. 1837-1878—Doubt as to the malicious burning of plantations if carried out over large areas; approval of compensation in such case, 1832-1836. 1866.

Further consideration of the joint question of scientific instruction and practical training, with reference to the different classes of students likely to avail themselves of the proposed facilities, and the actual demand for their services, 1879-1908—Conclusion that much mismanagement would be avoided if there were a class of skilled foresters, with scientific and practical attainments; benefit to proprietors to employ such men at an increased rate of pay, 1894-1908—Means of combining practical instruction with a course at Glasnevin (near Dublin); that is, for the class of land agents, 1879-1903.

Glasnevin Agricultural School. See *Ireland.*

Government Grants. Doubt as to forestry having any greater claim to special Parliamentary grants than other branches of agriculture, *Earl Bathurst* 552-554. 569-573—Questionable policy of the planting of waste lands by Government or of Government loans in aid of plantations, *ib.* 574-576. 593—Doubt as to the expediency of planting oak or other trees on a very large scale as a national undertaking or by means of State loans, *Sir J. Campbell* 658-660. 664-668. 693-695.

See also *Ireland. Schools of Forestry.*

H.

Harrington, Lord. More profitable results from Lord Harrington's woods if they had not been mismanaged formerly, *Barron* 105-110—Large extent to which the woods under witness' charge are cultivated and managed for commercial purposes; ornamental purposes also had in view, *ib.* 212-217.

Highland Society. See *Scotland.*

Hooker, Sir Joseph Dalton, M.D., C.B. (Analysis of his Evidence.)—Former experience of witness, for many years, as Director of the Royal Gardens at Kew, 2181—He considers that those woodlands in this country which are planted chiefly for shelter are in a very neglected state, whilst those grown for profit are in a much better condition, 2182-2184.

Great value of instruction in forestry at Cooper's Hill and at existing agricultural colleges; suggestions in detail on this subject, 2185 *et seq.*—Concurrence generally in Colonel Pearson's views as to the mode of utilising the Cooper's Hill establishment for the scientific instruction in forestry of land agents and others, 2188-2190. 2197 *et seq.*—Advantage of forestry as well as agriculture being taught at Cirencester and Downton, 2191-2194. 2201. 2207-2210—Expediency of utilising the facilities afforded by the Scotch universities, so as to obviate the necessity of Scotch students coming to England; the minimum course should be three months, 2193-2195. 2215-2219.

Encouragement desirable to be given to the instruction and training of students of a lower grade who may prove themselves competent to become land agents; consideration of the difficulty on the score of expense, 2198-2200. 2212. 2215-2219. 2233-2237—Facilities for botany instruction at Kew in connection with the forestry course at Cooper's Hill, 2205, 2206—Suggestions as to the branches of science to be included in the curriculum for forestry students, and as to the length of the course, 2211-2219. 2233-2237.

Doubt as to any profitable result from the cultivation of certain kinds of trees in this country which are of foreign origin and for which the climate of Great Britain is not suited, 2220-2224. 2226-2229—Reference to the larch as an Eastern tree for which the English climate is not well adapted; probable development of disease thereby, 2220. 2226-2229—Rapid growth of the Corsican pine in England, though the quality of the wood is not so good as of that grown in Corsica, 2221, 2222.

Report, 1887—continued.

Hooker, Sir Joseph Dalton, M.D., C.B. (Analysis of his Evidence)—continued.

Conclusion that the Douglas pine grown in this country will never be equal to that grown in Vancouver, 2223, 2224—Valueless character of the cedar of Lebanon when grown in England, 2223, 2224—Concurrence of views generally between Mr. Thistle-ton Dyer and witness on the subject of forestry instruction and the facilities to be given thereto, 2225.

I.

Ilex. Admirable character of the *ilex* or evergreen oak, which is, however, too costly to plant extensively, *Viscount Powerscourt* 2321-2323.

Import of Timber. See *Foreign Competition.*

Indian Forest Department. Special circumstances which account for the Indian Forest Department now yielding a large profit, *Sir A. Taylor* 2458-2462.—See also *Cooper's Hill.*

Inverness-shire. Large area in Inverness-shire suitable for planting profitably, *Thomson* 1325.

IRELAND:

Advantages of Glasnevin Agricultural School, near Dublin, as being largely subsidised by the State, *Wrightson* 248-251—Several beneficial results from planting mountainous districts in Ireland as well as Scotland, so that Government might undertake the work in some cases, *Macgregor* 1028-1044—Large areas of land in different parts of Ireland, as well as in Connemara, suitable for planting, but not obtainable so cheaply, *Flannery* 1528-1535. 1546.

Fairly good management of the larger woodlands in the eastern districts of Ireland, this not applying to the smaller woods where skilled foresters are not in charge, *Gilchrist* 1702, 1703—Opinion that tenants in Ireland might plant very profitably, but that landlords are not likely to do so since the late Land Act, *ib.* 1710-1712. 1770-1774. 1791, 1792. 1876-1878—Advantage if the question of forestry instruction were taken up by the Royal Dublin Society; still greater advantage if Government took the matter up, *ib.* 1745-1752—Good quality of Irish larch, the soil being suitable for its profitable cultivation as well as for that of Scotch fir, *ib.* 1768, 1769. 1793. 1794. 1837-1863.

Decided approval of Government acquiring large tracts in Ireland and planting them, *Gilchrist* 1783, 1784. 1814—Explanation that witness has no experience as to the financial results of planting with borrowed money, *ib.* 1806-1809—Fitness of the soil of Ireland for planting on a large scale; belief that more profitable results would be obtained, *ib.* 1810-1821. 1831. 1837-1878—Doubt as to the malicious burning of plantations, if carried out on a large scale; approval of compensation in such case, *ib.* 1832-1836. 1866—Means of combining practical instruction with a course at Glasnevin; that is, for the class of land agents, *ib.* 1879-1903.

Opinion that a forestry school in Ireland should be at the College of Science in Dublin, rather than at Glasnevin, *Brown* 2261-2263.

Suggestions as to the best kinds of trees for planting on the west coast of Ireland, these including the Scotch fir, the larch, evergreen oak, silver fir, sycamore, &c., *Viscount Powerscourt* 2300-2309—Belief as to oak and yew existing in the bogs generally in Ireland, *ib.* 2305, 2307, 2308—Concurrence with Mr. Gilchrist as to the great neglect of Irish woods in the matter of thinning, *ib.* 2314, 2315.

Recommendation that a central school of forestry for Ireland be established at Glasnevin; valuable facilities by means of the Botanical Gardens, and of the lectures given by the Royal Dublin Society, *Viscount Powerscourt* 2317, 2318. 2328-2331. 2406-2411—Excessive value put by Mr. Gilchrist on some land planted by witness, *ib.* 2314—Unfitness of Glasnevin or its vicinity for the growth of trees for practical teaching in connection with a school of forestry; suggestion that this can be best carried out in Connemara, or elsewhere in the west, *ib.* 2318, 2319. 2411, 2412.

Information as to the process of planting adopted by witness on his property in Wicklow, where at one period he planted from 150,000 to 200,000 trees annually; cost incurred and financial results, *Viscount Powerscourt* 2319, 2320. 2324. 2349-2351—Doubt as to its being profitable for Irish landlords to borrow money at three per cent. in order to plant; satisfactory results on the whole in witness' case, this being largely due to the vicinity of the woods to the Dublin market, *ib.* 2324-2327. 2332. 2361-2368. 2399-2403—Advantage of a home supply of trained foresters for Ireland, *ib.* 2331.

246.

Y

Evidence

IRELAND—continued.

Evidence as to the exceedingly small value of large areas on the west coast, as to the cost at which they might be planted, and as to the expediency of this being done directly or indirectly by Government; doubt, however, as to the financial results, *Viscount Powerscourt* 2341-2361. 2399-2403—Several respects in which extensive planting on the west coast would have beneficial results locally, as in giving increased employment, in leading to improved dwellings, in providing shelter, &c., *ib.* 2369-2378. 2381—Probable ill-will on the part of the peasantry if large areas were taken up for planting; instances of the malicious burning of some young plantations of witness, *ib.* 2370. 2379-2386—Beneficial effect as regards climate from planting on the west coast, *ib.* 2377, 2378.

Suggestions by Mr. James Price, Civil Engineer of Dublin, for planting on a large scale in the West of Ireland, and in other parts of the country, *App.* 141, 142.

Opinion of the Committee that a separate school should be founded in Ireland, *Rep.* iv.

Importance attached by the Committee to the evidence as to the expediency of extensive planting on the west coast of Ireland, *Rep.* iv.

See also *Connemara. Osiers. Powerscourt Estate. Schools of Forestry. Wicklow.*

K.

Kew Gardens. Facilities for botany instruction at Kew in connection with the forestry course at Cooper's Hill, *Sir J. D. Hooker* 2205, 2206.

L

LAND AGENTS:

Very little knowledge of forestry possessed by land agents, *Barron* 15-17. 23—Special education and training required for managers of forests; limited demand at present for agents with such knowledge, *McClellan* 403, 404. 427-433—Impression that land agents, as a class, are not well acquainted with forestry, *ib.* 420-422.

Highly qualified land agents who have passed through Cirencester; various classes in life whence they come to the college, *Earl of Ducie* 445-447. 457. 459—Conclusion as to the benefit derived by land agents from the forestry course at Cirencester; importance of land agents generally being specially instructed in forestry, *Elliot* 492-520—Value of special forestry instruction of land agents, or of chief foresters, whose knowledge might direct those under them, *Earl Bathurst* 610-613—Value of special instruction of land agents in forestry at institutions like Cirencester; great difficulty as to foresters or woodmen being specially instructed at any college, *Sir J. Campbell* 637, 638. 641. 643. 650. 719-723.

Very few agents who know anything of forestry; expediency of facilities being provided for their instruction, theoretically and practically, so that they may be able to teach the woodmen as to management, soil, &c., *Britton*, 781-787. 827-836—Decided advantage if land agents had more facilities for the study of practical knowledge, *Honourable G. Lascelles* 857-860—Advantage in land agents being so instructed as to be able to grow the largest produce on the smallest quantity of land, *Clutton* 1935. 1959, 1960. 2039.

Suggested examination of forestry students in different subjects connected with land agency, such as drainage, surveying, &c., *Rep.* vi.

See also *Cirencester Agricultural College. Cooper's Hill. Downton Agricultural College. Management and Cultivation of Woodlands. Practical Instruction. Schools of Forestry.*

Landowners. Importance of landed proprietors, as well as their agents, being specially instructed in the management and culture of estates, *Wrightson* 345-347.

Larch. Advantage of the larch and pine for planting on inferior ground, *Barron* 43-45. 164-168—Equal facility of successful cultivation of the larch and other trees in England as in Scotland, except that the supply of good foresters is more restricted in England, *ib.* 164-170.

Particulars as to the financial results of a plantation of 366 acres of larch, on the Athole estate, in 1817; value of about 40*l.* an acre at the present time, *Macgregor* 887-906. 987-991. 997-999. 1077-1079—Value of the larch in making grass come up in lieu of heather, *ib.* 906. 1103. 1104—Disapproval of planting with larch on account of the extensive disease, *ib.* 944. 945. 1000-1002. 1107. 1108. 1135—Very injurious consequences

Larch—continued.

consequences of the larch disease further adverted to, *Macgregor* 1068-1071. 1087-1089. 1092-1135—Varying elevations at which larch may be successfully planted (but for the disease), *ib.* 1081-1089.

Satisfactory working of the system of natural reproduction of larch as applied to some plantations under witness, *Thomson* 1288-1291—Plantation of larch by witness as a mixture with Scotch fir, *ib.* 1326.

Calculation in detail purporting to show the cost of planting twenty acres with larch, together with fencing, &c., the result over a period of eighty years being equal to an average annual rent of 2*l.* per acre, *McClellan* 1379-1388—Information respecting the larch disease, and the wholesale destruction thereby; deterrent effect upon planting, *Powell* 2059. 2076-2082. 2118-2128. 2152-2158.

Reference to the larch as an Eastern tree, for which the English climate is not well adapted; probable development of disease thereby, *Sir J. D. Hooker*, 2220. 2226-2229—Approval of the common larch as one of the best trees to plant, *Viscount Powerscourt* 2285.

Paper submitted by Mr. McClellan containing an estimate of the value of twenty acres of larch crop, at eighty years of age, charging accumulated compound interest on outlay, for the first thirty years, at the rate of 3½ per cent., *App.* 127.

Special value attached by Mr. James Price to the planting of larch in Ireland, *App.* 141.

See also *Athole, Duke of. Ireland.*

Lascelles, the Honourable G. (Analysis of his Evidence.)—Witness has been in charge of the New Forest, and other Crown woods in Hampshire, for the last seven years, 842.

Very extensive area under plantation in the New Forest, the older woods consisting of oak and beech, and the plantations at different periods of different kinds of timber, 843, 844—Experienced assistants and woodmen in charge under witness; supply of woodmen provided from the more intelligent labourers, 845-849—Several objections to the New Forest as a place for the study of forestry, 850-855.

Decided advantage if land agents had more facilities for the study of forestry; advantage more especially of practical knowledge, 857-860—Difficulty as to woodmen availing themselves of a scientific school, 857—Defective management of woodlands generally, except where the proprietor pays careful attention to them himself, 860.

Lascelles, Honourable G. Memorandum submitted by Mr. Lascelles in elucidation of his views on the evidence given before the Committee by Colonel Pearson and others; also on the question of forestry instruction, and increased planting in this country, *App.* 135-138.

M.

McClellan, Rev. John B., M.A. (Analysis of his Evidence.)—Witness has been Principal for the last seven years of the Royal Agricultural College at Cirencester, which was incorporated in 1845, and is managed by a committee, of which Lord Ducie is chairman, 350-353.

Explanation of the general objects of the college, and the curriculum of the studies; extent to which forestry is included, 354-356. 363. 364. 391-399—Total of fifty-seven in-students and of thirty out-students, their ages varying from seventeen to twenty-three, 357-359—Small proportion of the students who eventually become land agents, 360. 427, 428—Successful examinations passed at the Royal Agricultural Society and the Surveyors' Institution by students of Cirencester College, 361, 362.

Resources and capabilities of the college for instruction in forestry; botanic garden, nurseries, and woodlands available for the purpose, 363-366. 393-399. 408-411. 434. 435—Advantage if Lord Bathurst's woodlands and the Forest of Dean were available for instruction in connection with a national school of forestry at the college, 364, 365. 376-378. 434. 435—Instruction in forestry given by the professor of estate management; improvement if his services were available for the whole of the year, and if he had the assistance of a practical forester, 366. 370. 408-412. 436, 437.

Estimate of about 600*l.* a year as sufficient for a very valuable school of forestry at Cirencester College, whereas a grant of, probably, 100,000*l.*, and a large annual outlay, would be required for a national college of forestry, 369-371. 408-426—Accommodation available locally for a large number of out-students if there were special instruction in forestry, 371. 385—Difficulty in the way of instruction of practical woodmen; question of fees adverted to hereon, 372-375. 383. 384. 386-390.

Favourable opinion of witness as regards Colonel Pearson's suggestions for the constitution

M' Clellan, Rev. John B., M.A. (Analysis of his Evidence)—continued.

constitution of a forestry board for the whole country, 379-382—Impression that land agents, as a class, are not well acquainted with forestry, 400-402—Special education and training required for managers of forests; limited demand at present for agents with such knowledge, 403, 404, 427-433—Probability that woodland areas in the West of England may be profitably cultivated, as in some parts of Scotland, 405-407.

Approval of forestry being taught together with other subjects required to be known by managers of estates, rather than as a separate study, in a special or national school of forestry; saving of time and money under the former plan, 413-433.

M' Clellan, Rev. John B. Memorandum by Mr. M' Clellan on the evidence of Colonel Pearson; reasons submitted in detail for preferring the Royal Agricultural College at Cirencester to Cooper's Hill College for instruction in forestry, *App.* 129-133.

M' Corquodale, William. (Analysis of his Evidence.)—Exceedingly long and varied experience of witness in connection with woods; for the last fifty years he has been head forester to Lord Mansfield, in Perthshire, 1334-1344.

Inspection by witness of several woodlands in England, the management being, on the whole, efficient, 1342-1347—Considerable number of young men trained under witness on Lord Mansfield's estate as assistant foresters; competency of these after a few years to take charge of woodlands, 1348-1353—Doubt as to sufficient demand in Scotland for a forestry school; difficulty on the score of fees, 1353-1356, 1389-1392, 1396, 1397—Improvement if there were a Chair of Forestry attached to the Chair of Agriculture at Edinburgh University, 1357-1361.

Ruin of the home timber trade by foreign competition, 1362—Fair return to be derived from planting if properly carried out, 1363—Necessity of careful selection of trees with reference to soil, 1363, 1366—Exceptional instances of factors being competent to undertake planting, without the advice of head foresters, 1364-1366.

Very satisfactory results in the case of plantations of the Douglas pine on Lord Mansfield's property; rapid growth of this tree, whilst it is exceptionally free from insects, 1367-1370, 1374-1377, 1393-1395—Great injury to plantations in Perthshire from game, 1371-1373.

Calculation in detail purporting to show the cost of planting twenty acres with larch, together with fencing, &c., the result over a period of eighty years being equal to an average annual rent of 2 l. per acre, 1379-1388—Excellent quality of silver fir when grown on good soil; durability when used for railway sleepers, 1398-1403—Much better quality of Scotch fir when grown in Scotland than in England, 1400, 1404-1406—Favourable opinion as regards Corsican pine, except that it is a very shy grower, 1407.

Macgregor, John. (Analysis of his Evidence.)—Lengthened experience of witness in the service of the Duke of Athole; since 1860 he has had entire charge of the Duke's woods, having commenced as an ordinary workman in 1838; 863-869—Situation of the woods entirely in Perthshire, there being about 20,000 acres, consisting chiefly of larch and fir, 870-874.

Want of better management of the woods and forests generally in Perthshire, land agents or factors, and woodmen being deficient in knowledge as to the best soils for particular trees, the best mode of thinning, &c., 875-879, 963, 964—Expediency of better knowledge in foresters as to the diseases of trees and the effect produced by insects, 880, 881, 945-951, 1016-1019, 1071—Practice of thinning out the least valuable trees in the Duke of Athole's woods; greatly decreased value since the markets were glutted by the large fall of timber in the gales of 1879; 882-884, 1136-1139.

Grounds for the opinion that in Scotland there are large tracts of land which might be planted with profit, more especially with Scotch fir, 885-905, 943, 944, 969, 970, 1000-1015, 1028-1044, 1080-1092, 1122-1135—Satisfactory result as regards some 3,000 acres recently planted by the Duke of Athole, chiefly with Scotch fir, 886—Particulars as to the financial results of a plantation of 366 acres of larch in 1817; value of about 40 l. an acre at the present time, 887-905, 987-991, 997-999, 1077-1079—Value of the larch in making grass come up in lieu of heather, 905, 1103, 1104.

Absence of any means in Scotland for obtaining special forestry instruction, the only available institution being the Botanical Gardens at Edinburgh; want of a school of forestry and of practical instruction, where there are about 5,000 acres of woodland, 906, 907, 924-929, 947-950, 962-967—Information respecting the examinations of the Highland Society in connection with forestry, the class of persons who present themselves, &c., 907-923, 930-932, 961-961—Great want of some text-books on forestry, 921, 962.

Insufficient encouragement given by proprietors in Scotland to the instruction of foresters;

Macgregor, John. (Analysis of his Evidence)—continued.

foresters; advantage if the latter were certificated as to competency, 933-939, 963-965—Expediency of the entire management being confided to foresters where the woods are extensive, 940-942—Offers obtained from wood merchants, through advertisements, whenever a quantity of timber is to be cut down in the Duke of Athole's woods, 943, 971-979—Disapproval of planting with larch, on account of the extensive disease, 944, 945, 1000-1002, 1107, 1108, 1135.

Conclusion as to the want of a forestry school for Scotland, fees being charged to students, 963-967—Difficulty as to the payment of fees by working foresters, for whom there should be free classes, 967, 968—Great advantage of the Highland Railway for conveyance of timber to market, though the rates are complained of, 971, 972—Competition of foreign timber with home-grown for building purposes, 975-979.

Considerable injury from game in some woodlands in Scotland, 980-982—Doubt as to any advantage from growing timber on the natural system, 983-986—Very good spruce fir on the Athole estate; sale for pit props when the trees are about fifteen years old, 992-996—Value of the Douglas pine if planted on suitable land, 1010, 1011.

Further considerations as to the want of special instruction for foresters or woodmen in Scotland, and as to the means of supplying this want; advantage of some tuition on the subject in the elementary schools, 1020-1027, 1045-1056—Estimate of about 2 l. an acre as the cost for which large areas might be planted and fenced, 1028-1031, 1093-1102—Several beneficial results from planting mountainous districts in Ireland as well as Scotland, so that Government might undertake the work in some cases, 1028-1044.

Advantage of resident factors, as in Perthshire, having a knowledge of forestry, 1057-1059—Reference to the depression in the coal and iron trades, as well as the gales in 1879 and subsequent years, as accounting for the fall in the price of timber, 1060-1067—Very injurious consequences of the larch disease further adverted to, 1068-1071, 1087-1089, 1092-1135—Belief as to the beneficial effect upon the climate where there are large plantations; doubt as to the rainfall being affected, 1072-1076.

Less profitable results from Scotch woodlands than in former years, owing to the fall in prices; large reduction since 1879; 1077-1081—Varying elevations at which larch may be successfully planted (but for the disease), 1081-1089—Much less destructive effect of disease in the case of Scotch fir than of larch, 1087-1092, 1107, 1108, 1135—Reduced cost when planting is done on a large scale; enhanced cost if fenced against deer, 1109-1115.

Opinion that a central school of forestry should be associated with an Agricultural College (or in Scotland with the Highland Agricultural Society), rather than with Cooper's Hill, 1116-1120—Larger population to be maintained in Scotland if planting were much extended, this being feasible with profitable results; difficulty through the want of capital, the slow return, and other obstacles, 1121-1143.

MANAGEMENT AND CULTIVATION OF WOODLANDS:

Very unscientific and wasteful management of the woodlands generally throughout the country, *Barron* 13, 14, 22, 23, 29, 39-41, 84, 148—Fault of management rather than of soil that better timber is not produced in much larger quantities in successful competition with the foreign timber now imported, *ib.* 127-135, 171-174.

Very bad management, as a rule, of the woodlands in this country; exceptional instances of employment of foresters, *Britton* 759, 760, 809, 810, 821-824—Defective management of woodlands generally, except where the proprietor pays careful attention to them himself, *Hon. G. Lascelles* 860.

Expediency of the entire management being confided to foresters where the woods are extensive, *Macgregor* 940-942—Doubt as to any advantage from growing timber on the natural system, *ib.* 983-986.

Prejudicial effect where the ground has been under a crop of wood for a great length of time, the upper soil becoming choked with decayed vegetable matter, *Thomson* 1161-1163—Bad result of re-planting the same kind of trees on the same ground; instances of the Scotch fir being replaced by the larch by a sort of natural succession, *ib.* 1164, 1165, 1294-1296—Different management required in England as compared with Scotland, *ib.* 1292, 1293.

Inspection by witness of several woodlands in England, the management being, on the whole, efficient, *M' Corquodale* 1342-1347—Conclusion that much mismanagement would be avoided if there were a class of skilled foresters, with scientific and practical attainments; benefit to proprietors to employ such men at an increased rate of pay, *Gilchrist* 1894-1908—Very good management of many of the woodlands in the

MANAGEMENT AND CULTIVATION OF WOODLANDS—continued.

hands of large proprietors, whilst as a general rule the smaller woods are not well managed, *Clutton* 1918.

Gross mismanagement of woodlands in some parts of England, so that improved qualifications in land agents and foresters are greatly needed, *Powell* 2101–2107. 2136. 2168 — Different system of management of woods in Germany and France, as compared with England, *ib.* 2178.

Witness considers that those woodlands in this country which are planted chiefly for shelter are in a very neglected state, whilst those grown for profit being in a much better condition, *Sir J. D. Hooker* 2182–2184.

Conclusion of the Committee that the management of the woodlands of the United Kingdom might be materially improved, *Rep.* iii — Special importance of economical and skilful management in view of the present depressed values, *ib.* iii, iv.

Conclusion of the Committee that landowners might make their woods more remunerative if greater attention were paid to the selection of trees suitable to different soils, and to more skilful management, *Rep.* iv.

See also *Foresters and Woodmen.* *Land Agents.* *Pruning.* *Soil.*

N.

Nancy. Preference for the forestry instruction at Nancy, rather than at Cooper's Hill, as regards the Indian Forest Service, *Sir J. Campbell* 642. 704. 724–730. 733.

Natural Reproduction. See *Larch.*

New Forest. Very extensive area under plantation in the New Forest, the older woods consisting of oak and beech, and the plantations at different periods of different kinds of timber, *Hon. G. Lascelles* 843. 844 — Experienced assistants and woodmen in charge under witness; supply of woodmen provided from the more intelligent labourers, *ib.* 845–849 — Several objections to the New Forest as a place for the study of forestry, *ib.* 850–855.

Comment upon the large area (some 40,000 acres) of uncultivated land in the New Forest, *Clutton* 2018–2021. 2034. 2035 — Obstacles to utilising the New Forest for forestry instruction, *ib.* 2036–2038.

Explanations in memorandum by Sir James Campbell relative to the planting carried out in former years, the condition of the plantations, and the difficulties and restrictions under which the management laboured, *App.* 137. 138.

Conclusions of the Committee as to the present unsatisfactory condition of the forest, so that it demands the serious attention of the Government, *Rep.* iv, v.

Norway. Very large import of Norway pine, nine-tenths of the mining timber used in South Staffordshire coming from Norway, *Britton* 768. 840. 841 — Cheaper production in Norway than in Great Britain owing to the much lower wages in the former country, *Dundas* 1415 — Expected increase of price of timber from Norway, *Gilchrist* 1763. 1868. 1869.

Nurseries. Expediency of plants for a permanent forest being first proved in a nursery, whence they should not be planted out till they are from four to five feet high, *Barron* 63. 148. 149. 202–207.

O.

Oak. Statement showing the beneficial results from the transplanting of oak trees; satisfactory experiments on this subject in Dean Forest, *Sir J. Campbell* 745–750. 752 — It is only small oak trees that can now be sold at any profit, *Clutton* 1933.

Osiers. Favourable opinion as to the cultivation of osier beds in Ireland, *Viscount Powerscourt* 2333. 2334.

Statement by Mr. James Price as to the facilities and advantages of growing osiers in Ireland, *App.* 141. 142.

P.

Perthshire. Want of better management of the woods and forests generally in Perthshire, land agents or factors and woodmen being deficient in knowledge as to the best soils for particular trees, the best mode of thinning, &c., *Macgregor* 878–879. 963. 964 — Opinion

Perthshire—continued.

Opinion that there is a large area of waste land that might be profitably planted, *Macgregor* 969. 970. 1084–1086 — Advantage of resident factors, as in Perthshire, having a knowledge of forestry, *ib.* 1057–1059.

Pine. Several kinds of pine best fitted for planting in this country, the Corsican pine being one of these, *Barron* 45–48.

See also *Austrian Pine.* *Corsican Pine.* *Douglas Pine.*

Poplar. Favourable opinion as to the poplar for planting in Ireland; various uses to be made of the wood, *Viscount Powerscourt* 2286–2292. 2310–2313.

Pot-bound Plants. Reference to a specimen of the *Araucaria Imbricata* as illustrating the permanent mischief caused by plants being pot-bound, *Barron* 217.

Powell, Evan. (Analysis of his Evidence.) — Experience of witness for more than thirty years as a surveyor; extensive experience in planting, and in valuing and marketing timber, more especially in Wales, 2043–2048 — Interest of witness in large timber properties in the United States; visits by him to forests in America, as well as in Germany, 2049–2051. 2070. 2071.

Grounds for the opinion that the trade in home-grown timber will continue very depressed for some years to come, but that for several reasons the imports will decrease, and the price will advance, 2051–2055. 2070–2072. 2146–2151 — Rapid denudation of the forests in the United States and Canada; great waste and destruction in the States, 2054. 2055. 2070–2072. 2147–2151 — Enormous destruction by fire in the States; large areas cleared in order to cultivate the land for cotton, 2055. 2070–2072. 2172.

Diminished amount of planting in this country as compared with the quantity of timber cut down; less attention paid to the conservancy of woodlands than in any foreign country, 2055. 2056. 2147. 2169 — Conclusion that the rating of woodlands has a deterrent effect upon planting; expediency of relief on this score, 2056. 2097–2099. 2108–2116 — Bounty given for planting in the United States; encouragement otherwise given, 2056. 2099. 2100. 2137–2139. 2147–2149 — Inequality and unfairness of the railway rates for home-grown as compared with imported timber; much heavier rates in England than in America, 2057. 2092–2096. 2151.

Belief that larch and some other classes of timber can be profitably grown, more especially in Wales, 2058–2060. 2074. 2075. 2117. 2118. 2140–2143 — Information respecting the larch disease, and the wholesale destruction thereby; deterrent effect upon planting, 2059. 2076–2082. 2118–2128. 2152–2158 — Advocacy of the planting of the Douglas pine (*Abies Douglasii*) in this country, as not being liable to disease, and being of excellent quality; very large dimensions attained by this tree in the States, 2059. 2060. 2083–2087. 2142–2145. 2173–2177.

Approval of the establishment of a central school of forestry (in London), rather than of attaching a course of forestry to existing agricultural institutions; witness, in fact, fully approves of the scheme of Mr. Julian Rogers, 2061–2068. 2101–2107. 2159–2164. 2168 — Advantage if elementary forestry were taught in Board schools, 2069. 2165–2167 — Scarcity of timber in some parts of the States; enhanced price in New York, 2072. 2148–2151 — Very little Quebec yellow pine now obtainable from Canada, 2073.

Calculations as to the cost of planting larch and other timber in different parts of Wales; prospect of profitable result in course of years, 2074. 2075. 2081. 2082 — Immense value of the annual timber crop in the States, 2100 — Gross mismanagement of woodlands in some parts of England, so that improved qualifications in land agents and foresters are greatly needed, 2101–2107. 2136. 2168 — Information as to the condition of the plantations in Brecknockshire and Montgomeryshire; difficulties in the way of profitable results, 2129–2136.

Steps now taken in America for preventing destruction of the forests by fires, 2148. 2149. 2170–2172 — Want of practical instruction in a forest in connection with a central school of forestry, 2162–2164 — Different system of management of woods in Germany and France as compared with England, 2178 — Very strict legislation in Germany for the protection of woodlands, 2179.

Powerscourt, The Right Honourable the Viscount, K.P. (Analysis of his Evidence.) — Dissent from certain evidence of Father Flannery respecting the Austrian pine, witness' experience being that it is not a desirable tree to plant in this country, and that the timber is very valueless, 2283–2286 — Approval of the common larch as one of the best trees to plant, 2286 — Strong approval also of the Douglas pine; very promising results from a large number planted by witness on his property in Wicklow, 2285. 2293–2297 — Favourable opinion as to the poplar for planting in Ireland; various uses to be made of the wood, 2286–2292. 2310–2313 — Utility of the Austrian pine when planted for the shelter of other trees, 2299.

Powerscourt, The Right Hon. the Viscount, K.P. (Analysis of his Evidence)—continued.

Suggestions as to the best kinds of trees for planting on the west coast of Ireland, these including the Scotch fir, the larch, evergreen oak, silver fir, sycamore, &c., 2300-2309—Belief as to oak and yew existing in the bogs generally in Ireland, 2305, 2397, 2398—Excessive value put by Mr. Gilchrist on some land planted by witness, 2314—Concurrence with Mr. Gilchrist as to the great neglect of Irish woods in the matter of thinning, 2314, 2315.

Recommendation that a central school of forestry for Ireland be established at Glasnevin; valuable facilities by means of the Botanical Gardens and of the lectures given by the Royal Dublin Society, 2317, 2318, 2328-2331, 2406-2411—Unfitness of Glasnevin or its vicinity for the growth of trees for practical teaching in connection with a school of forestry; suggestion that this can best be carried out in Connemara, or elsewhere in the west, 2318, 2319, 2411, 2412.

Information as to the process of planting adopted by witness on his property in Wicklow, where at one period he planted from 150,000 to 200,000 trees annually; cost incurred and financial results, 2319, 2320, 2324, 2349-2351—Admirable character of the ilex, or evergreen oak, which is, however, too costly to plant extensively, 2321-2323—Doubt as to it being profitable for Irish landlords to borrow money at three per cent. in order to plant; satisfactory results, on the whole, in witness' case, this being largely due to the vicinity of his woods to the Dublin market, 2324-2327, 2332, 2361-2368, 2399-2403—Readiness of witness and other proprietors to admit students to their woods, 2329, 2409, 2410.

Advantage of a home supply of trained foresters for Ireland, 2331—Favourable opinion as to the cultivation of osier beds in Ireland, 2333, 2334—Conclusion as to the facilities for planting in Connemara, 2336, 2337—Great value to Wicklow through the scenery being beautified by the mixture of wood, mountain, and water, 2338-2340.

Evidence as to the exceedingly small value of large areas on the west coast, as to the cost at which they might be planted, and as to the expediency of this being done directly or indirectly by Government; doubt, however, as to the financial results, 2341-2361, 2399-2403—Several respects in which extensive planting on the west coast would have beneficial results locally, as in giving increased employment, in leading to improved dwellings, in providing shelter, &c., 2369-2378, 2381—Probable ill-will on the part of the peasantry if large areas were taken up for planting; instances of the malicious burning of some young plantations of witness, 2370, 2379, 2396.

Powerscourt Estate (Wicklow). Description of the planting operations at Powerscourt, as carried out under witness, the practice as to thinning, disposal of the timber, &c.; conclusion as to the profitable results attained, *Gilchrist* 1713-1736, 1753 *et seq.*—Calculations in detail respecting the original cost of planting per acre on the Powerscourt Estate, the original value of the land, the value as woodland, and the annual amounts realised; profits obtained from larch more especially, *ib.* 1719-1736, 1753-1761, 1815-1821—Use of foreign as well as home-grown timber on the Powerscourt Estate; relative quality and price of the two, *ib.* 1800-1805.

Practical Instruction. Sufficiency of an area of 200 acres for experiments and practical instruction; difficulty as to Government aid in support of the cost, *Wrightson* 333-343—Advantage of students in forestry going to the chief districts where larch or beech, &c., is grown in order to obtain practical knowledge, *Britton* 836—Importance of practical training in connection with special instruction in the local schools, *Gilchrist* 1777-1782, 1822-1830, 1865—Value of practical study in such woods as those of Lord Powerscourt and the Duke of Abercorn; expected facilities on their part, *ib.* 1796-1799, 1885-1887.

Want of practical instruction in a forest in connection with a central school of forestry, *Powell* 2162-2164—Grounds for the conclusion that scientific instruction should be given by itself at first, to be followed by practical study or instruction on the spot, *Brown* 2267-2272—Readiness of witness and other proprietors in Ireland to admit students to their woods, *Viscount Powerscourt* 2329, 2409, 2410.

Price, James, C.E. Letter from Mr. Price, civil engineer of Dublin, to the Chairman of the Committee, advocating the planting of larch and other trees over large districts in the West of Ireland and elsewhere in that country, *App.* 141, 142.

Price of Timber. Reference to the depression in the coal and iron trades, as well as the sales in 1879 and subsequent years, as accounting for the fall in the price of timber, *Macgregor* 1060-1067—Less profitable results from Scotch woodlands than in former years, owing to the fall in prices; large reduction since 1879, *ib.* 1077-1081—Heavy fall in prices during the last fifteen years, *Thomson* 1201.

Conclusion that prices will in course of time advance as the foreign supply decreases, *Thomson* 1223, 1224, 1256-1258; *Gilchrist* 1752-1764, 1857-1861, 1867-1869; *Clutton* 1935,

Price of Timber—continued.

1935, 1936, 1955-1966—Particulars as to the present prices of larch, Scotch fir, &c.; witness submitting that at these prices it is not possible to grow wood in this country at a profit, *Dundas* 1415, 1421-1423, 1427-1433, 1447, 1448, 1466—Decreased demand for timber through the increased use of iron in lieu of wood, *Gilchrist* 1765-1767.

Grounds for the opinion that the trade in home-grown timber will continue very depressed for some years to come, but that for several reasons the imports will decrease and the price will advance, *Powell* 2051-2055, 2070-2072, 2146-2151.

See also *Foreign Competition*.

Professor of Forestry. Opinion that there is not sufficient reason for the endowment of a professor of forestry with reference merely to research, *Sir J. Campbell* 742, 751-755—Improvement if there were a chair of forestry attached to the chair of agriculture at Dublin University, *McCorquodale* 1357-1361.

Profitable Results (Planting). Large areas of land in England which might be advantageously and profitably planted, on an improved system; reference more especially to land where rubbishy trees are now grown, *Barron* 60-63, 70-75, 95-104, 127, 128, 155-160, 171-174—List of the trees which could be grown most profitably, *ib.* 93, 94—Probability that woodland in the West of England may be profitably cultivated with larch and other timber, *McClellan* 405-407; *Earl of Ducie* 451-454, 460-462.

Obstacles to the profitable cultivation of woods in this country, even if there were a supply of especially trained foresters; great depreciation in the price of timber, *Earl Bathurst* 554-556, 559-564, 568, 574-597—Considerable expense in connection with witness' woods, which are not kept up solely for profit; particulars hereon as to the management and the results, *ib.* 554, 555, 560-563, 576-581, 586-592, 594-605—Fair return to be derived from planting if properly carried out, *Thomson* 1363.

Great obstacle to the growing of timber for profit since the abolition of the duty on foreign timber years ago, and the consequent reduction in price, *Dundas* 1415, 1421-1423, 1427-1433—Further difficulty through the great increase going on in the substitution of metal for wood, *ib.* 1415, 1466—Information as to the sale of timber by witness, the prices obtained, the rent or value of the land, &c.; unsatisfactory results as regards profit, *ib.* 1415-1434, 1447-1452.

Doubt as to its being profitable to grow hard wood, such as ash and oak, in large quantities in Ireland, *Gilchrist* 1733-1736, 1795-1864—Immense area of land now lying waste which should be planted; prospect of profitable results in course of time if the management be judicious, *Clutton* 1936, 1966, 1975, 1985-1989, 2018-2030—Instances within witness' knowledge of woodlands, as distinct from forests, which are giving a fair return on the outlay, *ib.* 1966-1973.

Belief that larch and some other classes of timber can be profitably grown, more especially in Wales, *Powell* 2058-2060, 2074, 2075, 2117, 2118, 2140-2143—Doubt as to any profitable result from the cultivation of certain kinds of trees in this country which are of foreign origin, and for which the climate of Great Britain is not suited, *Sir J. D. Hooker* 2220-2224, 2226-2229.

Strong evidence before the Committee to the effect that large tracts, especially in Scotland and Ireland, might be planted with advantage, *Rep.* iii.

See also *Athole, Duke of.* *Cost of Planting.* *Foreign Competition.* *Ireland.* *Larch.* *Management and Cultivation of Woodlands.* *Powerscourt Estate.* *Price of Timber.* *Scotland.* *Wales.* *West of England.*

Pruning. Suggestions as to the thinning and pruning of forest trees, and as to the distance to be allowed between each when planted; advantage of pruning every two or three years, the cost of labour being well repaid, *Barron* 185-203.

R.

Railway Rates (Conveyance of Timber). Information as to the preferential rates charged by railway companies in this country in favour of imported timber; abuse as regards home-grown timber, the rates for which should be modified, *Britton* 769-780, 790-800—Complaints habitually made by timber merchants in Scotland as to the railway rates, *Thomson* 1227, 1228.

Disadvantage to home-grown Irish timber through the preferential railway rates given to foreign timber, *Gilchrist* 1717, 1718—Inequality and unfairness of the railway rates for home-grown as compared with imported timber; much heavier rates in England than in America, *Powell* 2057, 2092-2096, 2151.

246.

Z

Rating

Report, 1887—continued.

Rating of Woodlands. Considerable difficulty in rating woodlands justly; effect, moreover, of the liability to rates in rendering profitable cultivation still more uncertain, *Clutton* 1932. 1973-1975—Conclusion that the rating of woodlands has a deterrent effect upon planting; expediency of relief on this score, *Powell* 2056. 2097-2099. 2108 2116.

Royal Agricultural College (Cirencester). See *Cirencester*.

S.

Sawing Machinery. Better facilities for competition with foreign timber if improved sawing machinery were used in this country, *Barron* 136-147.

SCHOOLS OF FORESTRY:

Strong approval of the establishment of schools of forestry in England, Scotland, and Ireland; suggestions in detail as to the scientific and technical instruction to be given, *Barron* 18-37. 64-93. 111-126—Opinion that when a sufficient supply of trained and specially qualified foresters has been provided, the proposed schools of forestry need not be permanently continued, *ib.* 78-83. 86-93.

Evidence in support of the conclusion that forestry should be taught in connection with agriculture and estate management, and that special schools for forestry exclusively are not desirable nor essential, *Wrightson* 232. 239. 252 *et seq.*—Approval of instruction in forestry conjointly with other subjects required to be known by managers of estates, rather than as a separate study in a special or national school of forestry; saving of time and money under the former plan, *McClellan* 413-433.

Necessity of Government aid if a forest school be established, *Earl of Ducie* 465—Opinion that the required instruction in forestry should be provided by supplementing existing institutions, such as Cirencester College, instead of by founding a large national college of forestry, at a great expense to the public; full approval, however, of Government aid in the matter, *Earl Bathurst* 547-554. 569-573. 609.

Evidence to the effect that there is not sufficient forest land in this country to require the establishment of a special school of forestry, or to justify large grants of Parliament for the purpose, *Sir J. Campbell* 637. 641. 649. 660. 692. 699-709. 719-732. 742. 746. 751—Sufficiency of one forestry establishment for Scotland and England, witness further suggesting, however, that existing institutions be utilised in this direction, *ib.* 669-674. 719-732—Explanation that witness strongly approves of extended scientific instruction in forestry, but for the financial difficulties, 742. 745.

Opinion that a central school of forestry should be associated with an agricultural college (or in Scotland with the Highland Agricultural Society), rather than with Cooper's Hill, *Macgregor* 1116-1120—Importance attached to the establishment of several local schools of forestry throughout the three kingdoms, three central schools being quite inadequate, and involving too much time and expense; suggestions for utilising Board schools and night schools for the purpose, *Gilchrist* 1737-1752. 1775-1790. 1822-1830. 1879-1893. 1900-1908—Further consideration of the joint question of scientific instruction and practical training with reference to the different classes of students likely to avail themselves of the proposed facilities, and the actual demand for their services, *ib.* 1879-1908.

Paper prepared by witness, in conjunction with Mr. Julian Rogers, of the Surveyors' Institution, setting forth their joint views on the subject of a State forestry school, *Clutton* 1924-1929—Decided preference for a national school of forestry, instead of attaching professorships of forestry to existing institutions throughout the country, *ib.* 1928. 1929. 1941-1948. 1953. 1954. 1994-2003—Limited public expenditure contemplated by witness in connection with a national school of forestry; that is, in view of the payments by students wishing to qualify as land agents, *ib.* 1955-1966. 1990-2007. 2010. 2040-2042—Suggestions as to the character of the instruction to be given in the proposed forestry school, *ib.* 1994-2013.

Approval of the establishment of a central school of forestry (in London), rather than attaching a course of forestry to existing agricultural institutions; witness, in fact, fully approves of the scheme of Mr. Julian Rogers, *Powell* 2061-2068. 2101-2107. 2159-2164. 2168—Advocacy of the establishment of a national school of forestry at Edinburgh for the United Kingdom, India, and the Colonies, rather than of separate schools for England, Scotland, and Ireland, *Brown* 2255-2266.

Paper containing the views of Sir James Campbell in favour of forestry education at existing colleges and schools, rather than at a central institution, *App.* 134.

Comparatively small area of woodlands belonging to the State; the difference between skilled and unskilled management would, however, more than repay the cost of a forest

Report, 1887—continued.

SCHOOLS OF FORESTRY—continued.

school, *Rep.* iii.—Existence of one or more forest schools in nearly every civilised country but Great Britain, *ib.* iv.

Advantage of more than one centre of instruction, though, in the first instance, it might be well to establish one school only, in order to secure the most complete equipment, the best teachers, and a sufficiency of students, *Rep.* iv.

See also *Board or Council of Forestry.* *Cirencester Agricultural College.*
Downton Agricultural College. *Germany.* *Government Grants.* *Ireland.*
Land Agents. *Scotland.* *Spain.* *Text-books.*

Scotch Firs. Much less destructive effect of disease in the case of Scotch fir than of larch, *Macgregor*, 1087-1092. 1107. 1108. 1135—Maturity of Scotch firs in about 100 years, *Thomson* 1322-1324—Much better quality of Scotch fir when grown in Scotland than in England, *McCormac* 1400. 1404-1406.—See also *Athole*, *Duke of*.

SCOTLAND:

Grounds for the opinion that in Scotland there are large tracts of land which might be planted with profit, more especially with Scotch fir, *Macgregor* 885-905. 943. 944. 969. 970. 1000-1015. 1080-1092. 1122-1135—Absence of any means in Scotland for obtaining special forestry instruction, the only available institution being the Botanical Gardens at Edinburgh; want of a school of forestry, and of practical instruction, where there are about 5,000 acres of woodland, *ib.* 906. 907. 924-929. 947-950. 962-967.

Information respecting the examinations of the Highland Society in connection with forestry, the class of persons who present themselves, &c., *Macgregor* 907-923. 930-932. 951-961—Conclusion as to the want of a forestry school for Scotland, fees being charged to students, *ib.* 963-967—Great advantage of the Highland Railway for conveyance of workers to market, though the rates are complained of, *ib.* 971. 972—Estimate of about 2 £ an acre as the cost for which large areas might be planted and fenced, *ib.* 1028-1031. 1093-1102.

Larger population to be maintained in Scotland if planting were much extended, this being feasible with profitable results; difficulty through the want of capital, the slow return, and other obstacles, *Macgregor* 1121-1143.

Advocacy of the experimental planting of several thousands of acres of good soil; grounds for the conclusion that profitable results would ensue, and that Government aid should be afforded, *Thomson* 1166-1168. 1180-1190. 1222-1226. 1279. 1280—Belief that it would eventually be remunerative to plant large tracts in Scotland, and to pay a rent of from 7 s. 6 d. to 10 s. per acre for suitable land for the purpose, *ib.* 1212-1215. 1222-1226. 1232-1234. 1244-1255.

Demand on the part of Scotch proprietors for trained and skilled foresters, some woodlands not being well managed, *Thomson* 1237-1243. 1259-1266—Decrease of planting in recent years, *ib.* 1305-1309.

Doubt as to sufficient demand in Scotland for a forestry school; difficulty on the score of fees, *McCormac* 1353-1356. 1389-1392. 1396. 1397—Exceptional instances of factors being competent to undertake planting without the advice of head foresters, *ib.* 1364-1366.

Grounds for the conclusion that the want of a separate school of forestry in Scotland has been much exaggerated, and that it would be much better to provide the required scientific instruction, in combination with the existing staff at Edinburgh and Aberdeen Universities, *Dundas* 1435-1446. 1453-1465.

Conclusion as to the insufficiency of one central school for Scotland, and as to the advantage of special forestry instruction in the Board schools, *Gilchrist* 1738-1744. 1775-1782—Expediency of utilising the facilities afforded by the Scotch universities, so as to obviate the necessity of Scotch students coming to England; the minimum course should be three months, *Sir J. D. Hooker* 2193-2195. 2215-2219—Diplomas in forestry given by the Highland Agricultural Society as an examining body, *Brown* 2279. 2281.

Urgent need of a forestry school for Scotland, *Rep.* iv.—Importance attached by the Committee to the evidence in favour of extensive planting in the Highlands of Scotland, *ib.*

See also *Athole*, *Duke of*. *Edinburgh University.* *Foresters and Woodmen.*
Game. *Inverness-shire.* *Perthshire.* *Schools of Forestry.* *Seafield Estate.*

Seafield Estate (Strathspey). Area of from 60,000 to 70,000 acres of woodland under charge of witness in the Strathspey district; expenditure thereon of about 90,000 £. 246. 22

Seafield Estate (Strathspey)—continued.

under his management, *Thomson* 1152, 1153, 1333—Large quantity of natural fir on the Seafield estate; goodness of the quality, *ib.* 1191–1195—Practice as to cutting and thinning, conveyance to market, &c.; considerable employment given, *ib.* 1196–1200—Conclusion as to the successful results, on the whole, of the extensive planting on the Seafield estate, *ib.* 1244–1248.

Seeds. Importance attached to the selection of seeds from the very finest specimens, *Barron* 13, 14, 62.

Silver Fir. Excellent quality of silver fir when grown on good soil; durability when used for railway sleepers, *M^cCorquodale* 1398–1403.

Soil. Great mistake in planting extensively on inferior ground and unsuitable soil, though with proper management and selection of trees good results may be produced, *Barron* 27, 42–45, 61, 152–158, 175, 176—Approval of the planting of certain tracts and classes of land now used as very poor pasture, as in Scotland, *Sir J. Campbell* 667, 668, 693–698—Necessity of careful selection of trees with reference to soil, *M^cCorquodale* 1363, 1366.

Different management required for trees and plantations in some counties as compared with others on account of the varying soil; necessity of practical knowledge being acquired on the spot over and above scientific instruction at a central school, *Clutton* 1953, 1954, 2031–2033.

Suggested examination of forestry students in geology, with special reference to soil, *Rep.* vi.

South Kensington. Examination in forestry at South Kensington, the students coming from outside sources, *Brown* 2281, 2282.

Spain. Result of witness' inquiries that he considers Spain affords the best mode for forestry school in this country; particulars hereon as to the national school at Madrid, the staff, course of instruction, facilities for practical study, &c., *Brown* 2242–2254, 2259, 2270—Comparatively little importance attached in Spain to practical instruction in the forests simultaneously with scientific training, *ib.* 2242, 2250, 2259, 2270—Advantage of the system in Spain of adapting the training to the requirements of the country, *ib.* 2254, 2276—Conflict of opinion in Spain upon the question of preservation of the forests; value attached by the engineers to the retention of the forests on climatic grounds, *ib.* 2277, 2278.

Succession Duty. Heavy pressure of the succession duty in the case of timber, *Earl Bathurst* 582–585.

Surveyors' Institution. Examination to a certain extent in forestry at the Surveyors' Institution, *Clutton* 2004, 2005, 2017.

Sycamore. Special value of the sycamore for standing against the wind, whilst the timber is very valuable, *Viscount Powerscourt* 2301–2304.

Value attached by Mr. James Price to the sycamore for planting in Ireland, *App.* 141.

T.

Taylor, Sir Alexander. (Analysis of his Evidence.)—Witness is President of the Royal Indian Engineering College at Cooper's Hill, 2413.

Explanation that the forest branch of the college has been established specially for the Indian forest service, there being no students who intend to become land agents in England, 2414–2416, 2442, 2463, 2464—Facility of arranging for the attendance of the land-agent class, by dispensing in their case with the preliminary examination on entrance, and by their coming as out-students to attend lectures at a moderate charge, 2416–2429—Payment of 180 l. a year by the students, the fees being now about equal to the expenses, 2420, 2451–2453.

Information respecting the forestry instruction given in the college, the staff employed, and the accommodation; increased staff and accommodation necessary if there were a special course of lectures and instruction for a land-agent class, 2423–2450, 2454–2457, 2466–2478—Unfitness of the present course for men of the woodreeve class; less scientific instruction required in their case, 2431, 2432, 2475–2478.

Statement

Taylor, Sir Alexander. (Analysis of his Evidence)—continued.

Statement to the effect that Cooper's Hill is only suitable for men wanting to learn forestry thoroughly, a modified and less expensive course and a much shorter term being necessary for men about to become land agents or head foresters, 2443–2449, 2454–2463–2478—Special circumstances which account for the Indian Forest Department now yielding a large profit, 2458–2462.

Temple, Sir Richard (Member of the Committee). (Analysis of his Evidence.)—Explanation that the educational course and the arrangements generally at Cooper's Hill are under a board of visitors, of which witness is chairman; belief on his part that the board would give favourable consideration to any proposal for utilising the college in connection with forestry in this country, 2479.

Text-Books. Mention of some of the best books (notably "Brown's Forester") for use in forestry schools, *Barron* 208–211—Great want of some text-books on forestry, *Macgregor* 921, 962—Advantage of a text-book on forestry for Board or national schools, *Gilchrist* 1779, 1785–1790.

Suggestion by the Committee that one of the functions of the proposed forestry board would be to prepare an official syllabus and text-book, *Rep.* v.

Thinnings. Great neglect in the matter of thinning, *Britton* 760—Statement as to common woodlands having paid nothing of late years, there being no demand for the thinnings of young plantations, *Clutton* 1933, 1934, 1936, 2025–2028.

Thomson, John Grant. (Analysis of his Evidence.)—Long and varied experience of witness in connection with woodlands; he is now head forester of Lady Seafield, at Strathspey, 1146–1150.

Area of from 60,000 to 70,000 acres of woodland under charge of witness in the Strathspey district; expenditure thereon of about 90,000 l. under his management, 1152, 1153, 1333—Much less cost of planting large than small inclosures, 1154, 1215—Particulars of cost of planting and fencing an area of nearly 900 acres, as carried out by witness; aggregate of 1,304 l., or about 30s. per acre, 1154, 1212, 1297–1304.

Decided advantage if for esters in Scotland could have some scientific instruction at a school of forestry, in addition to practical training in the woods; difficulty on the score of expense and time, 1155–1160, 1166–1171, 1186–1190, 1205–1209, 1216, 1267–1280, 1310–1318—Large number of young men trained under witness; competency of these in course of time to take charge of woodlands, 1157–1159, 1204–1211, 1219–1221, 1239–1241, 1259–1266, 1310, 1319–1321.

Prejudicial effect where the ground has been under a crop of wood for a great length of time, the upper soil becoming choked with decayed vegetable matter, 1161–1163—Bad result of re-planting the same kind of trees on the same ground; instances of the Scotch fir being replaced by the larch by a sort of natural succession, 1164, 1165, 1294–1296—Advocacy of the experimental planting of several thousands of acres of good soil in Scotland; grounds for the conclusion that profitable results would ensue, and that Government aid should be afforded, 1166–1168, 1180–1190, 1222–1226, 1279, 1280.

Advantage of an extended system of local examinations for foresters, in the absence of a school of forestry, as by means of the Highland Agricultural Society, 1172–1179, 1281–1287—Large quantity of natural fir on the Seafield estate; goodness of the quality, 1191–1195—Practice as to cutting and thinning, conveyance to market, &c.; considerable employment given, 1196–1200—Heavy fall in prices during the last fifteen years, 1201.

Belief that it would eventually be remunerative to plant large tracts in Scotland, and to pay a rent of from 7s. 6d. to 10s. per acre for suitable land for the purpose, 1212–1215, 1222–1226, 1232–1234, 1244–1255—Probability of a decrease of foreign competition, and of better prices for home-grown timber, 1223, 1224, 1256–1258—Complaints habitually made by timber merchants as to the railway rates, 1227, 1228—Beneficial effect of woodlands as regards the climate and the moisture of the soil, 1229–1231—Demand on the part of Scotch proprietors for trained and skilled foresters, some woodlands not being well managed, 1237–1243, 1259–1266.

Conclusion as to the successful results, on the whole, of the extensive planting on the Seafield estate, 1244–1248—Satisfactory working of the system of natural reproduction of larch, as applied to some plantations under witness, 1285–1291—Different management required in England as compared with Scotland, 1292, 1293—Decrease of planting in Scotland in recent years, 1305–1309.

Maturity of Scotch firs in about 100 years, 1322–1324—Large area in Inverness-shire suitable for planting profitably, 1325—Plantation of larch by witness as a mixture with Scotch fir, 1326—Good return from birch, as not involving any cost for planting, 1327–1329.

Timber. See *The Headings generally throughout the Index.*

246.

2 3

United

U.

United States. Low price at which oak and other timber is imported from America; very large supplies available, so that defective timber can be thrown aside, *Britton* 807. 814. 815.

Rapid denudation of the forests in the United States; great waste and destruction, *Powell* 2054, 2055. 2070-2072. 2147-2151—Enormous destruction by fire in the States; large areas cleared in order to cultivate the land for cotton, *ib.* 2055. 2070-2072. 2172—Bounty given for planting in the United States; encouragement otherwise given, *ib.* 2056. 2099. 2100. 2137-2139. 2147-2149.

Scarcity of timber in some parts of the States; enhanced price in New York, *Powell* 2072. 2148-2151—Immense value of the annual timber crop, *ib.* 2100—Steps now taken in America for preventing destruction of the forests by fires, *ib.* 2148, 2149. 2170-2172.

V.

Vancouver Pine. Objection to the Vancouver pine as compared with the Douglas pine, *Barron* 58, 59. — See also *Douglas Pine.*

Vegetable Physiology. Suggested examination of forestry students in vegetable physiology, *Rep.* vi.

W.

Wales. Large area in Wales suitable for planting, *Powell* 2059. 2117, 2118—Calculations as to the cost of planting larch and other timber in different parts of Wales; prospect of profitable result in course of years, *ib.* 2074, 2075. 2081, 2082—Information as to the condition of the plantations in Brecknockshire and Montgomeryshire; difficulties in the way of profitable results, *ib.* 2129-2136.

West of England. Probability that woodland areas in the West of England may be profitably cultivated, *M^cClellan* 405-407; *Earl of Ducie* 451-454. 460-462.

West of Ireland. See *Connemara.* *Ireland.*

Wicklow. Great value to Wicklow through the scenery being beautified by the mixture of wood, mountain, and water, *Viscount Powerscourt* 2338-2340.
See also *Ireland.* *Powerscourt Estate.*

Woodmen or Woodreeves. See *Foresters and Woodmen.*

Wrightson, Professor John. (Analysis of his Evidence.)—Witness is Professor of Agriculture in the College of Agriculture at Downton, and is Examiner in Agriculture in the Science and Art Department, 218, 219.

Enumeration of the chief subjects taught to the students at Downton College; instruction given not only in the science and principles of agriculture, but in its practice, 220, 256, 257. 333, 334—Different pursuits in life for which students are sent to Downton, the average number of students being about fifty, some of whom are in training for colonial careers, some for land-agency work at home, whilst others are the sons of gentlemen landowners, 221-223. 309-315.

Total of about 600 acres attached to the college, there being a botanical garden, and a belt of forest trees, about 500 yards in length, for special instruction in forestry, 224-226—Details as to the extent to which forestry is now taught in the college, and as to the character of the instruction, there being a combination of practical and scientific teaching, 227 *et seq.*—Explanation that forestry is part of the curriculum of the college, but has not, up to the present time, been a leading subject; staff provided for this branch, 227-236. 256-263.

Evidence in support of the conclusion that forestry should be taught in connection with agriculture and estate management, and that special schools for forestry exclusively are not desirable nor essential, 232. 239. 252 *et seq.*—Natural facilities at Downton for instruction in forestry, on account of the vicinity of the New Forest and of private woods; examination hereon upon the question of some 200 acres of the forest being

n, Professor John. (Analysis of his Evidence)—continued.

made available for experiments and for practical instruction, 237, 238. 271-275. 4. 329-342.

ns of rendering Downton capable of supplying much fuller instruction in forestry; importance attached to facilities for experiments and to practical teaching, 243-252 *et seq.*—Advantages of Glasnevin Agricultural School, in Ireland, as being subsidised by the State, 248-251—Consideration of the question of practical training being trained at Downton, as well as land agents and others; difficulty as to 24-276. 282-293. 305-315—Suggestions for further utilising, as regards forestry, leges at Downton and Cirencester, in connection with a system of public examinations, and of certificates to successful students, 276-281. 316, 317. 328.

ey outlay necessary in order to procure 200 acres of land near Downton, in the of its not being feasible to obtain a grant of portion of the New Forest, 318-322 apply of experienced woodmen in the employment of large owners of woodland in entry around Downton, 323-327—Sufficiency of an area of 200 acres for experimental and practical instruction; difficulty as to Government aid in support of the cost, 33—Necessarily high fees charged at Downton, 338—Instances of the al character of some of the experiments at Downton, 339—Belief as to the reporting character of an area of 200 acres utilised for the planting of trees under nt systems; question hereon as to the institution in charge being guaranteed t loss, 340-342—Further suggestions on the subject of students in forestry prepared at Downton or Cirencester for examination by a board of examiners in n; way in which such board should be constituted, 342-346.

ortance of landed proprietors, as well as their agents, being specially instructed in anagement and culture of estates, 345-347—Want of a period of about two for the curriculum advocated by witness, 348, 349.



JB mast
mes