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IMPRESSIONS OF EUROPEAN FORESTRY

Letters written during a six months' visit to England and to the Continent

BY

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In the summer and autumn of 1921 it was the privilege of the writer, during a period of sabbatic leave from Cornell University, to visit a number of the countries of northern Europe. His main object in making this trip was to obtain first hand acquaintance with certain features of the forests and forestry work of these countries, particularly with reference to his work as a teacher of forestry and also because of the bearing that European experience has on some of the forest problems of the United States.

The eight letters here reprinted were written as contributions to the Lumber World Review, at the request of the editor and publisher of that journal, Mr. Bolling Arthur Johnson. Written en route as they were, these letters make no pretension of covering comprehensively the forest work of any of the countries visited. Rather the idea was to present in a non-technical way the personal reaction of one American forester to certain European forest practices. Their publication in this form is made with the thought that some of the matters commented upon may be of interest to foresters and timberland owners in the United States. If they serve to quicken an interest in what is being done in forestry overseas, their purpose will have been achieved.

Grateful acknowledgment is here made to all those foresters of whatever station with whom the writer came in contact while abroad for the very many courtesies which he received at their hands. In almost every one of the letters he has had occasion to refer to the cordiality of the welcome accorded him. He wishes here once more to express his keen and lasting appreciation of all that was done to assist and aid him in accomplishing the objects that he had in mind. He can but feel that such contacts as are established by meetings of this type go a long way toward increasing mutual understanding and good relations between this country and our friends overseas.

—Ralph S. Hosmer.

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of the following dates in 1921-22: Oct. 10; Nov. 25;
Jan. 10; Feb. 25; March 25; April 25; May 10; May 25.
ADDENDA

Impressions of European Forestry

By Ralph S. Hosmer

Since the republication of these letters in book form the attention of the author has been called to certain inaccuracies in a few of his statements. He is glad to take this means of correcting these errors.

Chapter 2, pp. 21, 23, 24. Sweden. In a letter dated October 20, 1922, Hon. Karl Fredenberg, General Direktör of the Kungl. Domanstyrelsen, says: "Referring to your excellent description of forests and forestry in Sweden I beg to make herewith a few remarks:

"You say that the organization in Sweden is strictly centralized so that even questions of minor import go to Stockholm for decision. This depends of course on what means by minor questions. I wish to remind you that, for example, a forester (jägmästare) has the right of accepting sale bids up to an amount of 1000 Swedish kronors' value, and the district inspector (överjägmästare) up to 10,000 kronors. In questions of principle it is, however, possible that even small questions are put to the central office for decision.

"Referring to the 'protection forest' laws, a private owner cannot appeal to the government to buy his land on the ground that he is displeased with the blazing obtained, but he has the right to do so when it has been considered necessary to so restrict the cutting as to include even his privilege of taking timber for his private needs.

"The General law of 1903 does not apply to the whole of Sweden. The two most northern provinces (län) are excepted from it, where the more severe forest laws are in force. In consequence there are no local forest commissions (skogsvardsstyrelse) there, as these latter laws are handled by the central office."

On page 24, through a typographic error, 10 acres is given as the equivalent of 2 hectares. One hectare = 2.47 acres.

Chapter 5, p. 44. Forestry in France. The title of Theodore Salisbury Woolsey, Jr., the author of "Studies in French Forestry", is Lt. Colonel, not Major.

Chapter 8, pp. 79 and 80. Forest Schools in Great Britain. In regard to the statement covering the Forestry Department of the University of Aberdeen, Mr. Fraser Story, Education Officer and University Examiner, British Forestry Commission, writes under the date of Sept. 16, 1922:

"As regards your comments on British Universities, I must say I am doubtful if you are right in conveying the impression that more advanced courses are offered at Oxford and Cambridge than elsewhere. Aberdeen University and the University of Wales (Bangor) provide courses of a standard quite equal to those of the older Universities and Dr. Borthwick (Sec'y of the Forestry Commission, Scotland), to whom I have just put the question, is of my opinion. You may have got a different impression because the Commissioners are anxious to develop forestry teaching at Oxford and, in course of time, I have no doubt better facilities will be forthcoming at that centre but, at present, I am personally convinced no distinction can be made."

Further on this point, Mr. P. Leslie, Head of the Department of Forestry at Aberdeen, says, Oct. 17, 1922:

"Aberdeen is a very old university, going back to nearly 1400, although our forestry school was not started until 1908; William Dawson, now of Cambridge, being the first member of the Lectureship. As regards the type of men turned out at Aberdeen, they are sometimes already graduates before they enter the forestry courses, although it is not compulsory that they should be so. One of the Research men of the Forestry Commission was a graduate student who received his forestry training wholly with us."
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Great Britain's Afforestation Program

Why It Was Undertaken: How it Is Being Carried Forward

Great Britain is on the verge of becoming a timber producing country. If any one had made such a prediction in the spring of 1914 his statement, to put it mildly, would have been received with incredulity. Today the assertion comes near to being a statement of fact.

The stern necessities of the Great War proved conclusively that no nation is safe without its own supply of timber and of wood. One result of the war in the British Isles is that a program is now actually under way that provides for the afforestation of an area sufficient to supply the forest needs of the British people for a period of three years. Never again, after these new forests come to merchantable size, does Great Britain mean to be caught with its wood supply cut off by hostile submarines, or to be forced to have the carrying power of its ships for food stuffs curtailed by essential but necessarily bulky cargoes of wood.

It is a big program on which Great Britain has entered; one that extends over a period of 40 or more years for the afforestation alone. But the British nation is committed to it. By act of Parliament three and a half million pounds sterling (roughly nearly $15,000,000 at normal rates of exchange) have been authorized to be expended in the decade from 1919 to 1929. It is anticipated that for each of the next two ten-year periods even larger sums will be made available. This is forestry in earnest and it behooves Americans to take note of it, for

DOUGLAS FIR PLANTATION ON LAKE VYRNWY, WALES. D. W. YOUNG, DIVISIONAL FOREST OFFICER, AT RIGHT

SAMPLE PLOT OF EUROPEAN LARCH IN TINTERN FOREST, ENGLAND, FORTY-TWO YEARS OLD
with our area of original forest rapidly diminishing, we may be nearer to England's present plight than one of us like to think.

The purpose of this letter is to set forth why the British forestry program has come into being, with some personal notes on how it is working out in practice. Most of the figures quoted are from the First Annual Report of the Forestry Commission [First Annual Report of the Forestry Commissioners, Year ending Sept. 30, 1920, London, 1921. 60 pp. Published July, 1921, by His Majesty's Stationery Office, Imperial House, Kingsway, London, W. C. 2—by W. E. W. and Sir G. W. A.], or from other publications of that department. The illustrations are of localities personally visited by the writer during July and August of the present year. But before proceeding to details a word more about the general program.

The money allotted to the "Forestry Fund" is to be expended primarily in the acquisition of non-agricultural land, suited only to forest production, and in the planting of these areas with commercially valuable timber trees. In the fiscal year ending Sept. 30, 1920, £740,000 were made available for the forestry fund by votes of Parliament, plus £2,347 received mainly from the sale of timber and other forest products; a total of £490,347. On Sept. 30, 1920 the Forestry Commission was in occupation of a total area of 48,342 acres, of which 1,595 acres were planted during that year. Not a bad showing for the first season's work of a newly organized government body.

During the present decade, from 1919 to 1929, it is proposed to afforest 150,000 acres, at a rate of planting that increases per annum in somewhat the following proportion:

In the year 1919-20, 1,600 acres will be planted; in 1920-21, 5,700 acres; in 1921-22, 8,100 acres; in 1922-23, 11,500 acres; in 1923-24, 14,800. In the last years of the decade between 20,000 and 30,000 acres will be planted each season.

It is of particular interest to Americans to know that in this huge forest planting program large dependance is being placed on two trees from our own Pacific coast, Douglas fir and Sitka spruce. Other American trees are also being used, but to a much less extent. This is made possible by the close resemblance in climatic conditions between the Pacific northwest and the British Isles. Of the indigenous species, Scots pine, European larch and Norway spruce are the most important; of other exotics Corsican pine and Japanese larch. Of the 1,595 acres planted in 1920, all but 121 acres were devoted to conifers.

The aim of the LUMBER WORLD REVIEW is to give news. That is the "story." Let me now fill in some of the details.

THE REASON FOR A BRITISH FOREST POLICY

England has long been known as a wood importing country. Because of the close proximity of other countries from which ample supplies could easily be procured, especially those of the Scandinavian peninsula and, of late years, of northern Russia, it was not felt to be necessary in the United Kingdom to devote very much systematic attention to the home production of timber supplies. This is perhaps the more marked because of the fact that in India, Great Britain has maintained a progressive forestry organization for over 70 years. But at home England's merchant marine could attend to bringing in timber. And so it did—until the war.

The Forestry Commission's report has a significant paragraph on this topic: "Statistics gathered during the 'period of enquiry' (1885-1915) had made it generally known that:

"1. Imports of timber had increased five fold between 1850 and 1910.

"2. The consumption per head in the same period had risen from 3½ cubic feet per annum to nearly 11 cubic feet.

"3. The ratio of home to foreign timber had declined, and in 1914 amounted to barely 10 percent of the supply.

"4. The price of imported timber had risen steadily during the 30 years before the war, while the quality had declined.

"That this state of things was unsatisfactory in time of peace was generally admitted. It required but one year of war to show how critical the position was in a time of national emergency. In 1913 the quantities of timber and grain imported were about equal, and headed the list of imports. They absorbed between them a quarter of the total shipping that entered British ports from overseas. In 1916 the people were hungry, yet despite the most strenuous efforts to set more ships free for importing grain, it was found impossible to reduce even by 1 percent the proportion of shipping required to carry the timber essential for operations of war abroad and at home."—[Loc. cit. p. 11].

Such was the situation that the United Kingdom faced. Is it any wonder that provision is being made for a three years' supply, should a like emergency ever arise again?

THE STORY OF ITS DEVELOPMENT

In studying the forest history of Great Britain one is struck with three things:

First—That there were numerous individuals, far sighted men, from the 17th century on, who predicted danger and who recommended better practices. Sir Walter Scott, just about a century ago, in an inimitable essay, "On the Planting of Waste Land," made suggestions that are as sound today as when they were uttered. But like the wise recommendations, regarding the Adirondack forest, made about the same time by Governor De Witt Clinton of New York—whose chief claim to present day remembrance is that his picture adorns the revenue stamps on our cigarette boxes—these warnings fell for the most part on unheeding ears.

Second: That as well as individual voices, Great Britain has had a series of weighty and able reports from one official commission after another on various phases of forestry and on
afforestation. But until the war practically all of these reports were relegated to the pigeon holes of government bureaus and came to naught. One exception, however, is to be noted; the report of the Royal Commission on Coast Erosion and Afforestation, of 1909, for while its recommendations were not acted upon, it exerted a useful influence on a sub-committee of the Reconstruction Committee of the British Cabinet that was appointed in 1916. The last named body secured results, for its report, known from the chairman, the Rt. Hon. F. D. Acland, M. P., as the "Acland Report," in effect resulted in the passage by Parliament, in the summer of 1919, of the act establishing the present Forestry Commission.

The third point about the history of forestry in the United Kingdom is the active interest in trees and in forests that has been typical of the owners of the large private estates in England, Wales and Scotland for upwards of two centuries. This interest has served the nation well; first, because it led to the experimental planting of many exotic trees, and second, and certainly of infinite importance during the war, because from the planted forests on the private estates came the timber that kept England going during the latter years of the great conflict. It was not, as our newspapers then had it, the old oaks and other ornamental trees that line the long avenues by which one approaches the great houses, that were cut in the war—although some such trees were felled—but rather the even aged stands of Scots pine, spruce and larch that had been planted anywhere from 50 or 60 to 120 or more years ago. Much of this material went into pit props (mine tim-

A VIEW SHOWING SOME OF THE OLDEST AND BEST SCOTS PINE IN SCOTLAND. DEER OF CASTLE GRANT, GRANTOWN ON SPEY, IN FOREGROUND

BLAIR CASTLE, SEAT OF THE DUKE OF ATHOLL, WHOSE FAMILY FOR GENERATIONS HAVE BEEN GREAT TREE PLANTERS, INTRODUCING LARCH INTO SCOTLAND IN 1738

bers, we should call them) for the colliers of Wales and the midland counties of England. One striking instance of this use was told me in Wales. Before the war 95 percent of the pit props were imported. Many came from the south of France (Maritime pine) as a cheap return cargo in the coal ships that must otherwise have come home in ballast. During the war the ratio was exactly reversed; 95 percent of the pit props were home grown, 5 percent only were imported. The forests on the large estates saved the coal mines of England.

It is difficult to obtain accurate data as to
the quantities of wood so cut, but figures given out by the Forestry Commission in 1920 [Forestry in the United Kingdom—statement prepared pursuant to a recommendation of the British Empire Forestry conference. London, July, 1920, p. 31] throw some light on the matter, to wit:

"The area felled during the war is estimated to amount to approximately 470 square miles. Taking an average of 1,600,000 cubic feet, the total utilization would be 750,000,000 cubic feet." These figures do not perhaps seem large in terms of American forests, but when one stops to consider that all figures are relative and that after all both England and Scotland have but limited areas of land surface, he comes to appreciate their significance. Certain it is that had the war continued another year practically every estate plantation would have been requisitioned, including perhaps even the old Scots pine forest at Ballochbuie on the King's personal estate at Balmoral, Scotland.

About Balmoral and on another big estate just over the mountains, at Grantown-on-Spey, the Scots pine reproduces naturally and abundantly. In most other localities the Scottish and British foresters have to rely on artificial planting, which naturally leads, with the even aged stands, to the adoption of clear cutting, followed by planting. In particular America has a distinct advantage, in that in so many parts of our country natural reproduction can be depended on for a new crop, provided always that some seed trees are left and that fire is kept out. In the United Kingdom, too, much outlay has to be made for the protection of forest plantations from rabbits, and in some localities, from deer. The cost of fencing soon runs into large figures. Likewise, in certain sections drainage of the land by open ditches is felt to be essential, while in other localities the cleaning out of grass, bracken and other growth has to precede the establishment of the young trees on land that is being newly planted. When to these charges are added the high rates of post-war labor, tree planting becomes an expensive process, one that demands the rapid growth that is made for example by Douglas fir.

But to revert to private estate forestry. One who has visited that rugged bit of the Scottish Highlands, as it was my privilege to do a fortnight since, cannot wonder that the King likes to retire to Balmoral for real relaxation. But save for the old Scots pines that estate and the adjacent one, Abergeldie, belonging to the Prince of Wales, are not as interesting from a forest standpoint as are others where the introduction and planting of trees has been an avocation of the proprietors, often for several successive generations. Timber tree plantations started under such auspices are more than mere commercial forests. That was why it hurt to have them requisitioned and swept away during the war. But I was told that almost without exception the owners willingly responded to the call when it was made.

To anyone who at all possesses the historic sense, it becomes evident that the value to their owners of these estate forests is almost incalculable. When our host of the Lowther Castle, in Scotland casually referred to a forest right that dated back to the 13th century as if it were an everyday matter, as to him it doubtless was, it tended to bring home to one what these great landed properties mean to the families that have held them through all the years. Whether or not one approves the theory of the British land system, he cannot come away from the United Kingdom without realizing that on these estates he has got close to the heart of Britain.

As to the value to the nation of the estate forests and for one other point worth noting in this connection, I cannot refrain from quoting again from the report of the Forestry Commission, because of its bearing on the present afforestation program. Speaking of the three solid achievements of British private forestry, it says [p. 8]:

"(1) The trees were planted, which, during the recent war, when it was a choice between importing food or timber, enabled the people of these islands to be fed.

"(2) The faster growing conifers were introduced and the way paved for planting them on a commercial scale, a step which may, if there is no unforeseen set-back, revolutionize continental ideas on length of rotation and maximum yield.

"(3) Experiments were made, which though not fully recorded, should with intelligent investigation supply much of the information required for the successful establishment of state forests."

It cannot, I think, be too strongly emphasized that our British cousins are not going at this great planting plan of theirs blindly, or that in pinning their faith to exotic species like Douglas fir, they are doing so without good reasons. On the various estates, but particularly in Scotland, practical men have been watching and noting through several generations what small groups and demonstration areas of these trees have been doing. This information, unfortunately, is only in part tabulated, but it is nevertheless available and the tree planters of today are being guided by the successes and failures of the past. Striking examples of such continued interest in exotic trees and experimental plantations are to be found in Scotland on the Murthly Estate, near Birnam (whence traveled the wood to Dunsinane), which is noted for the wonderful avenues of magnificent old trees of many kinds that adorn the "polices" or grounds immediately about the castle. The neighboring estate of the Duke of Atholl at Dunkeld still cherishes one of the original larch trees introduced into Scotland from the continent by the head of that house in 1738. It is said that these trees were first grown in a greenhouse, but as they were doing poorly they were thrown out. Fortunately to strike root in the soil and become the progenitors of all the larch forests of Scotland today. The old tree has a girth at 3 feet of some 17 feet
and is 102 feet tall. Not far from it grows an ancient oak, a representative of "Birnam Wood," that easily runs back over 500 years. And these are but instances.

If we in the United States had equally as good information about even the most valuable of our trees as the English and Scottish foresters have about their relatively few species, one phase of our problem of a national timberland policy would be greatly simplified, although each nation has to work out and develop its own methods in forestry as in other things. But to recapitulate my third point, I believe that what has been done on the private estates in the United Kingdom is significant and that we Americans can profit in a number of ways from acquaintance with what has been accomplished.

The ultimate object of the British National Forest Policy is, as has been stated, "the creation in Great Britain and Ireland of reserves of standing timber sufficient to meet the essential requirements of the nation over a limited period of three years in time of war or national emergency. The immediate objective is a ten year scheme based on a block grant." The Acland Committee decided, after an exhaustive examination, "that it would be necessary for the state to afforest 1,770,000 acres of land previously unplanted (of which 1,180,000 acres should be planted in 40 years, and the whole in 80 years); and, at the same time, to take steps to secure the continuance under

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**SAMPLE PLOT, LAKE VYRNWY, WALES. Note numbers on trees. Purpose: To study growth and yield**

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**A VIEW SHOWING FOREST NURSERY IN TINTERN WOODS—indicating the extent of the nursery**

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...
timber and obtain an increased yield from the 3,000,000 acres of private forests which existed in 1914."

This is then the general policy, but one of the difficulties arises in reference to the last clause of the above quoted statement. For the present ten year period (1919-1929) the area of privately owned land to be afforested is 119,000 acres (out of the 3,000,000). Many of the private owners are willing enough and would be glad to proceed but at present are financially unable to do so. Taxation, especially of land, has reached practically the breaking point in the United Kingdom. The basic rate of the income tax is six shillings to the pound; when to this are added the local taxes ("rates," as they are called), which often run up to 12 shillings, it is obvious that the owner has little left. In some cases even, with the surtax on large incomes, the tax bill totals around 22 shillings on the pound (20 shillings). Unless the proprietor has considerable investments in other securities it is not difficult to see what happens. Indeed many old estates are being sold and broken up into small holdings as the result.

What the outcome will be no one seems to be able to predict, but it is a situation that is causing no little anxiety to those who stand for the continuation of established usages. The whole problem is full of complexities but this brief mention will indicate why greater activity in forest work may be looked for in the immediate future from the government rather than from the private estate owner.

The above leads naturally to a note upon one method whereby the Forestry Commission is obtaining occupation of the area to be planted. This is not by direct purchase of the land in fee simple but by a lease for a very long period, so that in effect control of the area is secured practically in perpetuity. It follows a custom that has long been in vogue on the large estates and appears admirably to suit the local conditions of the United Kingdom. This method has the unique advantage of very considerably increasing the purchasing power of the appropriations at present available, for naturally the sums that must be paid out as annual rental are materially less than would be the amounts required for outright purchase.
Many of the large estate owners have in this way turned over certain of their forest lands to the Forestry Commission, reserving, however, specified rights as to hunting and fishing. It is the policy of the commission not to acquire land that cannot produce at least 40 to 50 cubic feet per acre per annum, of which the poorer classes of Scots pine land serve as an example. On land well adapted for the growth of Douglas fir as much as 160 cubic feet per acre per annum can be grown, and provided a market exists for pit props, such an area will pay back the cost of planting in the first 25 years. It is figured that after a few decades the newly planted forests will become self-supporting through thinnings, systematically made, at definite intervals.

One other class of forest should here be mentioned, that belonging to municipal and corporate bodies. Perhaps the most striking example is the holding of the corporation of Liverpool, at Vyrnwy, Montgomeryshire, Wales. It comprises an area of 35½ square miles and includes the catchment basin and reservoir that gives the city of Liverpool its water supply. By means of a high dam a charming lake has been created in a valley among the hills. On every side, up to the summit of the ridge, forest is being planted under a co-operative plan between the corporation and the Forestry Commission. It will take 20 years to complete the planting, when the forest will cover 7½ square miles, above and around the lake. Surely here is an example that many American cities might well copy.

The distinctive thing about Vyrnwy is that the corporation was not content merely to secure the land necessary for its reservoir, with a narrow belt around its shores, but acquired the whole catchment basin and is afforesting all of the area above the water line. Incidentally it may be said that a visit to Lake Vyrnwy well repays anyone who has a love for beautiful scenery. Although the locality is rather inaccessible one is well cared for on arrival, at an excellent hotel. Lake Vyrnwy is to be commended along with some of the wilder lochs in the Scottish Highlands. It is one of the localities where Douglas fir grows exceptionally well.

Still another class of forests, the management of which is now under the Forestry Commission, are the old crown forests, like the Forest of Dean, Highmeadow Woods and Tintern Woods, in one of the Midland counties of England. From them, as from the private estates, valuable notes can be got as to the behavior of exotic tree species. They also include stretches of coppice oak forest, too small and poor in character to be of much commercial value. In time such stands will be clear cut and replaced by planted forests of the fast growing conifers. It is on such forests as these that one sees also the old oak trees that date back to the age when the term "Royal Forest" meant primarily the lands where the king and his nobles hunted the red deer, and when the value of the trees was but a minor consideration.

**FOREST NURSERIES**

To provide the little trees that are to be planted on the various projects naturally requires that no little attention be given to the matter of forest nurseries. Through the activity of a specially appointed body, the Interim Forest Authority, considerable preliminary work was undertaken in the years 1918 and 1919, so that when the present Forestry Commission began its work in November of the latter year, it did so with a flying start. The total areas in nurseries for the United Kingdom and Ireland for the three years 1918, 1919 and 1920 were respectively as follows: 217.6 acres, 271.6 acres and 343.2 acres. On Sept. 30, 1920 there were growing in these nurseries 27,000,000 transplants and 163,000,000 seedlings, the great majority being coniferous species. During the present year much additional land has been taken in. This procedure will continue, so that the supply for planting out will always keep ahead of the acquisition of planting sites. The size of the individual nurseries varies with the locality. Some forests have only a few acres; others like the Craibstone nursery near Aberdeen, Scotland, run up to large acreages. The Craibstone nursery contains 75 acres. It was started in 1918 under the direction of Mr. P. Leslie of the Department of Forestry, University of Aberdeen, and was taken over by the Forestry Commission in April, 1920. As an index of its growth it may be noted that 900,000 seedlings were started in 1916; in 1921 over 25,000,000. It is still undecided whether it is better to use large, centrally located nurseries, or to have numerous smaller ones nearer the planting sites. To this,
as to other details of nursery practice and procedure, the officials of the Forestry Commission are giving careful thought.

In choosing the areas to be planted and in

SELECTING THE KIND OF TREE TO USE ON A GIVEN SITE, THE FACTORS OF SOIL AND OF ELEVATION PLAY A LARGE PART, BOTH IN ENGLAND AND IN SCOTLAND. ONE THOUSAND TO 1,200 FEET SEEMS TO BE THE UPPER LIMIT IN MOST OF THE MOUNTAINOUS DISTRICTS, THE STRONG WINDS ON THE UPPER SLOPES MAKING GOOD GROWTH IMPRACTICABLE. THERE ARE ALSO INTERESTING PROBLEMS AS TO WHETHER INFERIOR GRAZING LAND HAD NOT BEST BE AFFORESTED. THE QUESTION OF RESTRICTING THE AREA AT PRESENT USED FOR HUNTING AND FOR GROUSE SHOOTING SEEMS NOT TO BE A SERIOUS ONE, AS THERE IS ENOUGH LAND LEFT ABOVE AND OUTSIDE OF THE PLANTABLE AREAS. ESSENTIALLY IT IS THE NON-AGRICULTURAL MOUNTAIN SLOPES THAT ARE BEING AFFORESTED. THE RANGE OF WOOD PRODUCTION HAS BEEN FOUND TO VARY FROM 40 TO 160 CUBIC FEET PER ACRE PER ANNUM. TAKING 60 CUBIC FEET AS AN AVERAGE ON THE WHOLE AREA, THE FORESTRY COMMISSION ESTIMATES THE AVERAGE ANNUAL RETURN AT SOMETHING BETWEEN £1.10. and £2.10. PER ACRE.

ORGANIZATION AND PERSONNEL

Americans are usually interested in matters of organization. That of the British Forestry Commission is a Board of Eight members, two of whom are salaried: the chairman, Lord Lovat and the technical commissioner, Mr. R. L. Robinson. The purely executive work, under the general direction of the commission, is in charge of three assistant commissioners, who sit with the board at its monthly meetings. These gentlemen are Mr. Hugh Murray, C. I. E., C. B. E., for England and Wales; Col. John Sutherland, C. B. E., for Scotland; and Mr. A. C. Forbes, O. B. E., for Ireland. Mr. Murray was formerly in the Forest Service in British India.

Under the assistant commissioners are divisional officers, at the present time three in England, two in Wales, four in Scotland and two in Ireland. Under them in turn are district officers, who for the most part are also technically trained foresters, who have charge of one or more forests, each of which aggregates from 2,000 acres up. The local man on each forest, under the district officer, corresponds somewhat to the forest ranger on our national forests. He has direct charge of the nurseries and the supervision of the laborers. The general headquarters of the commission is in London, 22 Grosvenor Gardens; that of the assistant commissioner for Scotland, in Edinburgh. To both the London office and that at Edinburgh are attached technical assistants and other specialists who handle specific problems or carry on investigative work that bears on administration. The technical assistant (really adviser) for Scotland is Dr. A. W. Borthwick.

Great Britain is indeed fortunate in having as the head of its forestry work the present chairman of the Forestry Commission, Lord Lovat, K. T., K. C. M. G., D. S. O. Coming from the Scottish Highlands, of a family that has been noted for centuries in the annals of both Scotland and England, Lord Lovat is a real leader of men. He went out to South Africa in the Boer War in command of Lovat's Scouts. During the great war he was in charge of the timber supply work for the British Army in France, and now as the chief administrative officer of the Forestry Commission he plays an

CLOSE UP UTILIZATION SHOWN, TINTERN FOREST, ENGLAND—NOTE LOW STUMP—ON RIGHT G. R. ROBERTS, CROWN FORESTER, TINTERN; CENTER MR. BECK, CANADIAN PULP AND PAPER ASSOCIATION
Important part in the affairs of the Empire.

Physically Lord Lovat is a big man, tall and well proportioned. He is absolutely democratic in manner; obviously a leader who inspires all the members of his organization by the force of his own example. Under Lord Lovat's guidance the forestry program of the United Kingdom should progress steadily, rapidly and surely.

Of the other members of the Forestry Commission, of various grades, the impression that I bring away from Great Britain is that of a highly intelligent and keen body of men who are actively and devotedly giving their best to the upbuilding of the nation's prosperity. I had the opportunity of meeting a considerable number in all the various ranks. The key note of the organization is unquestionably team play.

OTHER WORK OF THE FORESTRY COMMISSION

There is much more that might be said of the newly awakened interest in forestry in the British Isles and in the Empire. A campaign of popular education is planned against the time when the allotment for the next decade of tree planting comes to be considered. An elaborate program is being worked out regarding forestry education, both at certain of the Universities and in apprentice schools. Research work and forest experiment stations are not being overlooked, nor assistance to private owners and the encouragement of forest industries. In the summer of 1920 there was held in London the British Empire Forestry Conference, when forest officials assembled from the far corners of the earth to discuss common problems and to lay plans for mutual help and co-operation. A second conference is scheduled to be held in Canada in 1923 which should materially advance this project, a part of which is the establishment of the Imperial Forestry Bureau. Plans are also well in hand for a British Empire Forestry Society, a more general and popular association. There is no question that forestry is a live issue in Great Britain and that its influence is being felt far over seas.

But these things are not within the scope of this letter. Enough if it has served to awaken interest in a far sighted forestry program, of which we as Americans can well take cognizance in view of the problems of a kindred nature that face us in our own country. Further, this program is being carried out by the other great branch of the English speaking peoples, with whom we, working together as we must, share the responsibility of upholding the western ideal of civilization.
Forests and Forestry in Sweden

Methods of Dealing with Privately Owned Forests: Supervision by Community Committees

The Scandinavian peninsula is the wood yard of Europe. Sweden and Norway are both countries of limited area and lying as far north as they do are restricted in the crops that can be produced. But they can grow great forests. Consequently the export of lumber and other forest products, including pulp, ranks high in the industrial life of both nations and brings in a very considerable proportion of their annual income.

This fact is generally understood and appreciated by the people of both countries, so that it is only natural that provision has been made to perpetuate the forests. The purpose of the present letter is to indicate certain features of forestry as it is practiced in Sweden, with particular reference to phases of the work that have a bearing on American conditions.

Sweden is the larger of the two countries and covers about 58 percent of the Scandinavian peninsula, constituting its eastern part. It is roughly comparable in size to the combined land areas of the states of New York, New Jersey, Pennsylvania, Ohio and Indiana, or to the state of California. It lies between 55° and 69° north latitude and between 10° and 24° east longitude. The total area is 110,770,000 acres. The mountainous backbone of the peninsula separates Sweden from Norway, the higher elevations being in the north. From this range the country slopes gradually eastward to the Baltic sea while in its central and southern parts Sweden has a relatively level topography. The population is in the neighborhood of 6,000,000. The most important cities are Stockholm, the capital, Goteborg and Malmo.
Productive forests cover about 51 percent of the total land area of Sweden, the most important forest regions being in the northern provinces. Coniferous species made up 85 to 99 percent of the stands, pine (tall) and spruce (gran) being the two that are of commercial value. Of the broadleaf species birch is locally important while in the southern part of Sweden are found beech, oak and ash. Trees of minor value are aspen, elder, linden, elm and maple, but it is the two conifers, pine and spruce, that make up the forests. Of exotic species the larch and silver fir are found in planted stands in the central and southern parts of the country. Many American trees have been tried but few of them seem to do well. Sweden pins her faith to the native species. So much for the basis on which the Swedish foresters have to work.

OUTSTANDING FEATURES OF SWEDISH FORESTRY

The points which impress themselves on the visitor to the forests of Sweden are (1) the systematic organization of the forest work, (2) the interest taken in the scientific investigation of all forest problems, and (3) the appreciation by the public of the value of forests and of forestry. This is of course accounted for by the high place that forest products have in the industries of the country, but it is significant that the great majority of the people so well understand the situation as to be willing to submit practically without question to the regulations that have been laid down with the purpose of keeping the forests on a basis of sustained yield. Like most other countries Sweden in the past made inroads into her forest capital. Under the program now in force she is living within her forest income and is in the way steadily to increase the amount that may be cut for local consumption and for export.

The writer of this letter is a forester and forest and lumber products ranked 26.54 percent, and pulp and paper products 17.76 percent; together a total of 44.3 percent of the exports of Sweden. Another diagram on page 171 shows that for 1913, pine and spruce made 99.3 percent of wood of all kinds exported; divided into classes as follows: rough lumber 64.1 percent, planed lumber 19.9 percent, round timber 11.2 percent, hewn 7.9 percent, firewood 5.9 percent.

The countries of destination of Swedish timber that headed the list in 1913, were Great Britain (564,700 M.Ft.B.M.), France (383,549 M.Ft.B.M.), Germany (246,159 M.Ft.B.M.) and Denmark (205,368 M.Ft.B.M.), with small amounts to other countries in Europe and else-
where. (Mr. Oxholm's bulletin, p. 174). An English publication, "Statement prepared by the Forestry Commission for the British Empire Forestry Conference, London, July, 1920," throws a side light on Sweden's export trade. in a table on page 38, which shows the qualities and values of unmanufactured timber imported into the United Kingdom for the average of five years, 1909-13. The figures for the three countries that head the list, in value in pounds, are Russia, £10,814,000. Sweden, £2,775,000. Norway, £1,395,000.

At the present time Russia is, of course, eliminated as a competitor, but with the world-wide depression in business and the uncertainties resulting from abnormal exchange, the Swedish lumber trade is reported to be almost at a standstill; yards fully stocked and no opportunity to sell. But on this point the writer

is not prepared to speak. Rather let him return to his own last, forestry.

ORGANIZED FORESTRY
WORK IN SWEDEN

Organized forest work in Sweden divides roughly into two main classes. (a) that carried on directly under the Swedish Forest Service (Kungliga Domänsstyrelsen), or under other branches of the government, like the State Forest School (Skogshögskolan), or the Forest Experiment Station (Statens Skogsförsöksanstalt), or (b) that conducted under other auspices, especially by the local forest commissions (Skogsårdsstyrelsen), or by the Swedish Forestry Association (Svenska Skogsvårds föreningen).

The rational care of forests is no new thing in Sweden. The state has owned forests for over 700 years but in common with other European countries, the forests were regarded in early days as being of more importance for their game than for their timber. The early foresters were therefore essentially the king's

huntsmen, an interesting survival of which persists in the title carried by the forester today, "Jägmästare." Incidentally it may be said that the name is still appropriate, for every Swedish forester appears to be a keen sportsman whose chief recreation is to get out with dog and gun.

During my stay in Sweden I had the privilege of attending a hunt on one of the national forests, or "crown parks." At Omberg Kronopark is located one of the seven schools for the training of men for the trade of ranger. During the year four days are set apart for hunting, when the student body, 20 men and their instructors, repair to the woods armed with shotguns and have a fine time in shooting rabbits and foxes. Needless to say the days of the hunts are eagerly anticipated, and it so happened that our visit to Omberg just coincided with one of them.

CHARCOAL
WOOD RICKED
FOR SEASONING,
FROM FIRST
THINNING

The plan is to post a dozen or so persons along a road, or trail, or line through the woods, while the rest of the crowd heats the brush and drives out the game. The beaters are thrown out in a skirmish line 30 to 50 yards apart and advance striking blocks of wood together and shouting. Occasionally a rabbit and less often a fox darts out of the undergrowth and if one of the hunters on the line is quick enough, the bag begins to accumulate. Game was rather scarce at Omberg, but at the end of the day, when the party returned home, there were four large hares and three foxes, which was accounted a good kill. Anyway everybody concerned had a good time and felt the day to have been a decided success.

In the seventeenth century real forest management began in Sweden, and I think it was with a certain sense of satisfaction that my guide at the forestry college pointed out in the museum a carefully drawn map that accompanied a working plan made in the year 1638. A century ago the government sold large
areas of state forests, as did many of the other European countries at that time, but later, especially in the 70's, the policy was adopted of acquiring state forest land with the result that at the end of the calendar year 1918 there were 11,800,000 acres (4,767,009 hectare. 1 hectare = 2.47 acres) of crown forest (kronoparker), or, if there is included all the area administered by the Forest Service, a grand total of 8,711,750 hectare, or 21,118,023 acres. These figures are from the last available annual report of the Swedish Forest Service, that for 1918 (p.8).

Besides the state forests proper, the "crown parks," from which the income goes solely to the government, there are various classes of "controlled forest" which are managed by the Forest Service. It is unnecessary to go into details regarding these stands. They belong to the Established Church, to cities

and communes, and to official and semi-official institutions and organizations. The point is that they are all administered, usually under definite working plans, by the government foresters.

Sweden is divided into thirteen forest districts. Each district has a central headquarters, with an inspector and various assistants. Under him are the Jägmästare, or foresters, in charge of definite areas that may include a number of forests. The position of Jägmästare is about equivalent to that of supervisor in the United States Forest Service. Under him are forest rangers, who direct the work of the laborers employed on each forest. The Forest Service is managed from the headquarters at Stockholm, where the staff is distributed in a number of divisions, each charged with specific duties, both under area and subject matter. One point of interest is that in Sweden the organization is strictly centralized, questions of even minor import going to the Stockholm office for decision.

The making and periodic revision of working plans is an important part of the Forest Service program. This is done by men especially assigned to this duty. The job of the supervisor is to see that the plan is carried out and the forests under his charge properly handled. The chief forester at the head of the Swedish Forest Service is the Hon. Karl Fredenberg. His title is "General Direktör." He has held his post since 1905, during which time the Forest Service has made notable progress.

Through the extreme courtesy of General Direktör Fredenberg, I had a most unusual opportunity to see a number of the Swedish state forests and other places of especial interest. A member of the staff of the Stockholm office was detailed to accompany me on a two-weeks' trip, Jägmästare Axel Schard, who as holder of a Scandinavian-American Foundation fellowship, had spent 14 months in the United States, during a good part of which time he

was in the western states. Thanks to General Direktör Fredenberg and to Mr. Schard my visit to Sweden was most instructive, as well as highly enjoyable.

All the men in forestry work in Sweden are technically trained. The Jägmästaren are all graduates of the State Forestry College. The course covers three years, but as a prerequisite to entrance a man must have been graduated from the gymnasmium, or as we should say high school, and also had about two years of actual practical work in the woods. A year in the army also is sandwiched in between high school and college. The training is thorough and comprehensive and as the number of students at the college is strictly limited, there is keen competition. The men holding minor positions, the rangers, must also be graduates of ranger schools and have had an extended period of practical work in the forest.

The impression one receives from meeting Swedish foresters is that they are a highly trained, thoroughly efficient body of men,
vitaly interested in their work and going at it in a way that insures good team play.

One of the interesting features of the administration of the Swedish state forests is the provision that is made to insure a steady supply of labor. On the scattered pieces of agricultural land within the boundaries of the forests small holdings are leased to the laborers, for short terms but subject to renewal. On these little farms the government erects houses and barns, of standard design and construction, which provides the laborers with homes that are not only comfortable but attractive. The tenant pays rental in cash and in a specified number of days' labor. The homesteads are often referred to as “one- or two-horse homesteads,” depending on the number of horses the tenant keeps—the size of the stable corresponds. This feature is one that might well be considered as being applicable to certain large, privately owned forests in America.

**SCIENTIFIC INVESTIGATION OF FOREST PROBLEMS**

The second point, after administration, that impresses the visitor to the Swedish government forests is that he cannot go far in the woods before coming upon a permanent sample plot, established for the study of rate of growth or for the securing of precise data of other sorts. These areas are of varying sizes and shapes, often from ¼ to ½ hectare (0.6 to 1.35 acres), with the corners indicated by posts and every tree bearing a number stenciled on the bark in white paint. Exact measurements of diameter and height are taken at stated intervals, usually every five years; the point for caliper measurements being indicated on the tree by a cross, in white paint, at 1.3 meter above the ground. This is three inches lower than “d.b.h.,” diameter-breast high, in the United States.

The permanent sample plots are of two classes, (1) those established by the Government Forest Experiment Station and (2) those laid out by the supervisors themselves, or by the men in charge of the several ranger schools that are located on certain of the crown forests. The director and chief of the Forest Experiment Station is Professor Dr. Gunnar Schotte, a very active and energetic man, under whose direction much valuable scientific investigation is going on. The experiment station has the right to locate its sample plots where it likes on crown forests, and thereafter to have the exclusive control of these areas. In this way experiments in various methods of thinning can be carried out over a long period, sometimes the full rotation, without danger of interruption. The areas taken are so small relatively and the data secured so interesting to the supervisors that there is apparently no objection raised from an administrative standpoint over the segregation of the sample plots. The results of the experiments, shown both in tabular form and graphically, appear in the reports of the experiment station.

Other lines of research work conducted by the Forest Experiment Station are: (1) The determination of the strains or “races” of the native trees best adapted to given localities, it having been found that trees resulting from seed gathered in certain localities produce taller and better formed trees than that secured in certain other places. (2) The study of problems having to do with the drainage of swampy areas, so that forests may be grown thereon. This is a highly important matter in Sweden and is receiving much attention. The cost of drainage is high, but the results in the forest stands secured justify the outlay, when figured over a long period of years, as is possible in government work. (3) Investigation and research in forest entomology and forest pathology. Trouble from both these sources is closely guarded against. Diseased trees, for example, are removed very shortly after they are found to be infected, while equally prompt
measures are applied in combating insects. 
(4) Soil studies, under Professor Dr. Hesselman, and (5) miscellaneous investigations of special problems as they arise.

The Forest Experiment Station has its headquarters in Stockholm, on the grounds of the Forestry College, where are well equipped offices and laboratories and an excellent forestry library, but the greater part of the work of the experiment station is in the field, on the various crown forests.

The sample plot work carried on by the supervisors is less intensive than that of the experiment station plots, but nevertheless yields many valuable data. These are turned over to Professor Schotte in due course for compilation with the experiment station work. The interesting point about this phase of activity is that it shows the keen appreciation that all the members of the Swedish Forest Service have of the value and importance of carefully kept scientific records. It places the work on the forests on a very solid foundation.

**GOVERNMENT REGULATION OF THE PRIVATE FOREST OWNER**

The third feature of special interest about forestry in Sweden is the governmental regulation of the private owner. The outstanding thing in this matter is that while the supervision exercised by the forestry officials is, or may be, somewhat drastic, there appears to be little or no objection thereto. This is due apparently to the fact that the forest owners realize the importance of perpetuating the forests and are therefore willing to submit to what might well be considered a curtailment of their personal liberties. That there should be thought to be any sort of serious objection to the regulations imposed, seemed decidedly to amuse the various officials with whom I talked, and I took pains to repeat my questions to many of them. More than one of the Swedish foresters had a "come back" to my questions, by jokingly referring to our prohibition laws as an example of how things were done in "the land of the free." Indeed, about the first remark that is made to an American in all the countries on this side of the ocean, is the inquiry as to how we like prohibition, and if it really works? Sweden is not dry—not yet.

With regard to the enforcement of the forestry laws, the facts seem to be that in Sweden regulation of the private forest owner is effective, that the system works, and that the general public, including the forest owner, is in favor of it. It may, therefore, be of interest to outline briefly how it is accomplished.

**LAWS ADMINISTERED BY GOVERNMENT FORESTERS**

The laws regulating what and how the private owner shall cut and manage his forest fall into two classes; one, those administered by the Swedish Forest Service, the other, those enforced by local forest commissions. In the first case, the supervisors, in their respective districts, see that the laws are enforced and, through assistants, actually mark the trees that are to be felled on privately owned forest land. The two more important are the "Lappmark law" and the "Protection Forest law." These laws date from 1866—73 and '74, but have been re-enacted and amended since that time.

The laws of this class all have to do essentially with "protection forests," i. e., areas where a forest cover must be permanently maintained primarily for one or more of the three following reasons: (a) Prevention of avalanches, snow slides and in some cases erosion on steep mountain slopes, (b) protection of watersheds of drivable and navigable streams, (c) control of shifting sands and dunes. The laws of this class apply almost wholly in the mountain districts and especially in the northern provinces, except for the laws concerning sand dunes, which are applicable to certain stretches of the coast and to the two large islands in the Baltic sea, Gotland and Oland. There is also for the northern provinces a so-called "dimension law." This sought to regulate by a fixed diameter limit the over-exploitation of the forests in that section.

The essential feature of all these "protection forest" laws is that the timber to be cut must first be marked—the trees blazed—by a government forester. Should he deem it unwise to mark enough in a given locality to make a profitable logging chance, the private owner can appeal to the government to buy the land, at a price fixed by agreement, or by arbitration by three appraisers. But such cases appear to be rare. It is usually possible to mark for selling enough to satisfy the needs of the owner and still comply with the spirit and letter of the law. Where purchase or expropriation has to be resorted to, the purchase money is taken from the appropriation made annually to the Forest Service for the acquisition of state forest. I did not have the opportunity personally to visit the northern districts of Sweden, but I was given to understand that these laws are all being enforced without serious objection from the private owners. Under each of them the owner is permitted to take what he needs for domestic use. The law applies only to timber cut for commercial purposes. The main criticism seems to be that in some of the northern forests there is much over-mature timber that should be marketed. This problem will doubtless be solved when working plans, now in progress, are completed for all the forests in these districts.

**LAWS ADMINISTERED BY FOREST COMMISSIONS**

The general law governing the management of privately owned forests applies to the whole of Sweden. It was passed in 1893 and is in several parts, different acts dealing with the principles involved, methods of administration and financing of the administrative organization. This is the Swedish forest law that is of special interest to Americans because it may be pos-
sible that certain features of it could be with advantage introduced into the United States.

The gist of the law and the method of its administration is about as follows:

**UNDERLYING PRINCIPLES OF SWEDEN'S FOREST LAWS**

That privately owned forest lands must be cut in such a way that the perpetuation of the forest shall be assured and that if cut otherwise the owner must take necessary steps, under supervision, again to bring the forest into productive condition. (Incidentally this is not unlike "minimum silvicultural requirements" proposed by Col. Graves, in February, 1919.) A further law, passed in 1918 as a war-time measure, but since re-enacted, deals with the regulation of intermediate cuttings (thinnings), so that together these laws safeguard not only the continuation, but also to some extent the character and quality of the existing forests.

Perhaps this will be more apparent if a word is inserted here as to the methods of forest management that are followed in Sweden, for while the usage differs from place to place, especially between the northern and southern provinces, it all conforms to a general system. This is, essentially, that the young forest is given a light thinning when from 20 to 30 years old. Other thinnings follow, approximately at intervals of 10 years, until the stand is 60 to 80 years old. A heavy thinning then takes place that opens up the crown canopy, induces the production of seed and gives some additional increment to the best trees that are allowed to remain for the final harvest. This cut is made 20 years or so later, the rotation varying from 50 to 100 years, longer in the north. It is very seldom that more than 10 acres (2 hectare) are clean cut in any one spot. It follows that the stands are of relatively limited area. Reproduction is secured either naturally from seed trees, or artificially by seed sown in seed spots, or by planting out nursery grown stock. The usage varies with the natural conditions obtaining in each locality.

The underlying object is, of course, to secure the largest financial return. The proceeds from the thinnings contribute materially, for it must be remembered that Swedish forests are very intensively managed and that owing to local economic conditions, ready markets and a permanent road system in the forests, it is possible to dispose at a profit of what to an American is incredibly small stuff. The larger logs go out for lumber or as pulp wood, the tops for which there is no other market are made into charcoal, and in many places there is a ready sale even for the small slash that results from the cutting. In several of the crown forests I saw wood stacked for charcoal burning, some of it to be shipped, where the diameter at the small end was barely one-half inch! There was no trouble about practicing intensive forestry under such conditions. In the northern provinces the methods approach more the plan of selection cutting, but as rapidly as possible, on both government and private land, the idea is to put the forest under working plans that shall develop what the forester terms a "normal forest," i.e., a forest with normal age classes, in size and distribution, normal increment, and normal growing stock. And at the present rate of development it will not be long before most Swedish forests are in this condition.

**HOW THE FOREST COMMISSIONS WORK**

On the theory that more effective control could be exercised and that friction could thereby also be reduced to the minimum, the law of 1903 specifies that the regulation of the private forest owner shall be by a committee of local officials, residents of the district over which the committee has jurisdiction. Consequently the laws of 1903 are administered by local bodies that are entirely independent of the Swedish Forest Service, and form the forest of one another. Each of the 24 provinces (län) has a forest commission. The only essential connection between them seems to be that all submit annual reports following a common outline, that are issued together in a single volume, which by the way is published by the Swedish Forestry Association. The keynote of the whole thing is strict local autonomy.

Each forest commission is made up of a governing committee of three members who serve without salary, but receive traveling expenses for attending meetings. All are local men, usually prominent citizens and landowners, for it is considered a distinction to hold the position. One, the chairman, represents the government, one, the provincial government (the executive council of which is called the Länsting); and one, an influential private association (Hushällnings salskap) whose function is to promote the interests of the local community in general, but particularly in matters having to do with agriculture and forestry. This association seems to perform many of the functions that in the United States come under the head of farm bureau work.

The three committee members decide on questions of policy and direct the work of the paid staff. Ten meetings a year is the rule in a district that may be considered as typical. Under the commission, and acting as secretary but without a vote at the meetings, is employed a professional forester (Ländsågjägmästare). He is usually a man of some maturity, and often one who has had considerable previous experience in the Forest Service. His standing and salary is essentially the same as that of the supervisor of crown forests. He usually has one or more professional foresters as assistants, and, throughout the province, a number of rangers, each in charge of a stated district. There is also an office force of a number of persons.

The duties of the forester and his assistants are twofold; first, inspective in character, to
see that the provisions of the law are being carried out; and second, promotive, through the giving of aid and assistance to forest owners. A part of the duty of the forester is to visit all forests in his district, even tracts down to 5 acres in area, and give suggestions on the ground as to management. This usually suffices for the small owner, but his forest must thereafter be managed substantially in accordance with the directions given. If not, he is warned, once verbally, again, if necessary, in writing. Persistent disregard would lead to imprisonment, but I was told this almost never happens. The usual size of the smaller forest properties is between 50 and 60 acres. Suggestions are also made to larger owners, but such persons usually prefer to have regular working plans prepared for their forests. Such work is done by firms of consulting foresters, or by members of the Swedish Forest Service during their vacation periods. The fee for making working plans is around Kr. 2.20 per hectare. It will thus be seen that the inspection work, while entailing much time in the field is relatively simple, especially where working plans, in many cases under a resident forester, are in operation.

The commission forester has nothing to do with either the government forests, or the government controlled forests, within his province, nor has the government supervisor anything to do with the privately owned lands; although the districts of the two men may be practically the same as to boundaries. But good personal relations usually exist between these foresters and co-operation, outside of strictly administrative matters, as for example in meetings of the Forestry Association, and the like.

The promotive phase of the work of the forest commissions is carried on through the distribution and sale of a series of bulletins on forest work, prepared by the Swedish Forestry Association, by the holding of "schools" similar to our own extension schools in agriculture, and in work with school children, especially on Arbor days when considerable areas of actual forest are planted by groups from nearby schools. The schools are practical in character and consist of demonstrations in which those enrolled do the actual work, as in charcoal making, draining swamp land to make it productive for forest growing, seeding and planting, timber measurement, and the like. These schools run from one to seven weeks. The forest commissions also run forest nurseries from which seed and plants are sold at cost.

The point of special interest in all this promotive work is that none of it is propaganda to induce the public to practice forestry, but rather the giving of help and assistance as to how to proceed with work the need of which the public already thoroughly recognizes. The Swedes understand the value of forestry. Argument is unnecessary.

The work of the forest commissions (skogsvårdsstyrelsen) is financed by a tax on the stumpage value of the timber cut in a given province, 1.3 percent. Ninety percent is expended in that province. The other 10 percent goes into a general fund for the whole country. Other sources of additional income are an annual allotment from the Swedish parliament, appropriations by the local provincial government, proceeds derived from the sale of seeds, nursery stock, etc., and gifts and special allotments from individuals and private associations.

As has been said, the annual reports are published by the Swedish Forestry Association, indicating the close-knit connection in Sweden between the various organizations engaged in forestry work. A further sidelight is that the secretary of the Forestry Association is Professor Schotte, chief of the Forest Experiment Station. It may not be out of place to mention here, too, that the Forestry Association each year arranges an excursion to one or more forests that includes all those interested and that it also holds a forest week each spring, which is said to be a very interesting and important meeting.

Whether or not it would be desirable, or feasible, to attempt to introduce into the United States any such type of organization as that of the Swedish Forest Commissions, the writer of this letter is not now prepared to say. But there is no question but that it is a success in Sweden and that it is serving a very useful end in insuring to that country permanence in its forest industries.
An earlier letter in this series has set forth the impressions made upon the writer by what he saw of the forests and the forestry work in Sweden. The present contribution has to do with the two other Scandinavian countries, Norway and Denmark. Racially similar, the people have much in common but the two countries differ markedly in character, location, climate, composition of the forests and in economic ways. They must be considered separately, but in each there are points of forest interest that appeal to the visitor from America.

**FORESTRY IN NORWAY**

Quite apart from the interest that attaches to its forests, Norway is preeminently a country for the tourist. The combination of mountain and sea, the wonderful trip through the fjords, the snow capped peaks and the glaciers at the higher elevation, not to mention the excellent automobile roads, the good hotels and the comfortable railroad service, all unite to make Norway a country where one can enjoy a delightful vacation. The Norwegians have frankly capitalized the scenic value of their country. And why should they not? It certainly has much to offer.

While in Norway the writer departed from his forestry schedule and for a time became a tourist. He would advise other visitors to do likewise, and in their travels not to omit from their itinerary Balestrand, Gudvangen and Stalheim on the Sogne Fjord, north of Bergen. A journey by rail over the mountains from Kristiania to Bergen is also to be recommended, with enough time to see those two cities.

**A GOOD NORWEGIAN FOREST SHOWING A FINE GROWTH OF MATURE PINE OF MERCHANTABILITY SIZE**

**A BIRCH FOREST NEAR HAMAR, NORWAY. THIS IS SAID TO BE THE FINEST STAND OF BIRCH IN EUROPE**
It is hardly to be advised that one visit a foreign country without at least some knowledge of the language, but in Norway as far as getting about goes, the English speaking traveler has but little difficulty. The trouble comes when he starts in hopefully on the discussion of some technical matter that the phrase books do not deal with. But notwithstanding the differences in customs and the foreign tongue, an American feels very much at home in Norway. They have a standing joke that there are more Norwegians in the United States than there are at home. This naturally is not strictly accurate, but it shows that there are many close ties between the two countries which it is to be hoped may be strengthened and increased. Certainly the writer has reason to think pleasantly of Norway because of the courteous treatment that he everywhere received, but especially on account of the hospitality shown him by the Norwegian foresters.

AREA, POPULATION, AND INDUSTRIES OF NORWAY

The population of Norway in 1920 is given as about 2,649,000. The total area is 322,909 square kilometers (124,643 square miles), made up approximately as follows: agricultural area 4.45 percent, water 3.21, forest 22.31, mountainous and infertile 70.3. The productive forest area amounts to about 48,000 square kilometers (18,528 square miles), of which about 45,000 square kilometers (17,374 square miles) consists of conifers.

The main industries of Norway are its merchant marine, its fisheries and sea food canneries, and the products of its forests, including lumber and pulp and paper. Agriculture plays but a small part, although there are productive and fertile farms along the lower reaches of the Glommen river on the eastern side of Norway. In the central part of the country, especially in the fjord districts, every bit of agricultural land is tilled, even if it is but a tiny patch lying high up on a steep mountain side. Here, too, the short growing season and humid climate make it necessary to hang the grass on fences in order to cure it. The small farmers would seem to have a hard fight to wrest a living from the soil, but as one sees the people they appear to be well nourished. Thrift is the key note.

The export of forest products ranks high in the business of the nation, being 25 percent of the total, in value, in 1915. Great Britain is the largest single customer. As compared with Sweden, Norway sends out less rough lumber, so that there is comparatively little active competition. Further the exporters in the two countries co-operate, at least to some extent. The official handbooks in Norway give long lists of firms that deal in pulp and paper. The lumber industry is well organized also, perhaps the special feature being the river driving and timber rafting associations (Køellestningsforeningen) and the organizations of the scalers (Tømmermaalere) in the several main timber producing districts.

Another industry in Norway, that is still in its infancy, is the development of electrical power from the mountain streams. So far only a small percentage of the potential power has been harnessed. Developments will follow improvements in methods of long distance transmission. It is now even being suggested that through the co-operation of the Norwegian and Swedish electric companies, power may in time be transmitted by cable, under the channel, to Denmark. But the details of industrial development are not within the scope of this letter.

THE FORESTS OF NORWAY

The productive forests of Norway lie in the
southwestern part of the country, in the districts of Telemarken and Saetersdalene, south of the latitude of 60 degrees, and especially in the long interior valley of the Glommen river, that drains the entire eastern side of Norway, up to the latitude of 63 degrees. In the northern part of Norway the mountains are too steep and rocky to permit of good tree growth, and even farther south timber line is reached at about 900 meters (2,950 feet). Pine and spruce are the important species, although in some localities birch grows well. Larch is found in planted stands. The broad leaf trees are relatively unimportant. They are found only in the southern part of the country, except birch and aspen which extend farther north.

Of the total forest area of Norway, the government forests cover 12.36 percent. These forests divide into several classes: (a) State forest proper; (b) church or ecclesiastical forests (præstergårds skog); (c) commercial forests; and (d) district commons (bygdealmrnerg), or areas of forest in which the people of that locality enjoy joint ownership, with certain rights of user. Directly or indirectly the government forestry officials exercise control over all these forests. On the state forests it is of course absolute. On the ecclesiastical forests, the state foresters determine and regulate the cut but do not benefit from the revenue. These forests were set apart for the partial support of the local parishes of the established church. The first consideration is to supply what timber and wood may be needed by the minister, or for buildings and repairs on church property. After that the forest products are sold and the proceeds, less operating costs, are turned over to a special fund administered by the ecclesiastical authorities.

REGULATION OF PRIVATE FOREST OWNERS

The other two groups of forest are under the direct control of local committees, representing respectively the district council of the

"Herred", or commune, to which the forest belongs, or, in the case of the forest commons, those who have an interest in the forest. Norway is divided into eighteen counties, known locally either as "amit" or "fylke". The herred are local communities within the county. As a matter of fact, in a large number of instances, the committees in charge of these forests employ a professional forester, permanently or for consultation. But the government forester for the fylke, the skogforvalter, has general supervision over what takes place therein. This official in America usage would be called supervisor.

As regards the privately owned forest lands the control is even more strict. This indeed is the characteristic feature of Norwegian forest law. In the acts of August 8, 1908, and June 7, 1916, it is provided, in the interest of protecting and perpetuating the forests, that cutting on private forest land shall conform to definite regulations. These rules are drawn up by local committees, consisting of three men
this law has had very beneficial results and is good as far as it goes, but they are not satisfied with it and at an early session of parliament, probably however not until 1923, a bill will be introduced that may, if it becomes law, considerably alter the character of the regulations and perhaps even introduce some silvicultural requirements. But that is a matter for the future and can only come about after there has been full discussion of the whole question.

Another forest law of some interest is that whereby ownership of forest land in any large amount is restricted to residents of the district. The purpose of this law was to prevent speculative holding of forest areas, particularly by aliens; although it also applies to Norwegians who are non-residents of the district in question.

THE NORWEGIAN FOREST SERVICE

The Norwegian Forest Service (Skogvaesen
net) is a branch of the Department of Agricul-
ture (Landbruksdepartementet). The head-
quarters are at Kristiania; the chief of the service being Skogdirektor Henrik Jelstrup, a gentleman to whom the writer is indebted for many courtesies in connection with his visit to the forests of Norway. In the field there are three inspection districts, which subdivide into 38 forest districts (in 1919) each with a supervisor (Skogforvalter). In 20 of the districts there are assistants as well. The rangers, really guards, are usually men on part time, who combine their forestry work with other vocations, although this is not true of all of the ranger staff. Connected with the Kristiania office are a number of technical men, some of whom have the special duty of preparing working plans for the state forests. All the supervisors and assistants must be graduates of the State Forest School, a department of the Norwegian Agricultural College (Landbrukshôl-
skolet) at Aas, near Kristiania. There are also several ranger schools.

One piece of work, now going on in Norway, is of especial interest to Americans—a comprehensive survey of the forest resources of the country. So far only one fylke, or district, has been covered, that of Østfold in the southeastern corner of the country, but it is proposed to extend the survey to include all of the commercially valuable forest areas. The method followed is to gridiron the district with strip survey lines, spaced fairly close together, so that an accurate estimate will result, both of merchantable timber and of the young growth. With this are of course collected various other facts and figures of general interest. The making available of exact data of this sort gives a basis on which proper methods of forest management can rest. There would be less discussion and more accomplishment in forestry in the United States if we had a survey of this type actually under way and yielding results.

NORWAY'S FOREST EXPERIMENT STATION

Connected with the Forest Service, but directly under a committee that directs the general policy, is the Forest Experiment Station (Skogforsöksvaesenet). This station was established in 1917 and is located at Aas, adjoining the college. The first director was Erlich Ramsay Archer, a Norwegian of Scottish descent, who however has recently transferred to the administrative branch of the service. An extensive program of forest research has been outlined, but necessarily at the beginning much attention has had to be paid to the details of organization, so that the work of the station can as yet hardly be said fully to be under way. Important contributions are however to be looked for from this station in later years.
Research work in forestry is also being carried on at the Natural History Museum at Bergen, where Prof. Dr. Oscar Hagem is in charge of an experiment station at Søfteland. Plantations are being made of western American species, Douglas fir and Sitka spruce, which indicate that these species may be found to be adapted for rather general use on the west coast of central Norway. Various publications have been issued from the museum at Bergen, among them one elaborately illustrated bulletin on the forests of western North America by Dr. Anton Smitt, the result of an expedition made by him to the United States and British Columbia.

OTHER WORK IN FORESTRY

No account of forest work in Norway would be complete without at least mention of the two leading forestry associations, that of the professional foresters, Norsk Forstmannsfors!
ing, and the popular association Det Norske Skogsselskap. This is an influential organization publishing a forestry magazine, "Tidsskrift for Skogbruk" and other informational matter, and in connection with its branches, local associations all over Norway, doing much practical work in planting, draining swampland and in conducting forest nurseries. Under the direction of this association a successful excursion was made through certain typical Norwegian forests in 1920, when a considerable party of Swedish foresters were the guests of the Norwegians. A return excursion, in Sweden, was held in June, 1921, under the auspices of the Swedish Forestry Association.

A commercial organization that is also of interest is the Norwegian Mutual Forest Fire Insurance Association, Det Norske Gjensidige Skogbrand Forsikringsforselskap. This company was started in 1912, the sum insured that year being just under Kr. 45,000,000. In 1920 the figure was Kr. 259,000,000. Sixty percent of the forest area of Norway in private ownership, where insurance is desirable, is said now to be covered by policies of this company. The basic rate for insurance is 1.25 percent. After four years the premium is reduced by 20 percent, with further reductions for longer periods. In certain parts of Norway the company maintains fire lookout stations. It is an energetic and going concern. The forester for the company is Julius Nygaard, who is also the editor of the "Skogalmanak," a very useful little handbook, full of all sorts of facts and figures concerning forestry and the lumber industry of Norway.

Compared with its neighbor on the Scandinavian Peninsula, Norway has still much to do to bring its forests under full management. In Sweden the influence of Germany is much more apparent. Things are done there in a highly systematic way and with an elaboration of organization that has not as yet been possible in Norway. It should be remembered, however, that Sweden is a larger country, with over twice the population of Norway and with greater natural resources. But the Norwegians are fully awake to the necessity of proper forest management and are energetically tackling their problem. It will be interesting to see how much they are able to accomplish when the time comes for strengthening and extending their forest laws. And Americans can very profitably watch this development, for there are enough points of resemblance between Norway and the United States to make whatever is accomplished there of interest on our side of the Atlantic.

THIRTY-FIVE-YEAR-OLD PINE FOREST NEAR SKIEN, NORWAY

FORESTRY IN DENMARK

Denmark is essentially an agricultural country. Its principal exports are dairy products, with bacon and ham, a large part of which goes to Great Britain. Forests play a relatively unimportant part, but because the forest area
necessarily is limited—it was 8.5 percent of the total area in 1912—it becomes all the more important locally to take good care of what forest there is. And this the Danes have been doing for something over a century. Denmark imports rather than exports unmanufactured lumber. All that the Danish forests produce is needed for home consumption. It follows naturally that forestry in Denmark is intensive, and it is because this is so that gives to the forest work of the Danes the interest that rightly attaches to it.

The total area of Denmark proper, excluding the Faroe Islands and Iceland, is 39,033 square kilometers (14,866 square miles). The forest area is about 333,000 hectare, or 822,500 acres. The population of Denmark in 1920 was reckoned as about three and one half million. To these figures must now be added the area and population of that part of Schleswig-Holstein that the Great War restored to Denmark. The at Vihorg in Jutland, the peninsula that constitutes the western portion of Denmark. While not directly applicable to America these several phases of forestry are all of interest and worthy of comment.

In connection with the use of the forest as royal game preserves, methods of definite forest management began to be introduced about the middle of the seventeenth century, so that it was no new departure when under the influence of a German forester, Georg von Langen, a definite forestry policy was set up in 1783 that paved the way for the enactment in 1805 of a forestry law that is today still in full force and effective operation. Along with the work in the forest came the early establishment of a Forest School (1784), so that the Danes make the proud claim to be the first of the Scandinavian countries to get forestry really under way. The forest experiment station work dates from 1882, reorganized and expanded in 1901 and 1916. The forest law of 1805 was a comprehensive

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**PINE FOREST IN NORWAY**

—TImBER PILED IN FOREGROUND

Danes call this region "Sonderjylland" (South Jutland). The area is about 3,900 square kilometers (1,506 square miles). The population in 1910 was 166,600.

In common with the other Scandinavian countries many persons from Denmark have emigrated to the United States. For the period from 1850 to 1910 the average per year was around 6,000. Some of course have returned. At the leading hotel in Esbjerg—the main port on the west coast of Jutland—the proprietor, the head waiter and the porter are all American citizens.

**FORESTRY LAWS AND OPERATION**

The outstanding points about forestry in Denmark are its historical basis, certain features of its forest laws, the work of its forest experiment station, and in particular the activities of the Danish Heath Society—a quasi public association that has its headquarters act that dealt with many phases of forestry. Among other things, it provided for the extinguishment of the ancient rights of user, or servitudes, that so interfered with the proper management of forest properties; it directed that all grazing animals should be excluded from the forest; it provided through a cadaster, or elaborate land survey, for the determination of what were the areas that should be kept permanently as forest, as distinct from agricultural land, and by regulations led to the actual demarkation of these lands on the ground by the erection of earth mounds, some 4 or 5 feet high, that are still a characteristic feature of the Danish forests. It had other provisions as well, but perhaps the most important of all from the standpoint of policy, was that no one who purchased forest land could cut it during a period of 10 years except with the approval of a state forester, who was to mark the timber to be removed. The purpose of this clause was to prevent speculation and to perpetuate the
existing forest. Ten years is too long a time to wait for returns on a speculative venture. And there seems to have been the idea, too, that after an owner had cared for his forest for a decade, he would have got the habit and desire for continuing proper management. Anyway the 1805 law is still in force, and particularly the ten-year cutting provision.

There is likelihood that all the Danish forest laws will be codified, amended and re-enacted at an early session of parliament, but it was the opinion of more than one Danish forester that the essential provisions of the law of 1805 were fairly sure to be continued. In Denmark, as in Sweden, the public appreciates the value of the forests and apparently makes little objection to the law nor attempts to evade it.

Some railroad fire laws have recently been enacted (1920) that provide for the payment of damages by the railways for fires set from sparks from the locomotives. These are of interest because the greater part of the Danish railroads are owned and operated by the government. These laws also make elaborate provision for fire lines to be constructed parallel to the railroad, along certain of the lines made to prevent the drifting of snow. These snow guard plantations are conspicuous and characteristic features of the Danish railroads.

Beech is an important forest tree in Denmark along with the pine and the spruce, and there is also some oak. The best beech forests are in the southern part of Jutland where the stands consist of tall trees with 50 to 60 feet of merchantable length; clear, straight stems with diameters in the mature trees of 13 to 16 inches, breast high. The oaks are usually not of as good form. But in the forest plantations one usually finds the conifers, pine and spruce, and in some places the introduced Douglas fir and Sitka spruce.

The forest area of Denmark (333,000 hectares) is divided into a number of classes of ownership: State forests, 17 percent; sand dune forests, 7 percent; communal forests, 2 percent; estate and “foundation” forests, 21 percent; those controlled by the Heath Society, 2 percent; association and corporation owned forests, 4 percent; privately owned (largely in small holdings), 47 percent.

The Danish Forest Service is a branch of the Department of Agriculture (Landbruksministeriet) and has two principal divisions: That charged with administering the state forests and the dunes (Domæne Kontoret), and that which oversees the privately owned forest land (Landvaesenskontoret). The headquarters are in Copenhagen but there are various districts covering the country.

Under old laws the forest lands belonging to the families of the nobility could be neither sold nor mortgaged, the idea being to make cer-
RESEARCH IN FORESTRY

Experiment station work in forestry began, as has been said, in 1882, but the organization was much expanded between the years 1902 and 1915. In 1917 an office and laboratory building, with an adjoining dwelling, was provided for the director, Professor Adolph Oppermann, in one of the outer suburbs of Copenhagen, Springforb, where there is also an experimental garden and an interesting beech woods. At Egelund, near Hillerød, 34 kilometers from Copenhagen, is a large experimental garden and nursery where many "races" of timber tree species are being tried out, to determine which ones are best adapted to given sites and soils. Seed is collected in known localities and the resulting plants are set out in carefully marked plots. Beech, oak and the several conifers—pine, spruce, fir and larch, with some exotics, among them Douglas fir and Sitka spruce—are thus being tested. Near by this garden is the Frederiksberg Slot, formerly a royal castle, but now kept as a museum. This is one of the show places of Denmark and a Mecca for tourists. A visit to the castle can well be combined with an inspection of the Egelund Experimental Nursery. A few miles away, by rail, is Elsinore, where on the ramparts of Kronberg Castle is pointed out the spot where Hamlet is supposed to have met his father's ghost. It was the good fortune of the writer to see in Copenhagen a production of Hamlet by a Norwegian actor, Ingolf Schanche, who gave an interesting interpretation of the part. The actors of course spoke Danish, but to one familiar with the play there was no difficulty in following the action.

The director of the Danish Experimental Forestry Service (Forsøgsvaesenets) is Professor Doctor Adolph Oppermann, a man well known from his writings on forestry subjects, as well as on account of the valuable contributions that are contained in the reports of the station. Beside the tests on races of forest tree species, the Forest Experiment Station maintains permanent sample plots in the state forests all over Denmark for the study of growth and yield; conducts research in problems dealing with forest soils; and investigates ways of combating insects and disease in the forest.

The writer of this letter is indebted to Professor Oppermann for a most courteous reception at the experiment station at Springforb and for a very interesting day in the nursery and plantations at Egelund. There is a sort of free-masonry about forestry that seems to insure to any properly introduced forester a warm welcome from his colleagues in the profession in any country. This is certainly true in Scandinavia, and the writer of this letter is most happy here to record his very sincere appreciation of the many favors he received at the hands of the Danish foresters.

The technical education of foresters is one of the foundations of the Danish College of Veterinary Medicine and Agriculture, Forestry being a department of the Landbohøjskole. The head of the staff is Professor J. Heims, with whom is associated Professor C. V. Frytz and Professor Oppermann, director of the experimental station. There are also schools for forest rangers.

A popular Forestry Association (Dansk Skovforening) established in 1888, issues a quarterly magazine, "Tidsskrift," which also serves as the organ of the association of the technically trained foresters (Danske Forst-kandidaters Forening). C. M. Møller acts as secretary for both associations and editor of the "Tidsskrift." To him also the writer is indebted for numerous favors.

THE DANISH HEATH SOCIETY

The unique feature about Danish forestry is, however, the work of the Heath Society (Det Danske Hedeselskab). This is a private association formed in 1866 on the initiative of Captain Enrico Mylius Dalgas with the aim of reclaiming and making productive the extensive areas in Jutland that are covered with heather. This plant, so dear to the hearts of all Scottish folk, presents a most attractive sight when in bloom, but it is not an economic proposition, as are the pines and especially the spruce that in Denmark can be made to grow in its stead. Consequently the work of the Heath Society is of great local significance and has resulted in the development of Jutland in a rather remarkable way.

The Heath Society is managed by a board of 35 directors who elect an executive committee of three, with a technical deputy. This last position is now filled by Skovrider Christian Dal- gas, a son of Captain Dalgas. It is interesting to note that his son, in turn, is also a member of the Danish Forest Service, being the compiler of a book of yield tables of beech, oak, pine and spruce. The work of the Heath Society falls into several divisions: the establishment of forest plantations on the heath; the construction of drainage and irrigation canals for the improvement of meadow land; the making of marl railways—transportable tracks, whereby lime can be carried out easily to the fields; and, through the regulation of water courses and the making of dikes, the development of marsh land areas. The headquarters of the society are at Viborg, in central Jutland, where from a handsome and commodious building the work of the several branches is directed. In 1866 the area of unproductive land in Denmark amounted to 11,464 square kilometers (3,425 square miles). In 1920, the figure was only 3,824.5 (1,476 square miles). To the Heath Society is due most of the credit for bringing into economic use the other 7,540.5 square kilometers (1,849 square miles), a reduction of the waste area of 1866 by considerably over one-half.

In all the activities of the Heath Society the actual work has been done by the people living on the heath, with the consequence that prosperity has come to this section, both to individuals and to communities. Thriving towns (33)
have resulted directly from this development and a substantial increase in the wealth of the country. A typical instance of benefit to an individual is given in a publication, issued by the Heath Society in 1919, that may here be quoted as it stands: "Johan Peder Krath took possession of the property in 1895, as an inheritance from his native farm. The property consisted of a heath lot of 28 td., of land (about 110 acres), thereof 8 td. cultivated and 5 td. ploughed, without buildings and stock. It was valued at 800 krone; but surely nobody would have paid so much for that heath-lot then. Krath owned 150 krone himself, which he used to dig a well.

"In 1896 he married Eva Philbert, who brought nothing but a couple of hands accustomed to work, and then between themselves they set to work with a good will and, it must be said, a good health, and there was good use of both. Now we see the result. On the formerly black heath there now stands a nice farm, surrounded by a garden and well cultivated fields, and with a stock of 2 horses, 10 or 12 cows, 6 or 8 heifers and calves, 5 sheep and 10 to 15 pigs, etc.

"The first year he grew a crop of 1200 kg. corn and 3000 kg. potatoes; now about 12,000 kg. corn and 40,000 kg. potatoes, besides turnips, etc.

"We must concede that it is a fine result of the heath and the 150 krone he began with, both for the man himself and for the whole society."

The foregoing of course relates to another phase of the work, but it must be remembered that the initial impetus in all the Heath reclamation work came from the idea of Captain Dalgas and his associates to establish forest plantations. To aid in establishing forests on the heath, the government gives subventions to private owners through the Heath Society, but to receive this aid the owner must agree that thereafter the land shall forever be kept under forest.

The method followed in the tree planting work on the heath is first to burn off the heather in the summer. That autumn the ground is plowed to destroy the roots of the heather. A second plowing and disk harrowing comes a year later, and in the third autumn a trench plowing that goes down to a depth of 22 inches. The trees, pine and spruce in mixture, are planted the next spring. In from 8 to 10 years the pines are removed and the spruces left to form the forest crop. Thinnings occur at frequent intervals, 3 to 5 years apart. On the better heath lands the rotation is 60 to 80 years; on the poorer, 80 to 100.

Everything cut in the plantations finds a ready market, even the branches that are trimmed off the pines at the age of 8 years being sold for fuel, while garden stakes, bean poles and the like use saplings down to one-half inch in diameter. Denmark can and does practice absolute utilization. This fact, coupled with the regularity of the forests—even-aged, fully stocked stands, with the closely spaced trees all standing in marshalled rows—gives one a lasting impression of the extreme to which forestry can profitably be carried in countries of dense population and limited forest area.

Considered in terms of larger countries, the forests of Denmark may be insignificant, but looked at from the standpoint of an example of a country that is making the most of scanty natural resources, Denmark has many lessons to teach to nations that are blessed with large areas and a greater variety of timber trees. Small countries may in a sense be considered as laboratories where can be tried out on a limited scale experiments that are of far-reaching importance in their application. So with Denmark. The achievements of the Danish foresters can with profit be studied by those who are charged with the administration of the forests of other countries. And nowhere does the visitor receive a more cordial welcome than he has at the hands of the Danes.
A Few Observations on Forestry in Germany

A Visit to German State Forests—A Meeting With Dr. C. A. Schenck

It was not originally the intention of the writer to include a letter from Germany in this series of contributions. Indeed in his first schedule a visit to that country was purposely omitted, notwithstanding the interest that German forests must have, both historically and from the standpoint of management, for all members of the forestry profession. But if one is in Scandinavia and wishes to get to France, his only alternatives since the war are to cross Germany, or to go round by sea, via England. The lines of steamers from the Swedish and Danish ports to the Netherlands and to France have not yet resumed operation. Having thus perforce to pass through Germany it was but natural to take advantage of the opportunity to see something en route of German forests, particularly the Odenwald, the Spessart, and the Black Forest. Hence this letter.

So much has been written about these particular forests that it seems almost presumptuous to attempt to treat of them on the basis of only a few days' visit. But owing to the fact that he saw what he did under peculiarly favorable auspices, the writer feels that perhaps he may be justified in making a few observations concerning points of special interest; the more so as it has been diff-
cult since the war to obtain authentic information as to what is going on in Germany. In that the observations made are essentially personal impressions, an informal tone characterizes this letter.

**GERMANY AS IT IS TODAY**

Perhaps it may be well, first, to note certain impressions that even the casual visitor to Germany cannot but receive in these days. The outstanding point is that the people are willing to work and that they are working. Notwithstanding the depreciation of the mark in the world markets, and the fact that in certain places even the fractional currency is paper, those of the laboring class and the small shopkeepers appear to be prosperous. There seems to be plenty of food for those who have the wherewithal. The store windows are full of attractive things, and the theaters well patronized. Prices to be sure are 10 or 12 or even 15 times what they were in prewar days, but wages also have advanced. It appears, for comparison, that conditions in Germany today are in a way not unlike those that obtained in the United States during the war, when labor was paid high wages and the badge of the working man was the silk shirt. The German laborer may prefer other styles of personal adornment, but one sees the same sort of thing. The working man can have meat three times a day if he likes, whereas the man on a fixed income, as with us in the United States in war time, is fortunate if he has meat once a week. There is unquestionably much privation in Germany now among those on salaries and fixed incomes, but the working man is having his innings. It of course, must be remembered that these notes refer to the first part of October, 1921. Conditions in Germany are subject to sudden change. No one seems able to forecast the future.

In the lower section of the Murg river, in the Black forest, the saw mills and paper mills are running on a 24 hour day with three 8-hour shifts. This was said to be typical also of other industrial regions. The Germans have begun to work, while the people of other countries are as yet only talking about it. Whether it will profit Germany to pile up manufactured goods when she cannot sell them, and what will happen if the mark actually drops altogether out of sight, are questions that the writer of this letter makes no pretense whatsoever of being able to answer.

Roughly three-fourths of the German laborers are employed in industrial plants; one-fourth in agriculture. What will happen if production stops and these persons are thrown out of employment no one likes to contemplate. There is enough unrest and turmoil in Europe as it is. Were Germany to become actually bankrupt no one can foretell the outcome. The whole economic fabric in Germany at the present time seems to be resting on a very thin crust over a caldron of which no one knows the contents.

In connection with the apparent prosperity of those who are now making money in Germany one point ought to be noted that is sometimes overlooked, that by no means all the people one sees spending money in Germany are Germans. The low exchange rate of the German mark (it was 7/10 of a cent American money early in October, and is much lower now, as against 23 cents in prewar days) has attracted to Germany many persons from other countries. The people of the Scandina-

![A Beautiful Stand of Mature Beech Trees in Darmstadt City Forest —The Odenwald](image-url)
have such things in Germany!), and rest assured that, including the tips, he will not have exceeded $5 or $6, American money. In smaller towns the advantage to the holder of American travelers’ checks is even more marked. One who is so inclined can live like a prince on a very few dollars a day.

From quite another standpoint: The attitude manifested toward Americans in Germany is a matter of interest. There seems to be no animosity, but only kindly feeling. This cannot be accounted for by the fact that foreign money is welcome, for it was shown in various ways by those who had personally no advantage to gain thereby; small courtesies by street car conductors, persons from whom one inquired the way, and the like. One small shopkeeper for instance, from whom I had bought only a few picture postcards, accompanied me half way down the block to point out the way to the post office.

In explanation, one German gentleman who is in a position to know of what he speaks, said that this good feeling was due in part to the fact that after all the American army killed but comparatively few German soldiers, that those who were captured were treated better in our prison camps than in those of the other allies, and in general that the Germans have no ill feeling whatsoever toward the United States. This may be taken for what it is worth. Possibly it may not be as true in Prussia as in southern Germany, and perhaps also it may not hold with those who belonged to the military party under the Empire. But the facts do seem to bear out the assertion that there is no animosity among the rank and file of the people.

**GERMAN FORESTS UNTouched BY THE WAR**

As regards the forests of Germany, the outstanding point is that they were practically untouched by the war. I was able to check this statement both by inquiry of various persons and by personal observation. It is certainly true of the Black forest and is borne out by what one sees from the car window in crossing Prussia and in passing through other forested sections. The German army helped itself to the French forests on the west front, and to those of Poland on the east. The German forests came through the war essentially intact. And, contrary to newspaper stories current at that time, it is said there were no serious forest fires anywhere in Germany during the war.

The payment in forest products as a part of the reparations account is at the present time one of the subjects under active discussion, but so far the representatives of the French and the German governments have not been able to agree as to terms. Much lumber is going out of the Black forest. Of this considerable amounts, it is said, are being bought by French wood merchants, who

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**A STAND OF SPRUCE AND SILVER FIR IN THE SCHIFER-SCHAFTWALD—TREES ARE 140 YEARS OLD**

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in turn sell to their government. This is interesting and a rather curious anomaly in view of the official situation.

**MEETING WITH DR. SCHENCK FORMERLY OF BILTMORE, N. C.**

The writer has been unusually fortunate in seeing European forests under favorable auspices. On his visits to certain typical German forests he had the great good luck to have as his guide a German forester formerly well known in the United States, Forstmeister Dr. Carl Alwin Schenck, ex-director of the Forest Academy at Biltmore, N. C. Dr. Schenck is so well known throughout the United States that he needs no introduction to American lumbermen. He was much interested in hearing late news of what was happening in forestry in America, and particularly of the better understanding that has developed in recent years between lumbermen and foresters. To those who know him in earlier days he would send friendly greetings.
During the war, Dr. Schenck was in service in the German army. First in Poland, where he was badly wounded, then, after his recovery, he had to do with prisoners of war; and later, for a time, was in Belgium. He left the army in 1917, before America entered the war. After the Armistice he was in charge, until about six months ago, of relief work for children under the direction of a Quaker organization having its headquarters in Philadelphia. At present he is living at Lindenfels, near Darmstadt, Hesse, in which city he has his permanent home.

It will be recalled that in the later years of the Biltmore Forest Academy, Dr. Schenck was in the habit of conducting his students both to certain of the European forests and also to various centers of the lumber industry in the United States. It was my good fortune to visit with him some of the forests that his peripatetic school used to frequent. I by no means saw all of the forests of Germany, and use as well and are removed from the forest, and (3) the permanent road system by which all parts of the forest are made accessible. It goes without saying that neither close utilization nor permanent roads would pay unless there were markets near at hand and a relatively dense population in close proximity to the forest. These things are functions one of the other. In Germany one has such conditions, with the result that it is possible profitably to practice extremely intensive management. These forests are interesting primarily as examples of what can be done in forest management where economic conditions warrant highly intensive treatment.

All the forests are of course under very definite and exact working plans. A revision of the plan is made every ten years and a grand revision each twenty years. The basic idea is that of sustained yield and care is taken not to exceed the allowed cut per annum.

omitted Saxony altogether—a section noted for its spruce, managed with particular relation to high financial returns—but I did see excellent examples of what may be regarded as the best forests of south Germany, and near Darmstadt I saw something of pine forests on sand plains, of the same type that characterizes the forests of Prussia. The areas visited were the Odenwald in Hesse, the Spessart in Bavaria, the city forest of Heidelberg, and in the Schwarzwald, the forest of Herrnviel, the Schäumlinzwald and the Schifferstadt, in the states of Baden and Württemberg.

SOME TYPICAL GERMAN FORESTS

The outstanding features about all these forests, especially to the American visitor, are (1) the fully stocked stands of tall symmetrical trees. (2) the absolutely complete utilization of every part of the tree, down to branch wood one inch and less in diameter, while often the smaller branches and twigs find a

But the surprising thing is that notwithstanding all the prescriptions in the working plan and the faithful adherence to certain general rules, there is yet plenty of room for individual initiative on the part of the forester. These German forests are by no means managed by the exact methods set forth in the text books. Each forstmeister has the opportunity and the duty to modify the plan, within given limits. The result is that in forests of practically the same composition and of similar topography, lying only a few miles apart, there may be very distinct differences in the way in which they are managed. These distinctions may, it is true, be rather fine ones, but to the forester they are interesting subjects of study. The important point is that the German forester is not bound by any set rules in his management but must use good, common horse sense all the while to get the results desired and still to keep within the limits imposed by his working plan.

The method of management naturally va—

TREES IN THE SPESSART ARE 270 YEARS OLD—THE SMALL TREES BETWEEN ARE BEECH
ries in the several forest regions visited. But wherever possible dependence is placed on securing the new crop by natural reproduction. The planting of nursery grown stock in resected to only when the desired stand cannot be secured naturally, or where the forester is unwilling to wait for nature to give a good seed year. In the Black forest the method generally followed is that known to foresters as "shelterwood," but it is variously modified to meet local conditions.

Another point of forest interest is the relatively large amount of damage that is done in certain forests by windfall, particularly of course, with the shallow rooted spruce. On some forests a definite allowance is made in the working plan for a certain percentage of the allowed annual cut to be made up of trees that have been blown down. The figure sometimes runs as high as 20 percent of the allowed cut in a given year. Factors of this sort necessarily preclude rigid adherence to a theoretically perfect program of regular blocks of even aged forest arranged in an ideal cutting series. Here again the forester has to cut his cloth as he finds it. It is such problems that make the forestry game interesting.

In the Black forest the clear cutting of any considerable sized area is very seldom seen, except where there has been an exceptionally bad wind fall. Five to ten acres is the maximum; usually the clean cut areas are smaller. Rather the method usually is to work by groups, or narrow strips, as the case may be, or even a few trees. This is made possible by the permanent road system, for it is never far to the nearest road. In the Black forest the trees are peeled and slid down the hill to the roads along which they are hauled out. Along with this phase of intensive management it is also to be noted that diseased trees, or those subject to any sort of injury, can be and are removed as individuals, usually with-

The road had a regular Telford foundation, with broken stone above, surfaced by gravel. It was not rolled to be sure. Had it been, it would have been equal in construction, if not in width, to the best park roads in any one of our larger American cities. And this was strictly and absolutely a forest road to be used only for the transport of logs out of the woods.

The ordinary width of this road on tangents is from 10 to 12 feet. The maximum grade was 10 percent. The adjoining forest, Herrenwies, has a total area of 8746 acres (3541 hectares). That forest now has 115 kilometers (71.3 miles) of stone road. Of this 90 kilometers are forest roads; 25, main roads suitable for and used by automobiles. Twenty more kilometers of forest road are needed to complete the system. A definite part of the annual net profit from all of these forests is set apart for permanent betterments like roads. The forester said that the road under
construction, described above, would easily be paid for in full by the profit on the timber, until now considered inaccessible, that would be taken out over it during the coming year.

Higher up on the same mountain slope in the Schönminzwald was seen a small area of truly original forest where no cutting had ever been done. This area also is soon to be opened up by a road. It is probably one of the last bits of virgin forest in Germany.

THE PICTURESQUE ODENWALD

Considered specifically each of the three forest regions visited in Germany differs from the others in the character of the topography, the composition of the forest, and consequently in the method of forest management. The Odenwald is an area lying to the south and east of Darmstadt, in the state of Hesse. It is roughly 25 or 30 miles square; rolling country where the slopes and hill tops are forested and the valleys and lower lying lands are used for agriculture. It is an attractive region from the tourist standpoint, for there are many picturesque villages, and on certain of the hills the ruins of old castles that date back to feudal times. A case in point is Lindenfels, where the towers of the old Schloss dominate the little settlement that clusters close about the foot of the crag, in part still encircled by the ancient wall. Before the days of artillery these places could easily be defended against an attacking enemy; consequently the people all lived in compact little towns, cultivating the fields outside as opportunity offered. The custom has persisted and even today the isolated farm house is the exception. There is need that all the tillable land be used for growing food crops; the local authorities make it difficult for any one to devote it for other purposes than farming.

The Odenwald is essentially a beech forest. With us in the United States beech is a tree rights, or servitudes, that had come down from the middle ages. They are under careful management, in some places by a modification of the shelterwood method, when natural reproduction is re-enforced by artificial planting. The tendency today is to introduce more conifers and so create a mixed forest having a greater commercial value. Also there are found in the Odenwald many tracts of forest belonging to the old families. Indeed one of the things that kept up many of the families of the lesser nobility in Germany was the forest. Entail was required by laws which also stipulated that the forest area on the estate should not be diminished. In this way, and by careful management, the estate had an assured income that often was the chief support of the head of the family and his dependents. Since the incoming of the republic laws have been enacted that forbid entail,
with the purpose of breaking up the old estates, but some at least of the old families are organizing themselves into stock companies, so that their forest properties may still be held together as of old.

Dr. Schenck says that "the four hinges" of forest management in the Odenwald, if not indeed in other German forests, are (1) the demand for fuel wood, (2) the permanent road system, (3) the legal requirement that held intact the considerable areas of private estate forests, and (4) certain restrictions on exploitation (for which combinations of owners in the restraint of production are essential), made necessary by the fact that the forest itself is a limited resource.

For the reason that stability in ownership and continuity of management are essentials in good forestry over a long period, there is a great deal, from the forester's standpoint, to be said in favor of the present move toward placing these estate forests under stock companies. That program certainly works for well. It is the custom in all German forests to erect towers on the higher places. These are not fire lookouts, for the forest fire problem no longer troubles the German forester, but rather attractions for the local people and the tourist. Excellent walks with benches at frequent intervals are maintained throughout the forest, and at more frequented places rest houses, where may be obtained liquid and other refreshment. This in no way interferes with the management of the forest, and it is a good illustration that intensive commercial use of a forest can be combined with its use for recreational purposes. This is a lesson the American public still has to learn.

THE BEAUTIFUL SPESSART

The Spessart is a forest situated on sandstone hills in the extreme northwestern part of the state of Bavaria. The nearest important town is Aschaffenburg, which makes a good gateway of approach. This forest was for centuries the property of the archbishops of Mainz, who maintained a hunting castle at Aschaffenburg. After the dispossession by Napoleon of the archbishop, the Spessart came after a time into the possession of the Bavarian crown. It now belongs to the state of Bavaria.

The Spessart has supplied fuel wood from time immemorial—the wood was floated down the Main to Mainz—but its real importance rests in its oak, which is the finest anywhere in Germany, if not in Europe. In the eighteenth century a considerable industry grew up through the export of Spessart oak, down the Rhine to Holland. The forest has been under a definite working plan since 1760, which has of course been many times revised, but in general the program laid down in 1790 by a notable forester, Baron Tetteborn, has been adhered to. There are no community forests in the Spessart, this being one of the

A STAND OF SILVER FIR IN THE SCHIFFERSCHAFTWALD—DR. C. A. SCHENCK IN THE CENTER

conserving the supply of forest products in a given community, with the benefits which flow from the sustained upkeep of the existing wood using industries. And one of the striking things about all these German forests is the relatively large number of persons who find permanent local employment either in the forest or in working up its products. President Roosevelt once said that the ultimate purpose of forestry was the making of happy homes. Certainly when the forest gives work and livelihood to a stable resident population, this idea comes near to being realized. It does not make for large mills and big industry, but it does result in stability and local prosperity in the community.

The city of Darmstadt has an interesting forest on the hills back of the town. Beech is the predominant species, but there are also plantations of conifers that are developing
few remaining forest regions in Germany where the old time servitudes, or rights of user, have not been extinguished. Consequently, the people of the locality continue to exercise certain privileges of grazing and of taking dead wood. But by arrangement the removal of dead material is restricted to the older stands, which reduces the interference with the regular management. Until one comes in personal contact with the operation of a servitude he can hardly appreciate the trouble that it may cause. One of the reasons why permits are required on our own national forests in connection with free use, is to preclude the possibility of rights becoming established and prescriptive.

The feature of the Spessart is its great oaks; trees up to 125 feet and over in height, with diameters at breast height of 2½ to 3 feet. Suddenly to come upon them one is forcibly reminded of the southern Appalachian forest. Often the clear length is 60 or more feet. The Spessart oaks are noted the world over as producing among the finest white oak veneer wood. Before the war much was exported. The wood is characterized by soft, straight fibre, with regular, narrow rings of even growth. The larger trees are about 270 years old and probably originated in a heavy seed year that occurred during the Thirty Years’ war, when all the cattle and swine having been driven off by the roving bands of fighting men, the acorns had a chance to germinate and get well started. So does history beckon one at every turn in these Old World forests. The visitor to south Germany, who is interested in forests, should not omit the Spessart from his itinerary.

THE FAMOUS SCHWARZWALD

But interesting as are the beech forests of the Odenwald and wonderful as are the oaks of the Spessart, it is really to the Black forest that one turns to see German forestry at its best. As the name implies the Schwarzwald is essentially a coniferous forest, although there is much beech in mixture in places. In dull weather the uniform black tops of the spruces and fir present rather a somber aspect. The Black forest is well named.

The Black forest is a much broken country topographically. Deep cut valleys with sharply rising slopes that in the northern part run up to elevations of around 3,000 feet, are the dominant features. The underlying rocks are red sandstone over granite, the silver fir preferring the latter, while the spruce is found naturally higher up the slope. Where artificial planting has been done this distribution has sometimes been departed from. But generally in the Black forest reproduction is secured by natural seeding, under a group-wise modification of the shelterwood method. On the higher elevations, especially those with a southern aspect, is found the mountain pine (Pinus montana); spruce and fir are however the predominant species.

The Black forest lies in a roughly rectangular block in the states of Baden and Württemberg. It is bounded on the west by the Rhine valley, and extends from near Pforzheim south of Karlsruhe, to the Swiss border near Basle. The total area is 350,000 hectares (864,000 acres), of which the larger part (225,000 hectares) is in the state of Baden; the remainder lies in Württemberg. The forests visited are all in the northern part of the Black forest. In the south nearer the Swiss frontier, the elevations of the mountain tops are higher. The Black forest is owned in part by the states of Baden and of Württemberg and, in part by princely families, but largely by communities, whose holdings date back 200 to 300 years. About that time settlers were sent in by the government to develop this region. These people acquired rights in the forest, especially for grazing, which during the last century were extinguished, usually by giving in exchange the fee of a definite area, which now constitutes the communal forest for that particular locality.

It is however with three areas of state owned forest that this letter has to do, typical and historic examples of forest management in the Schwarzwald.

THE ANCIENT SCHIFFERSCHAFTWALD

The Schiffferschaftwald is located near the little town of Forbach, a mountain village in the valley of the Murg river, on the lower reaches of which stream, near the towns of Gernsberg and Weissenburg, are a succession of saw mills, often with a small paper mill as a part of the plant, that work up the logs from the forests higher up the river. This forest began to be exploited as early as the fourteenth century. Later a company of wood cutters and log drivers, known as the schifferschaft, undertook the systematic rafting of lumber down the Rhine to Holland. This association bought up some of the forest lands which the Count of Eberstein had mortgaged to his subjects and so obtained possession of the area now called the Schiffferschaftwald. About a century ago the Mur river was improved for driving, by the construction of a succession of splash dams, some of them of masonry, but with the building of roads driving was discontinued. The Mur now presents an excellent illustration of a fully harnessed steam, dams at frequent intervals utilizing the power directly for mills on its banks, or for the generation of electricity. The Schiffferschaftwald is now owned by a stock company, incorporated in 1905. The state of Baden has obtained possession of 51 percent of the shares, so that in effect it is now a state forest. The forest has been under definite forest management since 1815.

The outstanding thing about this forest is that although it has been yielding timber for several centuries, it was never in more productive condition than it is today after a century of rational forest management. In earlier times much of the cutting was merely
wholesale exploitation. Under forestry the productivity of the forest has been restored and will be permanently maintained. The forstmeister, Herr Stephanli, has been in charge many years and has worked out adaptations of the silvicultural methods that exactly fit his conditions. For this reason the Schiﬀerschaftwald has especial interest for the forester, but it is well worth a visit from any one who wishes to see what can be accomplished under intensive forestry.

SCHÖNMÜNZWALD
AND HERRENWIES

The adjoining forest of Schönmünzwald is similar in many ways but differs considerably from the Schiﬀerschaftwald in the details of management. Here the mature crop is removed in a series of narrow strips, made diagonally across and down the slope, between the roads. If reproduction is not secured through natural seeding quickly enough fully to stock the area with an even aged stand, nursery grown transplants are set out in the spaces. These two forests lie close together, in one place coming to a common boundary, but local conditions make it desirable that they be treated in different ways. It was on Schönmünzwald that I saw the area of virgin forest and the road construction, referred to above. This forest is in the state of Württemberg.

Herrenwies forest lies a few miles to the northwest of those just described, the village of Herrenwies being rather more easily reached from the city of Baden-Baden, if one travels by automobile. Some of the logs from this forest also go out that way down the valley of the Buhl; the rest finding their outlet down the Murg. The working plan for the forest of Herrenwies dates from 1843, perhaps the most striking feature being the steadily rising yield per hectare in the passing decades. There is considerable trouble at Herrenwies because of windthrow. The method of reproduction is to obtain the new crop through natural seeding through an extended period of regeneration. To the forester Herrenwies is also a most interesting place to visit.

Apart from the technical aspect these three forests make a special appeal to professional foresters because to them on their periodic excursions, it was the custom in earlier years to bring the students from the British Forest School, Cooper’s Hill. These excursions were led by Sir William Schlich, now professor of forestry, emeritus, at Oxford university, or by Sir Dietrich Brandis, the forester of German birth to whom is due so much of the credit of establishing the forest service of British India. Certain group pictures from that time, 20 to 40 years ago, remind the visitor that he is following in the footsteps of many foresters who have gone out to all parts of the world in the practice of their profession.

My trip also included a visit to the city forest of Heidelberg, an excellent example of a forest that is being transformed from coppice, or sprout growth, into stands of high forest (trees that have been grown from seed). Coppice forests serve a useful purpose but for timber production and quality one must have high forest. The Heidelberg city forest is divided into two parts. One lies on the steep hills back of the town, above the old castle, from the forest roads beautiful views are to be had up and down the Neckar valley; the other part is across the river from the city on lower ground. Space does not permit of a more extended account of this forest, but it should be mentioned that there are here an interesting series of sample plots in which various exotic trees, among them species from the western United States, are being observed and tried out. Experiments of this type often yield data of great value when systematically continued over a long series of years.

CONCLUSION—
THE LESSON

No attempt has been made in this letter to give statistics, or to elaborate the details of technical management. Rather the idea has been to tell something in an informal way of visits to some of the German forests that are most noted in the annals of forestry, forests that stand out as typical examples of forest management under economic and physical conditions that warrant a highly intensive treatment. It is of interest to know that even in these forests, that have so long been under management, and where the silvicultural methods are probably as fully developed as anywhere in the world, there is still room for individual initiative on the part of the forester; further, that his job requires him not merely to follow the rules of a textbook but continually to adapt his plan to constantly changing local conditions. From a study of such forests as these we Americans who are interested in the future of our own timber supply can learn much, even though we adopt not a single one of the German methods.
Some Features of Forestry in France

Impressions Received During a Series of Hasty Visits to Certain Typical Forests

There are a number of reasons why Americans should be interested in French forestry. In the first place the historic friendship between our nation and France creates the desire to know something of how a sister republic handles her forests; second, because of its geographic location, France has climatic conditions more nearly akin to those of the United States than are those of the countries of northern Europe, which in turn leads to certain similarities as regards the growth and development of the forests. Again, because in at least two phases of forestry work, the control and correction of torrents in the mountains and the reclamation of waste areas along the west coast, the French excel all other peoples. And finally, but perhaps most important to us of all, because some of the methods in use in forest work in France are more nearly possible of direct application in America than are those of any other European country.

This letter deals with certain general observations about French forestry, with particular reference to methods of silvicultural practice. A subsequent communication will concern itself with the reboisement work in the mountain areas and with the reclamation of the Landes and the coast of Gascony. Both letters are based on personal observations made during a circuit of France in the months of November and December, 1921, but supplemented especially as to the statistics given, by the comprehensive volume by Major Theodore S. Woolsey, Jr., entitled “Studies in French Forestry,” published by John Wiley & Sons, New York, 1920. In

OAKS IN THE FOREST OF AMANCE, NANCY—AN EXPERIMENT STATION SAMPLE PLOT
AN OLD OAK IN FONTAINEBLEAU FOREST—A WITNESS OF CENTURIES OF PROGRESS
this book, the result of extended sojourns in
the forests of France, are to be found data con-
cerning all phases of forestry work in France,
together with authoritative facts and figures
supplied the author by various members of the
French Forest Service. Those desiring to
acquit themselves with forestry in France
will find this book a mine of information.

THE FORESTS
OF FRANCE

Some years ago an eminent American for-
ester, Dr. B. E. Fernow, described forestry as "an
art born of necessity." France is an apt illus-
tration of this epigram. If there is any one
who doubts the need of a nation's making pro-
vision for the future through the proper man-
agement of its forests, that person particularly
would do well to study the history of forestry
in France. To repair the effects of past errors
that country has had to pay in the expensive
school of experience. We in America can profit
by her example.

France is favorably situated for the growth
and development of forests. In general there
is ample precipitation and while in parts of
the country the winters may be cold, there is
a long growing season. Further, France has

A TYPICAL PRIVATELY OWNED COM-
MUNITY SAWMILL, VOSGES MOUNTAINS

the advantage over her northern neighbors of
a greater number of trees of commercial im-
portance. Two especially to be noted are the
maritime pine and the cork oak, for while re-
stricted in distribution both are of high eco-
nomic value. Chestnut is also important in
parts of the country. But from the forest stand-
point the outstanding point about the favorable
climate of France is, natural reproduction is
easily secured and consequently the problems
of forest management are materially simplified.

The total area of France is approximately
204,000 square miles. Of this 18.7 percent is
under forest, an insufficient proportion to sup-
ply the needs of the country, so France is one
of the timber importing nations. It is there-
fore of the first importance that every avail-
able corner of waste land be put to use in grow-
ing forest. But it is to be observed as one trav-
els across France on the main lines of railroad,
he sees from the car window little of what we
in America would term waste land. The im-
pression rather is of an intensively cultivated
agricultural country. This is frankly a super-
fluous observation but it is borne out by a para-
graph from one of the two chapters by Col. W.
B. Greeley, which form a part of Major Wool-
sey's book. Col. Greeley says:

"Intensive use of a limited land area to sup-
port her dense population is forced upon France.
The situation would be paralleled if a third
of the people in the United States were crowded
into an area somewhat smaller than the state
of Texas. At the best, France must import a
large volume of wood products. France has
had to strike a close balance between her needs
for lumber and her needs for farm crops and,
notwithstanding the number of months to be
fed, has had to devote a considerable acreage
of agricultural land to timber production.
Intensive methods of growing successive crops of
timber form a necessary part of her national

FOREST REGIONS
OF FRANCE

The forest regions of France fall into two
broad divisions, the plains and the mountains.
On the southwest the Pyrenees form the frontier
with Spain; on the southeast are the Alps, and
on the east the Jura and the Vosges mountains.
There is also high land in the central plateau.
The plains subdivide into three parts: The
Parisienne zone, sloping to the north and west;
the Girondé zone in the southwest of France,
sloping to the west; and the Provençale zone,
horning the Mediterranean. This latter re-
gion, especially in its eastern part, is hot and
dry. In its vegetation as well as general char-
acter it reminds one strongly of southern Cali-
ifornia, which resemblance is further borne out
by the tourist resorts along the Riviera, or, as
they like to call it in France, "L'cote d'Azur."

As is to be expected, the forests of the moun-
tain division are largely of coniferous species,
silver fir, Norway spruce, some larch, and in
places pine; Scots at the lower elevations, moun-
tain and cembric at higher altitudes. The best
fir forests in France are found in the Jura and
in the Vosges mountains. At the lower eleva-
tions of the mountain regions, where the foot-
hills break into the plains, are beech, oak and
hornbeam. Various topographic subdivisions
are recognized in the mountain divisions, with
corresponding differences in the composition of
the forest.

The plains division is larger in area than the
mountains division, the Parisienne zone alone
covering more than half of France. Here the
broadleaf trees predominate, although in places
conifers have been introduced artificially. Oak,
beech, hornbeam are the important species.
Here are found the forests that produce the
large sized and exceedingly valuable old tim-
er. While managed essentially as a park, the
Forest of Fontainebleau contains many oaks of
this sort, as well as much fine beech. Oaks oc-
cupy 27.5 percent of the forest area of France.
There are two important species, the sessile and
the pedunculate oak. Beech comes next in percentage of area, 18.2; hornbeam 11 percent. The evergreen holm oak is found only in the south of France, 4 percent in area; the cork oak (Quercus suber) mainly bordering the Mediterranean. The last named species is limited in distribution but is highly valuable commercially. Miscellaneous species, as ash, poplar, willow and others, together 16 percent in area, make with those already listed a percentage in area of productive forest of 76.7 for the broad-leaved species. Of the 23.3 percent of conifers, fir has 7.1, Scots pine 6.5, maritime pine 4.0 and spruce 2.7, the other 3 percent miscellaneous.

The maritime pine is found chiefly in the Gironde zone of the plains division, though there is some on the Mediterranean shore. The area is not great relatively, but its commercial value for turpentine as well as for timber makes it

OWNERSHIP OF FRENCH FORESTS
As to ownership Woolsey states that “about one-tenth of the French forest area belongs to the state, two-tenths to communes and public institutions, and seven-tenths to an incredible number of small owners,” the great majority of whom have less than 25 acres. This is one of the striking things about France. “The forest, as well as the agricultural land, is divided among the people.” It does not follow that all the privately owned forests are as well managed as are those belonging to the state, but as has been noted in earlier letters as regards other European countries, the people of France have a clear understanding of the value and importance of forests, which creates a point of view that has not as yet become general with us. In looking at the history of forestry in

rank as one of the most important trees of France. Originally established artificially, it now reproduces naturally. A further account of this forest will appear in a subsequent letter in this series.

All over France the sycamore and the Lombardy poplar are trees much used for roadside planting. A characteristic sight, also, is the pollarded trees, those where the tops have been cut back and allowed to sprout, 10 feet more or less above the ground.

There has been some introduction of exotic trees in France but in general this aspect of forestry is not important. The French are better satisfied with the results that can be got from indigenous species. In the botanic gardens and at the arboretum of the National Forest School, in the forest of Amance, near Nancy, now sadly damaged by war, experimental planting of foreign species of trees is now going on, and with a return to normal conditions will be more actively pushed.

France, one should recall that unlike her northern neighbors France has for many centuries been a homogenous country, with a highly centralized government resident in Paris. In Germany for example the great number of local states and petty principalities led naturally to diversity in forest management as in other things. In France on the contrary there has in general been rather close adherence to a definite program and continuity of policy over a long period.

HISTORY OF FOREST LEGISLATION IN FRANCE
While the care of the forest in France dates back to a much earlier time, an outstanding date in French forestry is the year 1669, when in the reign of Louis XIV, was promulgated the “Forest Ordinance” of the great minister Colbert. On that foundation may justly be said to rest all subsequent French forestry legislation. In other European countries also the Forest

RETURN OF VEGETATION ON THE FIRING LINE—MONT PELE—PICTURE TAKEN BY FRENCH FOREST SERVICE IN AUGUST, 1921
Ordinance of 1669 had a profound effect. It was the forerunner of modern conservation laws.

When Colbert came into power he found that inefficiency and corruption in the then forest service had resulted in disastrous inroads upon the forest capital of the nation. His famous dictum, "France will perish for lack of woods," has become one of the classic utterances. But Colbert did not stop with a well turned phrase. At his insistence an investigating commission was set up with drastic powers to remedy matters. The commission did its work without fear or favor and made a most thorough house cleaning. The result was the new order of things that followed lasted down to the political upheaval which accompanied the French revolution. It is true not all of the provisions of the Forest Ordinance of 1669 were consistently observed, but in general the broad policy was carried out. Under Napoleon the essential features of the old ordinance were reenacted, and again in 1827 when was established the "Code Forestiere," which with but a few trifling changes remains the forest law of France to this day.

One especial feature of the Forest Ordinance of 1669 was the provision to insure the continuance of the forest. Reproduction was to be effected under what was known as the "methode a tire et aire," by leaving standing eight seed trees per hectare (2.41 acres), under a system of successive clear cutting. The method did not always work satisfactorily because the seed years often did not coincide with the cuttings. It also had other technical defects. But it was a great improvement over previous methods and as such its influence was widely felt, not only in France but throughout Europe. Colbert deserves gratefully to be remembered as a wise friend of the forests.

**Some Features of French Silviculture**

From the standpoint of silvicultural management one of the most interesting things about French forestry is the conversion of coppice, or sprout woodlands, into "high" forest; that is, stands where the trees originate from seed. Naturally enough the average private forest owner in France inclines to the method of coppice. Reproduction is easy, the rotation is short and he can receive his income at shorter intervals. But from the standpoint of the state high forest is distinctly preferable. Only from the veterans which develop from seedling trees can be secured the large sized and mature timber of high quality that the requirements of certain industries demand. The state is in business for all time and can afford to take a lower interest rate than can the individual. Further, the state can, and should, take account of the indirect benefits resulting from forests, as the individual owner cannot. So in France the general policy has developed that it is the duty of the state to grow the forests which must be managed on long rotations and as speedily as may be to transform the state forests now under coppice into true high forest.

Interesting examples of conversion are to be seen in the Forest D'Ecouves, near Alencon, in the northeastern part of France, and in the forests under the direct management of the Nation School of Forestry at Nancy; the forests of Heye and Anance. By a series of successive cuttings, under a sort of modified shelterwood method, the older trees of coppice origin and the standards, or seedling trees that formed the upper story over the coppice, are gradually removed and their places taken by groups of seedling trees resulting from natural reproduction. In the end the forest becomes a stand
of the high forest type. Oak and beech are the important species.

Along with the conversion, and distinct from the "reproduction cuttings," goes a systematic series of thinnings, made with the object of keeping the stand always at its maximum of development as to both quantity and quality. It is here that American foresters can profitably study French methods, for when it becomes economically possible in our country systematically to conduct thinnings, we can well use the procedure of France as a guide.

There are broadly two general ways of making thinnings. One, supposedly more favored in Germany, is to remove the smaller sized trees that fall into the classes termed by foresters "suppressed," "intermediate" and "co-dominant." This method regards the forest from below, as it were, and theoretically at any rate removes in systematic order the individuals of the classes named. It is called in French "éclaircie par la bas." As a matter of fact, however, it is to be noted that nowhere do European foresters confine themselves to the exact rules as set forth in the text books. Individual judgment and initiative and the demands for modification made by windfall or other unforeseen accidents alter the most theoretically perfect program.

The other method, the characteristically French method, is to regard the forest from above. They thin the top story in order to decrease competition between the best trees. In other words, the French foresters try to pick the winners among the trees in the stand whatever may be their size or age, and so to conduct the thinnings as to favor these individuals as against their competitors. The trees that are most promising are therefore chosen early in their life definitely to form the final crop. In French this method of thinning is known as "éclaircie par le haut." In general, and particularly for broadleaf forests, it commends itself to an American more than does the other system. It goes without saying that there are all sorts of local modifications to the French as there are to the German method.

In speaking of the application of the French method of making thinnings in the forests of the United States it is of course to be understood that such work would be strictly limited by local economic conditions. In France, as elsewhere in Europe, the relatively small area of the country and the dense population in the proximity of the forests, make for ready markets for almost all classes and sizes of wood. This in turn leads to permanent roads, the division of the forest into small compartments, the ability to remove at a profit even a few trees from a given locality, and the like. Few forests in the United States as yet have approached to anything like what in France is the normal condition. But from the very fact that it is easier to simplify than to build up, the methods used under the intensive treatment possible in France are of interest to us.

A corollary of the nearby markets for all forest products in France is the extent to which forest sanitation, or the removal of diseased trees, can there be practiced. If an individual tree shows signs of being unhealthy it is at once marked for removal and is usually cut within a few months' time. There is said to be relatively little injury from insects in the French forests, but here again, trees that are found to have been attacked are at once removed and all slash burned.

**THE WAR AND THE FORESTS**

But of injuries due to human agencies the forests of northern and eastern France are all too full. It was providential for France that she had so much forest area near her frontier. All up and down the battle line the forests played a most important part throughout the war. When one stands by the graves of the men who died fighting in these woods he is not concerned for the loss of the trees. They too
did their share. But if he has visited Germany he cannot fail to recall that across the boundary only a short distance away from the devastated area of France stand the forests of Germany unscathed by the war. Whether or not Germany can pay her debts is not within the province of this letter to discuss, but timber is certainly one form of realizable wealth that she does still possess.

The forests of France where there was heavy fighting help one to reconstruct the picture of what there took place. At Amance, for instance, near Nancy, where fell many of the students of the French Forest School within a few kilometers of their former class rooms, there are plenty of grim reminders of the battles. Few of the wire entanglements have yet been removed, trenches and dugouts are as they were left in 1918, and in places are even the remains of the camouflage that helped to conceal the roads. Nature is doing all she can to cover the

traces, but it takes more than three years to obliterate such havoc.

It is apparently the policy of the French government to facilitate visits to the battlefields, at any rate to the more noted places as Rheims and its vicinity and the famous forts outside of Verdun. Excellent automobile roads and an efficiently organized touring car service make it possible in a short time to get a comprehensive idea of typical portions of the battle front. Most of the salvage of value has of course been collected; one sees great piles of it at intervals. But there is plenty left of broken and twisted odds and ends to enable anyone with even a small store of imagination to reconstruct the actual picture. Otherwise the policy is to leave this part of the front as it was.

Around the outer forts at Verdun, Vaux and Douamont, a scanty vegetation is beginning to come back. But the impression that one receives can be summed up in the phrase, "the abomination of desolation." This is not the place, nor has the writer of this letter the ability, even if it were, to attempt to describe these battlefields. The heroic defense of this critical salient through the entire war makes it indeed holy ground. "They shall not pass."

Equally is the writer unwilling to attempt to write of the devastation either of the cities that were under bombardment, or of the pathetic remains of the little hamlets that dot the firing line. Brave attempts are everywhere being made at reconstruction, but it will be a long, long time before the temporary structures of today—many of them constructed of the sheet iron used in the bomb proof dugouts—are replaced by permanent houses. After visiting this section of France one does not wonder that the French want to keep up their army. It may be an unnecessary precaution to have as many men available as are now under arms (and every town of any size seems to have its garrison), but— When one has seen these things he better understands the French point of view.

MATURE TREES READY FOR THE FINAL CUT, FULL REPRODUCTION HAVING BEEN SECURED—FOREST OF HEYE, NANCY

FOREST MANAGEMENT IN FRANCE

In the administration of French forests and in the organization of the Forest Service (L'Administration des Eaux et Forêts) there are many points of interest for Americans. As has been said, the forests of France divide as to ownership into three classes, the state forests, the communal forests and the forests privately owned. The foresters of the forest service have full charge of the state forests and also to a considerable extent exercise supervision over the communal forests. In many cases the working plans for these latter forests are prepared by the government foresters, and the marking of the trees to be felled is done under their direction.

One outstanding and characteristic feature of the French forest law is that of requiring the maintenance of a "reserve" of 25 percent of the yield in communal forests. The purpose is that there always may be available a surplus that can be drawn on in case of emergency. The
origin of this custom dates back to the period of devastation in the sixteenth and seventeenth centuries. It was one of the provisions of the Forest Ordinance of 1669. That it has been on the whole a wise provision for France is well attested by the use to which certain of this reserved timber was put during the war. Without this provision it would have been difficult, if not impossible, to meet the demands of the French and the allied armies for the wood absolutely essential along the battle front.

In practice the reserve may be effected in either of two ways: First, by the segregation of a definite portion of the forest and its management apart from the general working plan for the forest; or second, by reducing by one-fourth the allowed annual, or periodic, cut. In normal times the reserves also perform the useful function of stabilizing local markets and giving steady employment to resident laborers, for should it prove necessary for any reason to stop operations in the regular working groups, the workmen can be transferred to the reserved portion of the forest.

by the experience of France. The lesson of the value of community forests is one that we as a nation have yet to learn.

Some of the communes own and operate their own sawmills, but more often the mills belong to some individual. They are small affairs, often run by water wheels. The saw plays up and down vertically with a short stroke. They cannot be called speedy. After the sawyer has adjusted the log on the carriage, he sits down for lunch, or goes about other work. By the time he is through the saw has about reached the other end of the log. In one little mill in the Vosges mountains the rate of motion was approximately one foot in 30 seconds. The capacity of that mill was about one good sized tree per day, though the silver firs in the Vosges are good trees. These mills meet the local needs and in regions where hand labor is still the normal condition, help to keep the local population employed. It is not fair to judge them by American standards, nor is it our affair if the French prefer to do things that way. They claim that these little mills do very accu-

COMMUNAL FORESTS

The importance to France of the communal forests can perhaps best be brought out here by quoting another paragraph from the chapter by Col. Greeley in Major Woolsey's book, already cited:

"These community forests are important sources of revenue for hundreds of French villages, reducing taxes and affording the means for constructing town halls, roads and other local improvements. The situation in France would be paralleled if every village in New England owned 500 or 1,000 acres of forest, kept continuously in the highest state of production, furnishing the timber locally needed, affording a substantial income for community purposes and providing steady employment for a number of its citizens." American foresters are not the only citizens of the United States who can profit

rate work and turn out planks of exact and uniform thickness. They have not yet recovered from their consternation at the way the American and Canadian forestry regiments jammed through the logs at their mills, when the one idea was to get lumber to the front with the absolute minimum of delay.

REGULATION OF THE PRIVATE FOREST OWNER

In the regulation of the private owner the French law is exceedingly strict. Indeed the Forest Ordinance of 1827, with its amendment in 1859, forms a special code separate from other French law and imposes on the forest owner restrictions that do not hold for any other class of property. The core of the law is, the private forest owner is held responsible for keeping his land productive as a forest. Once more to quote Col. Greeley: "The significance of this infringement of the rights of private
ownership can be appreciated only in the light of the sacredness of property rights in France. A people fully as jealous of individual liberties as ourselves have not hesitated to curtail property rights in the case of forests as distinct from all other classes of land, because of the special public interests which the forests serve.” This point is of interest because it shows that certain of the proposals that have been advanced for forest regulation in the United States have not been without the justification of the experience of another country under a republican form of government.

In practice the private owner can manage and exploit his forest as much as he likes, always provided, however, that the land shall be continued under forest. To clear land even for agricultural use requires the untieing of endless red tape, and even should the permission be granted, can be done only under official supervision. If privately owned forest land is devastated by any cause whatever, improper methods of cutting, grazing, fire, or clearing without the previous sanction of the govern-
ment, the owner is subject to fines and other penalties, in large sums, and to the requirement, also under penalty, that he reforest the area within a prescribed time. No excuses or explanations are accepted or allowed. The case rests on the fact that the land has been cleared illegally.

The laws concerning forest fire are very strict in France, particularly in the maritime pine forests in the Landes and in the dry region bordering the Mediterranean. There are also special provisions regarding the “protection forest” zones in the high mountains and in the region of the sand dunes. The more important of these latter laws date from 1882.

Thus it will be seen that regulation of the private forest owner is no new thing in France, the essential parts of the Forest Code having been continually in operation now for 95 years. The laws are drastic but the significant thing about them is they work. Whatever may be his opinion as to the enactment in the United States of legislation of this general character, it is advisable for anyone who is interested to post himself on the forest laws of France.

THE FRENCH FOREST SERVICE

France has always been noted for the highly centralized character of her government. Everything radiates from Paris, just as in other ways that city dominates the entire country. But while the central bureau of the French Forest Service is in Paris, the “conservateurs” in charge of the various districts have a surprising degree of autonomy in the conduct of the forests under their charge. There are 32 districts or “conservations,” in France, beside the three created since the war for Alsace and Lorraine. There are also forestry officials in the French colonies.

The French Forest Service is under the minister of agriculture, and in direct charge of a director general. In Paris there are three administrative bureaus, which subdivide into sections, somewhat as in our own Forest Service. Two general inspectors supervise the work of the 32 districts. In the districts, or conservations, the conservator (who has the military rank of lieutenant colonel) has under him several inspectors, each in charge of a number of forests, under whom in turn are assistant inspectors (gardes generaux), and finally rangers and laborers. Each man within his province has charge of all the work therein. It is an organization by area, rather than by subject matter as followed in much of the work of the U. S. Forest Service.

The National Forest School at Nancy is a part of the organization, although distinct from the administrative branch. In connection with the school is the Forest Experiment Station, which is divided into four sections. There is also a secondary school, at Barrès, for the train-
ing of subordinate officers in the service.

One rather interesting personal touch in connection with the personnel of the French Forest Service is that it seems to be the custom for some at least of the conservators to have their offices in their residences. Whether this is a matter of choice or of necessity because of limited appropriations, the writer does not know, but it seems to be the usual arrangement.

There is splendid esprit de corps in the French Forest Service. Notwithstanding the low salary scale it is very seldom indeed that a forester resigns to engage in other work. From personal experience the writer of this letter can bear testimony to the keen interest which the French foresters have in their profession, and to their sense of responsibility for the work under their charge. He also wishes to add that the courtesy of the French foresters is no mere outward formality. All those whom he met were uniformly willing in every way to assist him to obtain the information which he sought. To one who comes properly introduced the free masonry of forestry opens doors quite as quickly in France as it does in any other country.

CONCLUSIONS AND LESSONS

No American with an understanding of the need and purpose of forestry in the life of a nation can visit the forests of France without being impressed with the efficiency with which the French are handling their forest resources.

But one who looks deeper is not slow in seeing that the French people in their conserva-


tion of the forest and in their complete use of all its products have established their system on a principle both correct and fundamental. Even under the stress of the most urgent demands of the war when the enemy was almost at the gates of Paris, the French insisted the operations in the forest should be done systematically and with due regard for the future. A nation that, under the utmost stress of immediate necessity, can adhere to a program it knows is best in the long run, commands our attention.

Further, when the people of that nation, although highly individualistic and quite as keen about the rights of property as are we Americans, are willing for practically a century to submit themselves to as drastic a law as is the French Code Forestiere, it means that they have come to a full realization of the vital importance of forests in the economic life of a country. Fortunately we in America have not yet felt the pinch that in the years gone by compelled France to follow the course adopted. But the same natural laws that governed in France are in operation with us. We may not need to copy French methods, but if we are wise we in the United States shall profit by French experience. With the example before us of what France has had to do to recover from mistakes of the past, we shall indeed be recreant if we do not set our own house in order while there yet is time.

It behooves all those who have at heart the permanent welfare of our own forest resources to study the history of forestry in France.
Two Distinctive Phases of French Forestry

Practical Accomplishments in Reboisement and Reclamation

France has to her credit in forestry two distinctive accomplishments. In them she excels all other nations. They are the control of torrential streams in the high mountain districts, and the transformation of great areas of economically useless sand land into forests of high productive value. Concerning both of these types of forest work there is much of general interest. First, because in the solution of the problems that have been attacked certain principles have been made clear which are applicable everywhere. Second, because the methods that have been worked out, in both cases, have become the standard for similar work the world over. And third, because, from the standpoint of forest policy, many of the decisions that have been made can well serve as guides, if not as precedents, to other countries.

To see torrent control work one must visit the High Alps or the Pyrenees. The reclamation of the sand wastes is along the coast of southwestern France, near Bordeaux. This letter is written as one outcome of visits made to typical areas, both in the Alps and along the coast, which stand as examples of work that has been satisfactorily accomplished. Without going far into detail it aims to outline the salient points of these projects. A few comments are added regarding the bearing which the French forest policy in these matters may have on the problem of how to make the best use of certain waste lands in our own country.
REBOISEMENT IN MOUNTAIN AREAS

As used in this letter the term "reboisement" includes both the actual replacement of forest on the mountain slopes, naturally or artificially, and also the other work that has been carried on in connection with the reforestation. The development of reboisement has been the joint work of engineers and of foresters. But taken as a whole there is no question that reboisement activities are properly to be classed under the head of forestry.

It was stern necessity that forced France to undertake the reboisement of her high mountains. For practically a century the work of rectifying the errors of earlier days has been going on, and the job is not completed even yet. Approached from whatever standpoint the work that France has done in the French Alps constitutes one of the most interesting chapters in the whole history of forestry. It is a chapter full of significance to all other countries.

As will be recalled, France has the advantage of having high mountain ranges along much of her frontier; notably the Pyrenees on the southwest and the Alps on the southeast. But with the advantages come also drawbacks, one of which is the damage liable to result from the mountain streams where man has interfered with the vegetation that naturally covers their catchment areas. The control of torrents becomes therefore the keynote of forest management in the high mountain regions, for as an eminent French forester, Jacquot, has aptly said, "The forest is the sovereign regulator of water flow. Its presence stops the formation of torrents. Its development extinguishes it. Its destruction delivers the soil as a prey to erosion. All the fundamental laws recognize the absolute necessity of reforestation". This is a translation from "La Foret", by A. Jacquot, as given in appendix B of "Studies in French Forestry", T. S. Woolsey, Jr.; John Wiley & Sons, N. Y., 1920. This book, as noted in an earlier letter in this series, is now the standard authority in English on forestry in France. The statistics given in this letter are mainly taken therefrom.

The discussion of the damage resulting from torrents may perhaps be facilitated by the following definition, also taken from Major Woolsey's book, just cited (P. 150): "A torrent gorge is a temporary or permanent water course in which the water concentrates with extreme rapidity after heavy rains and by its energy of movement digs out its bed, which is considerable because of the mountain slope and because of the increase in density of the material transported. The soil and debris of all kinds eroded by the waters are deposited on the plain." The slope of torrents may exceed six percent for their entire course. It is never less than two percent.

Two thirds of the torrents of Europe are said to be in France; the remainder being in Switzerland and Italy. The damage that they cause is not limited to the direct erosion and the destruction that results from the deposit of debris on near-by agricultural lands. The effect of uncontrolled torrential streams makes itself felt all the way to the sea. It is this phase of the question, quite as much as the local damage, that gives to the problem of torrent control the importance that it has.

THE HISTORY OF REBOISEMENT

The necessity of keeping a forest cover on the mountain slopes was early recognized in France. It was advocated by Bernard Palissy in the sixteenth century. And indeed his work paved the way for his successors in recent times. But as so often seems to be necessary where man is dealing with the forces of nature, it took a series of catastrophes to arouse the people of France to the absolute need of systematic action.
Over-cutting on the mountain slopes in the French Alps runs back for centuries, but in the years immediately following the French Revolution, when the old forest ordinances were thrown aside and law and order had not yet been re-established throughout France, indiscriminate cutting in the French Alps proceeded on an extensive scale and with what had been done earlier created conditions the evil results of which began soon to be felt. Especially troublesome became the uncertainty in the flow of the streams. Floods alternated with periods of low water. Industries dependent upon water power were crippled, and nearer the sea even navigation was involved. A situation had been created that came near to being a national calamity.

Especially may be mentioned the great floods in 1840 and 1856, because it was out of the damage wrought in these years that there finally came the organization of the control work on a comprehensive basis. Before that time what had been done was largely local and sporadic. In 1860 and again 1864 laws were passed dealing with reforestation in the mountains; but they failed to be effective, primarily because they provided that the mountain lands, mainly belonging to the communes, could be taken over by the government without payment. It was not until 1882 that really satisfactory legislation was secured. This is the law in effect today. Its essential provisions are that the state may acquire by purchase or condemnation the areas where intensive work in reboisement is essential, but the lands so taken must be paid for. This permits the government to control the "key areas". For the remainder of the land within the project boundaries, an agreement is entered into between the state and the owner, usually a commune, whereby a subsidy is granted by the government, but only provided that certain conditions and requirements are satisfied. The plans proposed by the forest service must have the sanction of a local commission, but it may be remarked in passing that the forest service retains the whip hand in this matter, because it is largely upon its recommendation that the government subsidies are granted or withheld.

From the standpoint of policy the interesting thing is the breakdown that followed the attempt of the government in earlier years to make the owner of the land pay the cost, and the adoption finally of the present arrangement whereby at least the key areas, that constitute the core of any given project, shall be purchased by the state. It is but another illustration that when the benefits to be derived from forests are as indirect as must be the case with forests of the protection forest type, it becomes the business of the state, rather than of the individual or corporation, to undertake their management. In connection with the reboisement provisions in the law of 1882 there are, however, somewhat drastic regulations governing the way in which the private owner may cut his forest if it lies within certain specified regions. Reference to laws of this sort was made in an earlier letter in this series.

METHODS FOLLOWED IN REBOISEMENT

Reboisement work in the French Alps, as also in similarly situated areas in Switzerland, divides into two parts; the control of torrents, and the prevention of avalanches. Torrent control may also be subdivided into the "correction works" on the lower portions of the torrential streams, and the preventive measures that are practiced high up on the catchment basins to forestall further trouble. In the correction of torrential streams engineering works play a large part; the construction of masonry dams, the paving of the stream beds, and the like. In the prevention of torrents, especially in recent years, more and more emphasis is being put on afforestation.

It has been a subject of much debate in what proportion the work of torrent control

METHOD OF REGULATING THE FLOW OF A TORRENTIAL STREAM HIGH UP ON A MOUNTAIN SLOPE, SWITZERLAND
should be divided between these two methods of approach, but it has now pretty generally come to be recognized that while both are important, the most effective thing to do is to stop the trouble at its source, rather than to rely so much on engineering works lower down, which after all are alleviative rather than preventive in character. Perhaps the most significant thing about all this work is, however, that it is now recognized a given stream must be treated as a unit, from its highest source way up on the mountain sides down to the point where it joins a large river in one of the broad and gently sloping valleys of the plains.

EXAMPLES OF STREAM CONTROL WORK

Perhaps as interesting examples of the control of torrential streams through engineering works as can be found anywhere in

France are to be seen in the valley of Saint Jean de Maurienne, east of Chambery, in the Department of Savoie. It is through this valley that one of the main continental railways winds its way, finally to plunge through the Mt. Cenis tunnel and emerge in Italy. It is a narrow valley. On either side rise high mountains with steeply sloping sides. The many branched ravines that run well back toward the summits of the ridges form ideal channels for concentrating the run-off from the heavy precipitation. The result is that immense volumes of water rush down the stream courses and, if not controlled, work havoc to everything along their path.

To meet this situation the French forest engineers construct elaborate masonry dams across the stream bed to break the force of the waters. The height of the dams and their distance apart depend on the gradient of the stream, the object being to secure a series of nearly level steps. Where the grade is steep the dams must be close together, sometimes as near as 100 feet. On less abrupt gradients the dams are farther apart though still numerous. The length of the stream bed that must be so treated often runs up to several miles. It will thus be seen that the construction of dams, or barrages, is an expensive procedure, even with the lower prices for labor that obtained before the war.

But this is not all. In the case of the worst torrents the streams have to be walled in, wing dams constructed to deflect the overflow in times of unusual freshets, and in some instances the entire bed of the stream between its retaining walls, has to be substantially paved with stone blocks to withstand the erosive pounding of the rocks and other waste that is carried along by the rushing waters.

A typical stream is the torrent of Saint Julien in this valley. Up to 1913 over $129,000 had been expended on engineering and tree planting work in connection with its

BED OF A TORRENTIAL STREAM 
HIGH UP THE MOUNTAIN BROKEN BY SMALL DAMS TO PREVENT EROSION

correction. And this was for a single stream, one of many in the valley. The longer correction work is put off the more it costs when it is done. The old adage about the ounce of prevention was never truer than when applied to the work of reboisement.

Of similar character, though less elaborate, are the corrective works farther upstream. Here dams made of timbers are used. Higher up still, logs laid lengthwise with the stream are fixed firmly in place across the bed, but always with the idea of making a series of steps that shall break the force of the torrent. On the upper reaches of the streams, too, wattle work, consisting of small poles woven in and out between upright stakes, replaces the masonry side walls. But even so it is work that quickly runs into money and that would not be undertaken were it not absolutely essential.

In Switzerland, as well as in France, in the region of the High Alps, torrent control
and reboisement occupy a large share of the attention of the foresters. An interesting example of the necessity of building barrages and side walls even on the portion of a torrential stream where the gradient has become relatively gentle, is to be seen just outside of Interlaken, where before the correction work was undertaken much damage resulted in time of flood to valuable meadow land, of which Switzerland has at best all too little. As the methods followed in the two countries are essentially alike, it may not be inappropriate, for the purpose of this letter, to include Swiss examples, even when discussing French forest methods.

Where there are flats or depressions at or above the tops of the steep slopes, as is often the case in the section of the Alpine high pastures, there is some tendency for the land to become boggy. Here artificial drainage is often practiced, by the construction of ditches that lead off the surplus water and turn it into prepared channels. Were this not done the saturated condition of the soil in these places would result in times of heavy precipitation, in the torrents being even more swollen than normal. There are many phases of reboisement work.

DEVELOPMENT OF REBOISEMENT

The names of the French foresters and engineers that especially stand out in connection with reboisement in the High Alps are those of Surell and Demontzey. The book by the latter, "Reboisement des Montagnes," although written in 1878, is still regarded, in its later editions, as being the standard authority on this subject. But there has been much written concerning the various sections into which work of this sort divides itself. Perhaps the most important recent contribution is an official report by the French Forest Service, issued in 1911: "Restauration et Conservation des Terrains en Montagne" Paris, 1911.

In recent years, as has been said, more and more attention has been given to attempting to prevent the trouble at its source, through the afforestation of the upper parts of the catchment areas by establishing forest plantations. A lively discussion between the engineers and the foresters continued for a long time over the relative merits of the two methods of approaching this problem. One can hear today more than echoes of it. But the results that have followed the afforestation of certain watersheds seem now to have swung the balance distinctly to the forester's side of the argument. Nevertheless the dams and other engineering works will always have their place on certain streams.

The species used in these high mountain plantations naturally vary with localities, depending on the elevation, aspect, soil and exposure to the wind. Scots, Austrian and mountain pine, spruce, larch, and others are all in use. The study of questions that arise in connection with these plantations, and in general in the reboisement work, falls within the scope of the French Forest Experiment Station, located at the Forest School at Nancy. One of the four sections of that organization deals exclusively with problems of reboisement. It is under the direction of Professor Bernard, assistant director of the National School of Forestry. In Switzerland much experimental work in tree planting on the high mountains is being done by Dr. Franz Fankhauser, chief inspector of the Swiss Federal Forest Service, at Berne. That work is proceeding in connection with the afforestation of open land in the mountains, from which areas the run-off enters torrential stream beds.

The big fact about all the tree planting on these upland catchment areas is that if it is possible to retard and equalize the run-off,
there will be a material reduction in the quantity of water that has to be controlled in the torrent beds, and with increasing volume, the torrents grow in power.

Necessarily forests that are formed by such afforestation are essentially of the "protection forest" type, and are not to be considered from the viewpoint of commercial utilization for timber. But that they serve an important economic end and are of value to the nation is a fact that is absolutely self evident.

WHY REBOISEMENT WORK SHOULD INTEREST AMERICANS

The bearing of all this French work of torrent control on our forest problems in the United States is more direct than may at first be apparent. Every reader of the LUMBER WORLD REVIEW will recall that the basic argument used in the creation of the national forests in the southern Appalachians was the effect that preserving a forest cover on these mountains had upon the navigability of the streams that rise on their slopes. Anyone who has seen how rapidly erosion goes on in that section of the United States, once the cover of vegetation has been removed, is not inclined to question the wisdom of the legislation that was then enacted, or of that which has followed since in providing additional appropriations. But there are other sections of the country where similar provisions might well be put in force. France has had to work for a century to remedy the evils that resulted from lack of thought for the future. Of the many lessons Americans can learn from European forest history that of the control of torrential streams is not the least.

THE PREVENTION OF AVALANCHES

The second type of protection forest work in the Alps, both in France and in Switzerland, is the prevention of avalanches. In the United States this subject is of course of less importance than is stream control, but nevertheless it may be recalled that not so many years ago there occurred in one of the northwestern states a dramatic example of this form of damage, when a transcontinental train was overwhelmed, with considerable loss of life, by an avalanche that came down from a mountain side above the track that had shortly before been clean-cut. The details are given in a circular of the U. S. Forest Service.

In avalanche control, as in the case of torrents, the idea is to check the trouble at the source. This means that what precautions are taken must be where the avalanches start, that is, near the top of the steep slopes. If one desires to visit these localities it behooves him to have stout legs and good wind. But if he is a lover of nature, he will be well repaid for his climb by the wonderful views of the surrounding mountains that he gets as he stops to catch his breath.

The avalanche proper is a great snow-slide. In the heavy storms of the winter great masses of snow accumulate at the base of the sharp peaks and high ridges that catch the full force of the wind. As the warmer weather begins to make itself felt in early spring, portions of these snow fields start to slide. It does not take much to set a ball rolling. Down the steep slope it goes, gathering force and momentum as it travels. Soon it develops into a true avalanche, that rips out everything in its path and on reaching the valley covers up and destroys whatever there may be in its way.

It may be asked why people continue to live and build in localities that are subject to such danger. The same question can be asked of those who live below the flood line along any of our own great rivers. Convenience and business consideration outweigh the memory of former disasters—until the next time. But with avalanches it is possible in many places to take precautions that afford reasonable safety.
HOW THE WORK IS DONE

The whole idea is to stop the snow at the top of the steep slopes from starting to slide. As high up as it is possible to grow trees—and of course many of the worst areas for avalanches are above timber line—dependence is placed on a forest cover treated as protection forest. Above the forest the method is to build barriers, masonry walls, that shall hold the snow in place or actually stop small slides, on the same principle that the points inserted between the tiles of a roof keep the snow from sliding off into the street.

At Chamonix, France, at the very top of the slope there are also being constructed snow fences, made of cross planks held in place by steel bars set in the rock. After the manner of snow breaks along railroads, these barriers prevent drifting to some extent. At any rate they help to fix and hold the snow at the particular point where the avalanches are most liable to start.

As all the material used in construction has to be packed up from the valley, often on men’s backs, the costs of this work are high. Even with wall building the figures are large, for it is hard to hold laborers in the face of the cutting winds, the fogs and the cold that even in summer are of frequent occurrence at these high altitudes. But in the aggregate a great deal of avalanche control work has been done both in France and in Switzerland, with beneficial results to the valleys below.

There is some danger from avalanches that start from the breaking off of great boulders from the almost perpendicular walls of the “needles”, or sharp peaks, along the ridges of the divides. In many instances it is impracticable to do anything of value to avert damage from this particular source. But again there are places where the cliff can be shored up, as it were, or where a great boulder that has lodged a little way down the slope can be held in position by the building in of a foundation, or retaining wall, on the lower side. Above the timber-line use is made of hardy shrubs and of grasses, which started in clumps and lines, spread over the surfaces of bare soil and so prevent erosion by washing.

Another type of avalanche is that caused by “land-slips”. In this case the upper strata becoming super-saturated with moisture, may if they lie over a clay substratum simply slide off in large blocks in continued wet weather, and especially in connection with the action of frost. A particularly good example of this sort of thing occurs at Murren, a mountain village above Lauterbrunnen in Switzerland. Above that little town the mountain wall rises almost as a precipice for something like 2,000 feet. Above this the slope is moderate but steady. Above the cliffs are strata of clay that underlie the surface soil. If a slide started it would go over the cliff and fall on a part of Lauterbrunnen. The remedial measures that have been taken consist of large strong retaining walls, supplemented by small barrages of stone and wicker work to stop erosion on the surface, and of the replanting with forest of open areas where trouble might start from snow slides.

The forester, if he be wise, adopts measures in all that he does that permit him to work with, rather than contrary to nature. Even when it comes to combating natural forces he still does well to rely on living things as well as on artificial helps, such as walls and dams. Naturally all this leads to a variety of methods, for what is effective in one locality may not be at all what is required in another place. Reboisement is a task that calls for ingenuity and perseverance. That is what gives to this work its peculiar fascination.

As never before the protective role of the forest is today being recognized. The indi-

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FIRE LINE IN THE MARITIME PINE FOREST, LACANAU-OCEAN, FRANCE. THESE FORESTS ARE PARTICULARLY SUSCEPTIBLE TO FIRE
rect benefits that come from rightly located and properly tended forests of this class, especially in mountain regions, may even entitle them to be regarded, at any rate to the nation, as being of equal value with those more favorably located, that make their return in supplying timber and wood and other forest products. So whether the purpose of afforestation and other related work in high mountain regions is torrent regulation or avalanche control, it becomes a part of the forestry program that is rightfully entitled to the emphasis that the French Forest Service and the Swiss Forest Service are now giving it.

RECLAMATION IN THE SOUTH OF FRANCE

The other special development in forestry for which the French are noted, perhaps even more than for reboisement, is the reclamation of the sand wastes in the Landes and other contiguous departments in the southwest of France. Putting the story in one sentence, the work of the foresters has within a little over a century transformed that portion of the country from being a region that was poverty stricken, unhealthy and practically without economic value, into one of, if not the most prosperous, substantial and salubrious parts of France. It is a truly remarkable transformation. How it has been brought about is a tale worth telling.

The southern part of the west coast of France runs for something over one hundred and fifty miles on an almost north and south line. It is a flat region and between the mouth of the Garonne river, north of Bordeaux, and the Adour river, that empties into the ocean near Bayonne, the coast line is one long beach of fine sand. Facing the Atlantic, it is subjected to the prevailing westerly winds which are often of high velocity. The result is that all along this stretch of coast, in the departments of Gironne and of Landes, sand dunes are formed. In former years these sand dunes moved steadily inland, rendering the region behind a barren waste.

The situation along the southwest coast of France, as regards sand dunes, differs from that of our Atlantic seaboard in that in France the prevailing winds blow inland from the sea, whereas with us the winds come mainly from the land. For this reason the dunes along the central Atlantic coast of the United States are not dangerous. But still they present a problem, as is typified by the dune control work on the so-called “Province lands” on Cape Cod. Elsewhere in the United States we have other shifting sand areas; the stretch on the Pacific, near the Presidio at San Francisco; certain sections along the Columbia river; the sand hills of Nebraska; and the area at the south end of Lake Michigan that can almost be overlooked from the “Wide East Windows”. The control of shifting sand is therefore to us more than of mere academic interest.

HISTORY OF THE DUNES OF GASCONY

Some of those who read this letter may remember the pictures of the Landes which used to find a place in the old school geography—shepherds mounted on tall stilts, all busily knitting. The women of the Landes still knit, but there is no need any longer for stilts. What was formerly waste land is now productive forest. The old marshes and swamps that lay among the sand hills have been drained. When the inhabitants wish to go from place to place many of them now travel by automobile. It is a different country. And the change is all due to the work of the foresters.

It is supposed that in ancient times much of this section was forested. But by the end
of the sixteenth century the destruction caused by the shifting dunes was a matter of national concern. As the dunes moved inland they not only destroyed farms, but actually overwhelmed villages. Near Mimizan is to be seen an ancient church, dating from about the twelfth century, the west front and nave of which succumbed to the inroads of the sand.

As these years went by many recommendations were made as to ways to relieve the situation in the Landes, but it was not until 1787 that anything really effective was actually begun. In that year a French engineer, Bremonterie, started the work that has culminated in the transformation that we behold today. Bremonterie's idea was that if the dunes could be stabilized it would be a relatively simple matter to reclaim the back country. So he set to work to direct the forces of nature in such a manner that there should be built up all along the coast a littoral or barrier dune, which, kept in place by sand binding grasses and other vegetation, should prevent the formation of other dunes, and so protect the land behind. It required many trials to learn how to do it, but finally methods were evolved that proved satisfactory.

Very briefly the several steps in the program of building up a barrier dune are as follows: First fences are set up parallel to the shore, a little above high water mark. The wind blows the sand up against the fence and starts a dune. The stakes of the fence are then raised several feet. More sand is blown in and the dune gains in height. This process is repeated again and again till the height of the dune is sufficient to offset the power of the wind to carry the sand over the top in sufficient quantity to be dangerous. The height of the completed littoral dune varies with the locality. Usually it is between 40 and 50 feet. At the same time, and along with its building up, the surface of the dune, top and sides, is planted with a sand binding grass, maram, genista (a sort of broom), heather, and one or two other shrubs. At first, when there is still tendency for the sand to blow, in this zone behind the barrier dune, pine branches, reeds, or other covers are placed in regular rows, one end of the branch, in the case of pine brush, being fixed in the sand.

The protective zone behind the barrier dune is not usually very wide—perhaps two to three hundred yards. Then comes the forest, of maritime pine. Along the outer edge the trees naturally are short and crooked, for they have to withstand the wind, but farther in one finds better development, and somewhat back from the shore excellent stands. In Bremonterie's time it was necessary to establish the maritime pine by sowing the seed with the genista. It now reproduced itself naturally and thus today the only worry that the local forester has about securing reproduction is to see that the proper silvicultural methods are carried out in the management of the forest.

In an official statement, issued in May, 1921, M. DeLapasse, conservateur at Bordeaux (a position corresponding to that of district forester in the U. S. Forest Service), gives the area of the maritime pine forests in the six departments in southwest France, where it is the important tree, as 821,400 hectares (1,979,574 acres). The Landes has 462,400 hectares, Gironde 229,200, the others much smaller areas, under maritime pine forest. For this total area, the average annual production of timber and wood is given as 1,125,000,000 cubic feet; the forms in which it is put on the market being timbers, telegraph poles, ties, mine props and fuel.

Mine timbers, especially for export to England, have always, in recent times, been one of the chief products of this region. The English ships that bring over coal from the mines in Wales and the Midlands carry back "pit props". They can do it cheaply, as oth-
otherwise these ships might have to go in ballast. Therefore, the maritime pine can be landed at the English mines cheaper than can mine props from near-by English forests.

During the war the maritime pine forests played a very large part in supplying timber and wood of various sorts needed at the front. One of the important centers of American Forest Engineers in France during the war was near Mimizan, in the Landes. Woolsey says that 41.4 million board feet were cut in their operations.

**THE TURPENTINE INDUSTRY**

But the value of the maritime pine does not rest alone in its wood. The production of resin is even more important. Indeed these forests are managed primarily for the yield of turpentine and secondarily for their timber. Especially is this true of the privately owned portions, which as a rule occupy the more productive soils. In some of the forests of this class two-thirds of the income is derived from resin.

This letter would have to be much longer than space permits to describe the turpentine operations in the maritime pine forests of France. Those who are interested can find full information, in detail, in Chapter 8 of Major Woolsey’s “Studies in French Forestry”, to which reference has already been made, more than once. But very briefly it may be said that the method in use differs mainly from the American method in that much narrower faces are cut than with us and that the cut is not as deep. The width of face in France is 3.5 inches. There are also differences in the way in which the face is increased in height.

The procedure in the management of these forests is in general somewhat as follows: Following the regeneration of a stand cleanings and thinnings are made at five-year intervals until at 25 years there should be about 200 trees per acre. Pruning is also done, the branches being removed up to 10 or 15 feet above the ground. At about 25 years tapping of the trees begins to be combined with thinning; those that are to be removed being the first to be tapped. “Permanent trees are not tapped till they are 13 inches in diameter.

There are two classes of tapped trees: Those where the object is to tap without killing the tree (Gemmage a vie) and those that are being tapped to death (Gemmage a mort). The smaller sized trees that are to be removed in the thinnings, but which are large enough to yield turpentine, may at once be tapped and killed but more often they are first tapped without killing for a time, before they are subjected to gemmage a mort.

When the permanent trees are large enough to tap (13 inches, diameter breast high is the minimum) a face is started near the root swelling, which is extended upward in subsequent seasons. The method now is to work one face four years, when its top will be at a height between 9 and 10 feet. As the tree increases in size additional faces are cut, but only as may be designated by the local forester. The rotation on state owned forests is usually 70 to 75 years. It will thus be seen that on mature trees, there may in the end have been ten or a dozen faces, each worked for four years. Finally the tree is tapped to death and then cut for its timber.

As to yield, Woolsey (p. 202) quotes De Lapasse as follows: “One might say that 166 quarts can yield annually a barrel of resin, but in order to collect 100 quarts it is necessary to have 50 pines tapped alive, each tree producing an average of two quarts. In the thinnings, 1000 trees tapped to death may yield, according to the size of the trees, from 4 to 6 barrels of 340 quarts each. In this case 59 pines tapped to death are necessary to obtain 100 quarts of resin. In the regeneration felling, with pine 67 to 70 years old with four faces each, each face can produce one and one-half or six quarts per tree. An acre stocked on an average with 90 trees will yield about 480 quarts of resin per year”.

With the fixation of the dunes and the establishment of the forest went also the draining of the wet areas that in old times were the breeding places of disease. Today apart from their economic assets in forest products, the departments of Gironde and the Landes have many health and tourist resorts. Arcachon is a case in point. But all along the coast, the combination of a wonderful beach with the forest close at hand behind, had led to the creation of many summer colonies, that range from simple hamlets of a few cottages up to elaborate and fashionable vacation towns.

**THE CONCLUSION**

The writer of this letter has no desire to moralize, but it is impossible to visit the southwest of France and not be impressed with what has been accomplished there in the past century.

The big, outstanding feature about it all is that here was a great section of worthless land, where the conditions of life for the few people who did manage to hold on were steadily going from bad to worse, that through the agencies of human skill and perseverance has been absolutely transformed into perhaps the most prosperous part of France.

In America we do not have, fortunately, anything quite like what the Landes was a century and a half ago. Our problems are different but nevertheless comparable, for we do have areas, once covered with forest but now merely waste places, that can be restored to productivity only by the replacement of the forest. The French did not find their task an easy one. Neither, probably, shall we. But it is a task that sometime we have got to tackle. A good starting point would be some of the barren spots used to be the white pine belt of the lake states.

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City, Town and Communal Forests
A Phase of European Forestry that Has Particular Significance for the United States

A characteristic and striking feature of European forestry is the number of communal, town and city forests that one sees in each of the several countries. Indeed this class of forest land plays a large part in serving the needs of very many persons who otherwise would be hard put to it to obtain the supplies of wood that they absolutely require. It is a phase of forestry that should be of interest to Americans, for it holds lessons that could well be taken to heart by many communities in the United States. The purpose of this letter is to give some account of this system, with especial reference to certain forests that are recognized as being classic examples of this class of publicly owned forest land.

The history of many of the communal forests runs back to very early days. Some are the remnants of the land that in pre-feudal times was held for the common use of all the people of the tribe or community in a given locality. More have their origin in prescriptive rights that were secured by the common people during the Middle Ages, under the feudal system. Others, of more recent date, have been obtained through gift, or purchase, or as the result of land adjustments made at the conclusion of a war. But, however they came into being, forests of this class are now distinctly a factor to be reckoned with in all the European countries.

Mention has been made, in an earlier letter in this series, of the servitudes, or rights of user, that have so much bothered the European foresters in times past, especially during the middle of the nineteenth century, when by purchase or compromise most of
these ancient rights were eliminated from the state owned forests. But perhaps, from its bearing on the topic now under discussion, it may be in order briefly to summarize how such rights became established. They were for the most part, as have been said, an outgrowth of the feudal system.

In theory there was not a little that commends itself under that method of government. But its weaknesses outnumbered its good features and led to abuses which when finally they came to be corrected set in motion forces that are at work even to the present day. Under the feudal system the common people belonged to the land. In return for the protection which they received from the baron, or count, or local prince and his fighting men, the people contributed to him a certain percentage of their labor and of their crops. To secure better protection the people lived in walled towns centering about the castle, the fields outside being held more or less in common, while the forest was thought of as a place primarily devoted to hunting, in which the game was strictly reserved for the count or baron and his friends. But as time went on it often became necessary to make concessions to the people, notwithstanding the fact that in many places they were gradually sinking from the status of freemen into that of serfs. Some of these concessions took the form of privileges to graze cattle, to run swine in the forest, or to take wood for domestic and other use. Gradually these usages became prescriptive rights and so finally it came about that the owner of the forest found it burdened by so many servitudes that he had only in part the say as to what he could do with his own property.

Coming down to recent times we find that the servitudes in the forest had become vested in the recognized citizens, the land holders, of given communities. When these rights came to be extinguished 50 to 75 or more years ago, these persons either were bought off for a lump sum; or more often were given a solid block of forest land in exchange for their right to graze cattle or take wood over a larger area. The blocks so designated are the communal forests of today. Necessarily, there were all sorts of variations in the negotiations but in general this was what happened.

Where communal forests originated from the results of a war, it was usually those towns that craftily or legitimately were able to retain possession of the forest land of which the former owners had been dispossessed, that benefited most.

So much for history. As to the reasons for the desirability and necessity for communal forests, we find the answer in two words, fuel and transportation. As conditions became more settled in the European countries and as population increased, the accessible forests were naturally the first to begin to show the effects of exploitation. With the difficulties of transport it became evident that the local wood supplies must be conserved and continued. Especially was this true with regard to fuel wood. This accounts for the prevalence of beech in the communal forests of south Germany and also in some of those in Switzerland.

Precisely the same economic factors were at work in America 80 years ago, when Emerson in the "Trees of Massachusetts" published about 1840, argued for the protection of forests in that state lest the people suffer from a fuel famine. We have only to recall the "Wood Using Campaign" throughout the eastern states in the coal scarcity during the war, to be reminded of how big a factor transportation is in getting a bulky crop like fuel wood moved even a comparatively short distance.

THE GRINDELWALD

But to get to specific examples of European town and city forests. Unquestionably the most noted forest of this class in forestry annals is the city forest of Zurich, Switzerland,
the Sihlwald. This is in large part due to the fact that so much is known of the exact history of that forest through the comprehensive book by the late Ulrich Meister, for many years Stadtforsmeister von Zürich. This work, in German, "Die Stadtwaldungen von Zürich", is indispensable to one who wishes really to study this forest. It was published in 1883. A second, enlarged edition, with many illustrations, came out in 1903, just after one of the 20 year grand revisions of the working plan, not long before Forstmeister Meister's death. (The book is now out of print and is not easy to secure from the regular booksellers. But it may be obtained from the editor, Albert Müller, Sonnenquai 18, Zürich, who still has a limited number. The price is 12 francs.)

The Sihlwald is a forest of 2580 acres (1044.8 hectares) in area, situated on the east slope of a range of hills, known as the Zürichberg, that runs south from Zürich. The highest point is Albishorn (2974 feet). The forest lies in the valley of the Sihl river. It is 14 kilometers by rail from Zürich, by the main line that runs up the Sihl valley. If they are on the lookout, travelers from Zürich to Zug and Lucerne can catch a momentary glimpse of the Sihlwald as their train dashes out of one tunnel and into another, across the narrow valley.

The history of the Sihlwald as a forest supplying the needs of Zürich, runs back to the year 833, when the German king, Ludwig, gave it, with other lands, to his daughter Hildegarde, the first abbess of the nunnery at Zürich. During the succeeding centuries it continued to supply construction timber and other wood required by the people of the city. In 1524, with the political changes incident to the Reformation, the Sihlwald became the property of the city of Zürich, in whose ownership it has since remained.

The old chronicles record various ordinances in regard to the use of the Sihlwald and indicate that there was a more or less definite plan of management, at any rate from about the beginning of the sixteenth century. The appointment of two foresters was definitely authorized in 1460, and there are many other indications that the forest was carefully looked after. Modern working plans for the Sihlwald date from 1834, the years of grand revisions being 1860, 1880, 1900 and 1920. There are periodic revisions every 10 years. The occasion of Forstmeister Meister's book was the grand revision of 1880.

It was interesting, at the headquarters of the forester on the Sihlwald, to see the manuscript copy of this working plan with its subsequent revisions. One point of especial value that this particular plan has is an appendix in which is recorded the reasons why certain pieces of work were done on the forest. By this means subsequent foresters have the opportunity to check up more accurately the projects initiated by their predecessors. Especially is this true if the project was somewhat experimental in character and turned out badly; knowing all the facts in the case, that particular mistake is not likely to be repeated. It would be well if more forest working plans were as completely supplemented by progress reports.

The forest of the Sihlwald is predominantly beech, managed on a rotation of 100 years. The silvicultural method is shelterwood, where the final crop is removed in a series of cuttings, so spaced as to years, as to induce natural reproduction of the new crop. The preparatory cuttings open up the crown canopy and let in light that favors the production of seed and also enables the seedlings to become established. After a complete stand of seedling trees has been secured, the remainder of the mature crop is removed. But prior to the preparatory cut, there is made a series of thinnings while the stand is between the ages of 30 and 80 years, that aim to better the quality of the forest and as nearly as may be always to keep the number of trees

THIS STAND OF SPRUCE IN THE WINTER-THUR IS 80-90 YEARS OLD. NOTE THE DENSE GROWTH OF THRIFTY YOUNG TREES
per acre in accord with the requirements of a fully stocked, normal stand. The wood and timber from the thinnings of course form an important part of the annual proceeds from the forest.

It is interesting to note that in former times the Sihlwald was not a beech forest, but a mixed forest of conifers and broadleaf trees. Beech came in to meet the demand for fuel, already commented on. The idea at present is gradually to increase the percentage of conifers and so eventually to bring the Sihlwald back into being a mixed forest, because of the greater commercial value of the conifers. There are already some softwood stands. Where planting must be done, as in windfall areas, conifers are generally used. Larch is being planted on the higher slopes.

At times there has been much trouble in the Sihlwald from wind throw; also from the breakage of trees in young stands by snow and ice. A surprising amount of damage often results in these dense stands when after a storm the weather suddenly changes and the soft, wet snow on the crowns turns into ice. When a forest is under highly intensive management an importance attaches to injuries of this sort that never would be deemed possible under American conditions. A very serious storm of this character occurred in September, 1885, when something over 210 acres of young beech were absolutely destroyed.

For transporting the logs down the slope there has been constructed a narrow gauge railroad, in part with movable tracks, that seems well to serve the purpose. Log shoots are also in use for both timber and fuel wood. The smaller wood, branches and the like, is usually brought down on sleds over prepared tracks; the sleds being carried up the hill by the laborers. Similar sleds are in use in other parts of Switzerland and also in the Black Forest in Germany.

The area of the Sihlwald is hardly great enough profitably to support a local woodworking industry, but a small mill established in earlier years is still maintained and actively operated. Lumber, railroad ties, tool handles of various kinds, stakes and poles are the main products, together with that from an excelsior machine that turns out four grades of this material, called in Europe "woodwool". Much of the woodwool from the Sihlwald goes to Italy for use in packing fruit for transportation. There is also an impregnating plant for the preservative treatment of railroad ties. Some 30 men are employed in the mill, and about 120 more in the forest, so that the Sihlwald supports directly a comfortable little community. In connection with the Sihlwald there is maintained in Zürich a city woodyard from which the people of this city can be supplied with fuel wood. At the mill in the Sihlwald bundled kindling wood is also prepared for sale at this market.

A STAND OF 60 YEAR OLD BEECH IN THE SIHLWALD, SWITZERLAND, THE FOREST FLOOR CLEAR OF UNDER-GROWTH.

The normal annual yield of the Sihlwald, including both the thinnings and the final cut, averages around 8.5 cubic meters per hectare (2.47 acres). With the present unsettled condition of prices and the high cost of labor, net returns in money values are of little moment. Such data are therefore omitted from this letter. In general it may be said, however, that in normal times the Sihlwald is an investment that yields a satisfactory revenue. The memorable thing about this forest is that it has been supplying Zürich with wood for over one thousand years.

THE FOREST OF WINTERTHUR

Not far from Zürich, to the northeast is another city forest that, except it lacks the historical background of the Sihlwald, is almost as interesting a place to visit. This is the forest of Winterthur, that city being an important manufacturing center where espe-
sially are made various kinds of machinery. It is 27 kilometers from Zürich. The forest lies on the rising land immediately behind the town.

Whereas the Sihlwald is predominantly a beech forest (60 percent), Winterthur is a coniferous stand, containing in some of its compartments as fine trees as one could ask to see anywhere; pines, spruces and firs 120 to 140 years old, 20 to 26 inches diameter breast high and from 100 to 125 feet tall. None of the trees that one sees in the European forests has very large diameter, but in the better forests they make up for this by their tall, straight, clean, cylindrical form. Winterthur is a case in point.

The forest of Winterthur covers an area of 2984 acres (1208 hectare). It has long been a city forest and for more than a century has been managed under a definite working plan. The rotation normally in use is 100 years, but there are numerous stands older than this and in certain places over-

to 1.5 francs. Somewhat larger branch wood, especially of the broadleaf species, is made up into bundles 80 centimeters (31 1/2 inches) long and one meter (39 1/2 inches) in circumference, held by two wires. Fifty bundles are considered to equal one cubic meter. The larger fuel wood is corded and sold alongside the roads, the same allowance for open space in piled wood being used as is customary with us, namely, 30 percent. Dead branches and cones are collected by poor persons on certain days of the week, so absolutely nothing which can be used is allowed to go to waste. This is not an argument that American forests should be handled in like manner, but it is of interest to a visitor to see the extreme lengths to which close utilization can be carried under different economic conditions.

In Winterthur, as in other of the city forests visited in Switzerland and in Germany, ample provision is made for those who repair to the forest for recreation. All the crossings of the forest roads have sign boards, standards of pine are being allowed to remain into or through the second rotation. The silvicultural method followed is group-wise shelterwood. Small openings are made in the mature forest, which as reproduction begins are gradually enlarged by the removal of more and more of the old trees, until finally the old stand is replaced by the new crop. Where the natural seeding is not satisfactory the planting of nursery stock is resorted to. It must be remembered that Winterthur, in common with the other forests with which this letter deals, has a system of permanent forest roads, so that with the ready market for all forest products even a few trees can be removed from a given place at a profit.

Particularly close utilization is a feature of this forest. Even the small branches of the spruces and firs are sold for use in covering garden beds. The price per bundle is 1 seat are provided at frequent intervals, trees are cut out to make vistas where there is a chance for an outlook, and on the top of the hill in the center of the forest is a tall steel tower from which one can get an admirable view over the surrounding country.

FOREST ADMINISTRATION IN SWITZERLAND

The administration of the Winterthur forest, as is also the case with the Sihlwald, is in the hands of a stadtforstmeister, who has a technically trained assistant (forst adjunkt) and several "unterförster", or guards and rangers. At Winterthur there are six men of this grade, and from 20 to 40 permanent laborers. Owing to the present high rate of wages the number is now reduced to twenty.

The stadtforstmeister is responsible to the oberforstmeister for the canton, who also has the supervision of the forstmeisters in charge of the cantonal forests of the several
circles" in his district. The oberforstmeister for the canton of Zürich is Herr Theodor Weber, who is now the president of the Swiss Forestry Association (Schweizerischer Forstverein), an organization made up of professional foresters, forest landowners and others interested in forestry. This association publishes a monthly journal, in a German and a French edition, and through its committees is an active force in forestry in Switzerland. It was the great good fortune of the writer to have Herr Weber accompany him to Winterthur. The day spent in that forest was a highly profitable one.

While on the subject of administrative organization, a word may well be added concerning the other cantons and the confederation. Switzerland is divided politically into 22 cantons, each of which preserves a large share of autonomy. Each, for instance, has its own forestry organization, all generally similar to that of Zürich, although differing in details and in the titles borne by the foresters. The cantonal forest services are independent of the federal government and of one another, much as are our own state forestry organizations. But there is this exception: Under the Swiss forest law areas that are required to be kept under forest for protective purposes, as torrent and avalanche control, are declared to be "protection forests", and then come under the supervision of inspectors who make up the staff of the Forestry Bureau of the Confederation, that has its headquarters at Berne. All work on these forests is, however, done co-operatively with the cantonal forest services.

The office at Berne also compiles and publishes statistics for all of the cantons.

The Swiss Forest School is a federal institution. It is located at Zürich, where it forms a part of Zürich University. Here also are the headquarters of the Forest Experiment Station, which under the able direction of Professor Dr. Arnold Engler, is making valuable contributions to the scientific side of forestry.

THE COMMUNAL FOREST OF GRINDELWALD

But this letter is supposed to deal with town and communal forests. There is one other Swiss example that deserves mention, the mountain forests of the commune of Grindelwald, in the forest district of Interlaken, in the canton of Berne. Grindelwald, as every one knows, is a little town nestling in a high valley in the Bernese Oberland, under the shadow of the high peaks of the Wetternhorn and of the Jungfrau. The commune is made up of seven mountain villages, each of which has its forest. Three-fourths of the forest land in the valley belongs to the commune. From their location these forests all fall into a protection forest class. They are managed under working plans, drawn up by one of the assistants in the district forester's office and supervised and administered by the local ranger. No trees can be cut until they have been marked by the ranger, and strict care is taken not to exceed the allowed annual limit.

The interesting point is, however, the way in which the timber so cut is distributed among the people, for there is not enough to permit any to be shipped out of the valley. Applications for timber and wood may be made only by bona fide residents of the commune, landowners. They are divided into six classes. First served are those who want lumber for repairing the little cabins that shelter the cattle in the high pasture lands, or for the construction of new cabins. In local usage these mountain pastures are "the alpine", not the mountain peaks as we normally use the term. Second, comes wood for building and repairing fences on the mountain sides. Third, repairs to cattle stabiles in the valley. Fourth, repairs to houses in the valley. Fifth, lumber for new houses—which are usually put up by all the neighbors joining in a house raising "bee", just as used to be the custom in America, when the Ohio valley was still on the frontier. (Likewise the owner of the house sets up drinks for the crowd, the only payment, just as did our own worthy forbears.)

When all these needs are served, if there is any wood left, the sixth-class applicant comes to be considered, the man who wants fuel. Often he does not get any, for the allowed cut has been exhausted; but he seldom goes cold, for almost every land owner has a little patch of private woodland and also the right to gather dry wood and branches in the communal forest. Of all peaks as is on a very small scale and rather primitive as to methods—the lumber for the repairs to the alpine cabins has for instance all to be packed on men's backs, up slopes where one plank makes a good load—but it serves to show the value of communal forests and the need of exercising the greatest care in their perpetuation.

Another similar custom is the way in which grazing is regulated in the high mountain pastures. It goes by the amount of land a man owns in the valley. If he has one "ar- pent" he may send up 8 sheep, or 8 goats or 1 cow. If he has but one half arpent 4 sheep or goats, and so on. Locally, it is said that a man has so many hoofs, or toes, of land; a cow being classed as having 8 hoofs. The mountain slopes are usually divided into three paddocks, the animals being allowed to proceed to the higher land as the summer season advances. By these regulations the pastures are never overstocked, nor subjected to the danger from erosion that would follow over-grazing.

One point in the Swiss forest law regarding privately owned forest land may perhaps here be noted. In the federal enactment that applies to all the cantons it is made specific and mandatory that the existing forest area of Switzerland shall not be reduced. Consequently, when the private owner of forest land cuts his forest he must
either do it in a manner approved by the local forest officer, or within a specified time, two years, replant it artificially with nursery stock. If he fails to do so the government does the planting and sends him the bill. Payment or imprisonment are the remaining alternatives. This provision of the law applies even to areas in the agricultural valleys where the owner desires to transform his forest into farming land. He may be permitted to do this after due consideration by the local officials, but he must still afforest an equal area somewhere else. The present proportion of forest land to total area must be maintained.

During the war, owing to the high prices that could be got for lumber shipped to France or to Italy, all the forest lands of Switzerland were temporarily declared protection forest and thus made subject to inspection and more effective control. In this way wholesale exploitation of private forest land was prevented, for with wartime prices the owner who clear cut could well have paid his fine and still made a very handsome profit. The government did not wish to see the local supply so much reduced. This law is still in force, though by now of course prices have dropped. The question of whether or not it shall be repealed comes up before the National Assembly of next winter.

CONCLUSIONS—APPLICATIONS OF THE PRINCIPLE

The conclusions which an American may draw from visits to the city, town, and communal forests of Europe may perhaps be summarized somewhat as follows: It is quite obvious that the economic conditions that obtain in Europe do not hold for the United States. There nearly markets and dense population justify highly intensive forest management, with permanent roads and absolute utilization. With us there is another set of conditions altogether, to say nothing of differences in climate, in the species that make up the forest, and above all in the customs and habits of the people. But notwithstanding all this, it is borne in upon the visitor that these European communities have got hold of a principle, and are using it to their advantage, that could equally well be applied in other countries.

In a few of the smaller German villages, it is said that the annual net proceeds from the community forest are sufficient not only to pay all the local public expenses, such as schools, roads, official salaries and the like, but also to permit of a cash dividend to all the land owners, in place of a tax levy. That this is exceptional is true; also it is true that it is only found in a few very small communities. But in many European towns the net revenue from the town or communal forest is enough materially to reduce the yearly budget of the town, which would otherwise have to be raised wholly by taxation.

In Switzerland, with at least some of the city forests, the net income goes to the support of specified public, or quasi-public institutions, like schools, hospitals, libraries, and art museums. Just how much of their income these and perhaps other similar organizations receive from the forest, the writer in the time at his disposal was unable to ascertain. But that does not particularly matter. The important thing is the principle. If only a part of the upkeep comes from the forest it is a good thing for the community.

And further with a community forest there is bound to be a development of local industry; small perhaps, but nevertheless of value. The more persons who are employed in permanent, stable industries the better it is for any community.

Now for the application. Almost every American city, town and village has in its neighborhood areas of waste land, of little or no value for agriculture or for any other productive use except the growing of trees. But it can do that. And moreover it can be bought very cheaply. Very often there is already enough young growth on the land to make, under proper care, the beginning of a forest. Refinements and intensive practice of forestry can come later when the forest begins to pay a revenue. A very small investment by the town at the start will set things going.

And so the lesson that the writer believes America can gain from these European town forests is not the importation of European methods or systems, but rather the adoption in practice of the principle that has led to such beneficial results on the other side of the Atlantic.
Some European Forest Schools
An Account of Visits Paid to Forest Schools in Great Britain, France, Switzerland and the Scandinavian Countries

From whatever angle one considers European forestry he cannot fail to be impressed with the prominent part that is played by the forest schools. In no small measure the accomplishments that lie to the credit of the forestry profession in the continental countries can be traced back directly to the training given at these institutions. It seems to the writer appropriate, therefore, to devote this, the concluding letter in this series, to certain observations on the forest schools of the countries which he visited, just as in preceding letters he has endeavored to set forth some of the impressions made upon him by the forests and the forest work that he there saw in progress.

This letter is in no way intended to be an exposition of educational methods, or a technical discussion of differing curricula. Rather it is a popular account of the schools visited, with a few notes on their organization and their relation to the other forestry work of these several countries. In it only passing reference is made to the secondary forest schools, where are trained the men who fill the subordinate positions. Because the forest schools in Great Britain differ in material ways from those on the continent, it seems natural to consider the schools visited in two groups; taking up first those on the mainland.

THE FOREST SCHOOLS OF CONTINENTAL EUROPE

In the time at his disposal the writer was unable to visit the forest schools of Germany. But by reason of the fact that these institutions have played so important a part in the development of forestry education, it is only just that a few notes regarding them be included in this statement. For a comprehensive account of a representative German forest school, reference may be made to an article by Prof. A. B. Recknagel of Cornell University, that appeared in the "Forestry Quarterly," Vol. 11, No. 1, in 1913. In Major Woolsey's "Studies in French Forestry," a section is devoted to education in Forestry in France.

Had it not been for the German forest schools, particularly those at Tharandt in Saxony and Eberswalde in Prussia, and Tharandt in Saxony, the course of forestry education would have been very different from what it is today. And this not only in Europe, but throughout the world. Foresters everywhere are under a deep debt to the men who started these German schools and to those who in later years faithfully carried on the work in accordance with the ideals set up by the founders. Two men rank in forestry annals as the fathers of modern forestry, Georg Ludwig Hartig and Heinrich von Cotta, born respectively in 1764 and 1768. Both had to do, among other things, with forestry education. Their period of greatest activity lay in the first quarter of the nineteenth century, when they, with their associates, well and truly laid the foundations on which rests the forestry of today.

Of the existing forest schools of Germany, Tharandt is the oldest, dating from 1816. It was an outgrowth of a "Master School" established by Cotta in 1785, a type of school in vogue at that period.

The master schools were private undertakings, a forester gathering about him apprentices, as it were; to whom he gave more or less formal instruction, combined with much work on the forest. In America the Biltmore Forest Academy, conducted for a dozen years prior to the war, by Dr. C. A. Schenck, was essentially of this type. Since 1816 Tharandt has been a state institution. Notable among its directors was Judich, in the middle of the last century. The schools at Eberswalde and Münden date respectively from 1839 to 1888. The former is somewhat better known but both hold places of high rank. There are also chairs of forestry at several of the German universities.

Down to the present day the men who have made the most notable contributions to the development of the science of forestry in Germany have been either members of the staff of one of the forest schools or closely connected therewith. This holds equally true of the other continental countries, so that in a very real sense it is just to say that directly through contributions to forestry knowledge made by the professors, or indirectly through the work done by their graduates, the schools have in fact been the directing force in bringing forestry to the place it now holds. But this letter deals with the schools of other countries. Enough of historical reminders.

GENERAL OBSERVATIONS ON FORESTRY INSTRUCTION ABROAD

Before proceeding to individual schools there are certain general observations that may be made as applying to all the forest schools of the continental countries. The first thing that strikes an American about these schools is that in any given country of Europe, education in forestry is an integral part of the forestry work of the government, and that the school is a government institution. Further, in the Scandinavian countries, in Switzerland and in France, there is but one forest school of the first class. For comparison it may be noted that in the United States 24 universities and colleges offer a forestry degree and of these 12 grant to graduate
students the master's degree in forestry. To those who desire to post themselves on the present status of forestry education in the United States, attention is called to a very recently issued bulletin of the U. S. Bureau of Education, No. 44—1921. "Education in Forestry: The Proceedings of the Second National Forestry Education Conference, Held at New Haven, Conn., December, 1920."

Next, one notices that the European forest schools are run with particular reference to supplying men for the government forest service and only incidentally for training those who may find employment with private owners or corporations. This naturally leads to restriction in the number of students allowed to matriculate and also to a more or less rigid curriculum that is followed by all students. This does not necessarily imply that all the graduates actually enter the government service, but it does mean that all men in the forest service of that government must be forest school graduates. In these days this principle holds as well for the subordinate forest officers. To be eligible for such positions these men must have completed satisfactorily the course at a secondary forest academy, or as we should say, a ranger school.

Third, is to be noted the close relation between the forest school and the army. Under the system of compulsory military training the young forester naturally has to serve his time in the army along with his fellows, but the military training of the foresters is usually so arranged that at the end of the course they emerge as officers, at least of the reserve crops. In some countries this comes about automatically. In France, for example, all government foresters have a military rank, graduated according to their positions. In some of the other countries it is more or less of an unwritten law that a forester follow through the various steps that shall qualify him for a commission.

A fourth point is the stress that is laid on combining practical work in the forest with the theoretical instruction at the forest school. Often a considerable period is demanded as a prerequisite to entrance. In other instances practical training forms a part of the school program. The object in any case is to make sure that the young forester is able himself to do the things that later he will require of the men under him. Most American forest schools demand a period of practical work in the woods as one of the requirements for graduation, but usually the period is shorter than that insisted upon in the European schools.

Fifth, taken by and large, the European forestry student enters the forest school better prepared in the fundamental sciences, in mathematics and especially in the modern
languages than is the case with us. In other words, the preparatory schools carry the students farther than do the corresponding schools of the United States. Such subjects as are usually studied by freshmen in our colleges have already been covered by the European student in the gymnasium, or the lycée. Judging from a confessedly superficial investigation, it would appear that the curricula of the preparatory schools abroad are more systematically organized and better arranged than are those in ours.

The emphasis put on the modern languages is a natural result of local conditions in Europe. The relatively small areas of all these countries and the close proximity of other nationalities makes a working knowledge of at least one other language essential. That such equipment is a valuable asset cannot be gainsaid. In Scandinavia, for example, the young forester is expected to know German and English, or French, as well as his own tongue. In France the requirements are less strict. In Switzerland practically every educated person speaks French and German fluently and often English and Italian as well. For the most part European children begin the study of foreign languages early, thereby gaining a distinct advantage over their American cousins.

As to the general effect upon the student of continental methods of secondary school education, particularly as regards the development of initiative, self-reliance and certain other qualities that we as Americans particularly favor, the writer of this letter is not now prepared to express an opinion. It requires longer than a hasty visit to accumulate data sufficient to justify the formation of a judgment. But in common with most college bred Americans he can but repeat the axiom that the average educated European seems to have a familiarity with art, music, literature, and, though to a less extent, science, that is not found in the general run of American college graduates. Part of this is a matter of environment, but if we Americans could but combine with the acknowledged good features of our own system some of this broader point of view on the finer sides of life, our whole national existence would be enriched.

One last general observation: Whether the forest school should be a part of a large university or an independent academy has long been and still is a matter of active controversy in Europe. Usage differs in the several countries visited, but the tendency today seems to be, at any rate in the minds of many foresters, toward approval of affiliation with a large institution, at least for a part of the student’s period of study. Modern developments in transportation have practically nullified the argument that a forest school must be located directly in the forest. But it is hard to transform established institutions.
NORWAY'S FOREST SCHOOL

The first of the continental forest schools visited by the writer was that of Norway. It is a department of the Norwegian College of Agriculture, an institution situated at Aas, a small village some 20 miles south of Kristiania. The course covers a period of three years and is open to all students who can comply with the entrance requirements. The department has the use of certain rooms in the general college building and is at the present time somewhat handicapped for space. The teaching staff in forestry consists of two full professors, with instructors and assistants. The students take their own work, in the fundamental sciences and in allied subjects, in the other departments of the college, just as do the students in one of our own state universities. Prof. Agnar Barth has just become head of the department, a man well known in Norway from his books on forestry and because of the administrative ability that he has shown in work under the Norwegian Forest Service. A college forest has lately been acquired, at Larvik, to which the faculty and students repair for the field work that constitutes a part of the instruction. In addition candidates for the forestry course must have had a rather extended period of work in the forest before they are permitted to enroll.

The graduates are not given degrees, as with us, but are designated "forst kandidat". Those who enter the forest service serve at first under the older officers for a probationary period, later to work up to positions of responsibility as opportunity offers for promotion.

The relation between the Norwegian Forest Service and the forest school is intimate, but not as direct as in some of the other countries. Like other features of Norwegian forestry, education in forestry is not as highly systematized, as it is for instance in Sweden. Also it has been difficult during and since the war to obtain as large appropriations for the school as are needed. For this reason the development has been less rapid than those in charge of the school could wish. But with the gradual return of better times the Norwegian Forest School will doubtless come in for a larger share of support.

There is a feeling in some quarters that it would have been better had the school been located at Kristiania, as a part of the University of Norway, rather than at Aas as a department of the Norwegian College of Agriculture, but there seems small likelihood now of a transfer being effected.

SWEDEN'S FOREST SCHOOL

Forestry in Sweden, as has been noted in an earlier letter, is patterned much on German models. The whole organization is high-

THE NORWEGIAN NATIONAL COLLEGE OF AGRICULTURE, AT AAS, NEAR KRISTIANIA, OF WHICH THE SCHOOL OF FORESTRY IS A DEPARTMENT.
with the material on which the lectures treat. No small dependance is placed on “visual” instruction, the museum being well supplied with models, as for example, of splash dams, logging camps, arrangements for sorting logs on the drive, and the like. Another feature of the instruction at this school is an annual excursion to one or more of the state forests.

In an annex at one end of the building is an excellent forestry library, above which is a well appointed club room for the students. It is of interest to note that in Europe, as in the United States, the value of an active forest school club is recognized as an important aid in developing the esprit de corps without which the profession of forestry would lose one of its most distinctive features.

The staff of the Swedish Forest School consists of a rector and three other professors who teach strictly forestry subjects, plus about a dozen lecturers who handle related subjects. The school is organized as an academy—that is, it is not a part of the university but an independent unit. The rector is Prof. A. H. Wahlgren, author of a large volume on silviculture that is used as a textbook in all the Scandinavian forest schools. As showing the connection between the forest service and the forest school in Sweden, it may be noted that questions of policy are decided by an administrative board, on which there serve ex officio, representatives of the forest service and of other Swedish organizations having to do with forestry.

The number of students is limited to 25 to a class; the course covers three autumn terms, two spring terms and two summer terms. But not all of the instruction is given at Stockholm. Prior to formal matriculation at the school the students spend a preparatory period of nine months at Garpenberg, a place about 80 miles north of Stockholm, where they live in a handsome old chateau located on one of the “krono-parks” or national forests. Forty men are permitted to enter the class, but at the end of the period only 25 may proceed to Stockholm. The natural result is that the student body is kept keyed up to a high state of efficiency, for to be dropped means in many cases the end of a man’s opportunity to qualify for entrance into the profession. There is, however, an arrangement whereby a student who has failed by only a few points may be permitted to have another chance the next year. The students while at Garpenberg are under strict military discipline. They wear uniforms, as do indeed the members of the Swedish Forest Service itself when they are on duty. For occasions of ceremony a large cape and a sword complete the costume. The graduates of the forest school are designated “jagmastare”. Their assignment to more or less desirable stations in the forest service depends in part on their scholastic standing while at the school, for the isolated posts in the north of Sweden, with the long, dark winters, are naturally less attractive than are the positions

on the forests in the central and southern parts of the country.

Occupying a portion of the grounds of the forest school is the headquarters of the Swedish Forest Experiment Station. Its large library is operated in conjunction with that of the school and members of its staff are among the instructors at the school. This intimate relation between teaching and investigation perhaps accounts in part for the very general interest taken by all Swedish foresters in forest research. The net impression that one carries away from a visit to Stockholm is that education in forestry in Sweden is extremely well provided for and that the training that the students receive is both comprehensive and thorough.

**THE AMERICAN-SCANDINAVIAN FOUNDATION**

While not a part of the regularly established educational system of Sweden, or of Norway, it is appropriate here to make mention of an educational organization that is destined to play a considerable part in co-

**THE SWEDISH FOREST SCHOOL AT STOCKHOLM.**

**THE WING AT THE RIGHT CONTAINS THE LIBRARY AND THE FOREST CLUB ROOMS**
menting the friendly relations between the foresters of the Scandinavian countries and of the United States—the American-Scandinavian Foundation. Established through the munificence of a Swedish-American gentleman, with the purpose of fostering better acquaintance and understanding between these countries and our own, the foundation offers annually to properly qualified students on each side of the ocean, fellowships carrying a stipend of $1,000, on the understanding that the recipient shall spend a college year overseas in advanced study. The majority of the fellowships are for engineering students, but there are also some for foresters. An American forestry student to be eligible must hold the degree master of forestry from an approved institution. The appointments are based on the comparative merits of the applicants. The American headquarters of the American-Scandinavian Foundation is at 25 West 45th street, New York city.

THE ROYAL COLLEGE OF AGRICULTURE, COPENHAGEN, DENMARK—THE SCHOOL OF FORESTRY IS A DEPARTMENT

Several exchanges of forestry students have already been effected. It was the writer's good fortune to have as a guide while in Sweden one of the Swedish foresters who had thus been in the United States, Jagmastare Axel Schard, now a member of the Swedish Forest Service. At the present time there are two American forestry students in Sweden, Messrs. W. K. Williams, Jr., a graduate of the Yale Forest School, and Henry Vettel, a graduate of the Department of Forestry at Cornell University. It is to be hoped that each year this interchange may go on, for certainly much can be gained on either hand from the opportunities that are afforded to recipients of these foundation fellowships.

THE FOREST SCHOOL OF DENMARK

The Forest School of Denmark is located at Copenhagen as a department of the Royal College of Veterinary Medicine and Agriculture, an educational institution with an enviable reputation of long standing, because of the notable men that have been among its graduates. The Danish Forest School was first established at Kiel in 1784. It has been located at Copenhagen since 1832. The department of forestry occupies quarters in one of the large building of the college of agriculture, which while unpretentious and relatively small, serve the present needs. The forestry staff consists of two professors of forestry, with several lecturers and assistants.

As in Norway, instruction in allied branches is given by the departments concerned, as it is in American state colleges of agriculture.

The head of the forestry department is Prof. John Helms. One of the special lecturers is Prof. Dr. A. Oppermann, director of the Danish Forest Experiment Station.

The course covers an extended period. First 18 months of practical work under direction of a forester on a forest of not less than 600 acres. Here the men act as laborers and receive pay. Then four years at the college, one summer being spent in surveying work. After this comes 18 months of work as assistant on a forest, at the expiration of which time an examination is taken that admits the young forester to the grade of "forst kandidat." As in Norway, this title takes the place of a degree. Somewhere along the way there is sandwiched in eight months military training, or if the student desires a commission, a year and a half. The graduated forester then hunts a job. This long period of preparation is quite in keeping with the intensive methods in forestry that have already been commented on as characteristic of Denmark.

THE FOREST SCHOOL OF SWITZERLAND

Switzerland is one of the countries where the forest school is a part of the national polytechnic school. The capital of Switzerland is Berne, but Zürich is the chief educational city of the Confederation. Here in a commodious building devoted exclusively to

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its use is found Der Schweizerischer Eidgenossen Forstschule. The Swiss Forest School dates from 1827. The present building, completed in 1917, replaced an earlier one, also of good size, that was built about forty years ago. The forest school ranks as a department of the college of agriculture.

The course in forestry at Zurich covers a period of three and a half years. The forestry staff consists of three professors, instruction in allied branches is handled, as in other similarly organized colleges, by the related departments. As in Denmark, the head of the Swiss Forest Experiment Station, Prof. Dr. A. Engler, is one of the professors. These two institutions are thus bound together through personal relations as well as physically. The experiment station occupies a floor of one of the other buildings of the university.

The building of the Swiss Forest School has an imposing facade. It is built about a court, glassed in above. The floor space in the center is used for an exhibit of wild and domesticated animals; skeletons and mounted specimens. Lecture rooms and offices open on the balconies that surround the court. The walls are lined with wood specimens and other illustrative material, as well as maps and photographs of forests.

The faculty of the forest school at Zurich is in close touch with the development of professional affairs in Switzerland. One of the staff, Prof. Heinrich Badoux, is editor of the French edition of the "Swiss Forestry Journal," for owing to diversities of language in the several cantons, French, German and Italian all have official recognition. The editor of the German edition is Oberforster Hans von Greverz. In Switzerland, as is but natural, the German text-books on forestry are those most used, but there have been notable contributions to forestry literature from Swiss foresters.

Two names that stand out in Swiss forestry are those of Coaz and Landolt. Dr. Johannes Coaz died in 1915, at the age of 96, still in harness. His work as an able administrator will long be remembered. Prof. Elias Landolt was for many years head of the forest school at Zurich. In the small garden in front of the forest school building stands a bust of him. The practice of erecting statues to individuals is not so common in Switzerland as elsewhere in Europe. The Swiss indeed rather pride themselves on being so democratic as not to desire thus to honor even their prominent men. This recognition of Prof. Landolt is therefore of more than ordinary significance.

THE FOREST SCHOOL OF FRANCE

The French forest school—Ecole Nationale des Eaux et Forets—situated at Nancy, in the northeast of France, is of particular interest to Americans, not only from its long and honorable record, but also because there have studied here a number of the best known American foresters. In the published list of graduates the name of Gifford Pinchot stands alone as representing this country—class of 1889—but many other Americans have for longer or shorter times been in attendance at Nancy.

Nancy is a most attractive city. In the middle of the eighteenth century it was the home of Stanislas, king of Poland and duke of Lorraine, whose daughter was the queen of Louis XV. In the period between 1750 and 1765 King Stanislas enriched the city with many public buildings, triumphal arches and other architectural adornments, all done in the best style of that resplendent period, and apparently without regard to expense. The result is that today Nancy is one of the most delightful of the smaller cities of France, outside of those where the interest is primarily due to historical association. Especially to be remarked about Nancy is the

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central square, Place Stanislas, on which front numerous handsome buildings. From this square radiate half a dozen streets, the approaches to which are guarded by wonderful iron gates, even more artistic than are those at Versailles.

On a side street not far from the Place Stanislas is the forest school. One enters through a handsome gateway into a courtyard on which face three large buildings and a garden planted with trees from various parts of the world. Each building bears the name of one of the former directors of the school—Lorentz, Mathieu, Nanquette. And as everywhere in France, there is a memorial tablet commemorating the men connected with the school who fell in the war, many within but a few miles of these very buildings.

There is little in the buildings themselves—lecture rooms, laboratories and offices—that particularly differentiates them from other college halls. But in its museums the school at Nancy has collections that are of more than usual interest. Especially, perhaps may be noted the models illustrating various sorts of forestry work, lumbering, reboisement, sand dune control and the like. Nancy has the unique distinction of having developed this phase of its museum earlier than did other schools. In the collection of woods, which is housed in a special museum building in the garden, the Galerie Daubree, is an exceptionally full series of specimens illustrating the uses to which the various European timber trees are put, both in the way of articles made from wood and in derived products. A group of the game animals of France occupies a prominent place in this museum, for in common with other European countries, the men of the French Forest Service are as a rule keenly interested in hunting.

The forest school at Nancy was established in 1825, the first director, Lorentz, having been a student of Georg L. Hartig. Subsequently the school saw stormy days because of supposed German influence. In recent times the faculty has of course been composed entirely of French foresters. The present director is M. le professeur Guinier; the sub-director, M. le professeur Bernard. Beside these gentlemen there are three other professors teaching strictly forestry subjects, with five or six others who conduct the work in related fields. The French Forest Experiment Station has its headquarters at the school. It is under the director of the school and consists of four sections. M. Perrin, who is in charge of the college forests near Nancy and chief of the section of silviculture, is also on the staff of the forest school. The college forests, Heye and Amance, totalling an area of about 6,000 acres, are within easy reach of the school.

In organization the forest school at Nancy ranks as a part of the French Forest Service. But in purely educational matters the faculty of the school has the deciding voice. The course at Nancy covers two years, the students previously having had two years at the college of agriculture in Paris, where the work is mainly in the fundamental sciences. There are about 20 students in each class. The men wear uniforms and are under military discipline. One of the buildings in the group above referred to is used as a dormitory in which the students are housed, two men to a room. They take their meals at some restaurant in the city; the seniors frequently one, the juniors another. There is a forestry club that is said to be a live organization.

Opportunity is afforded at Nancy for post graduate work and many young foresters have resorted thither from various countries. At one time a term at Nancy was a regular part of the training required of the students in the British Forest School, then located at the engineering college at Cooper's Hill, England. These men also joined the annual excursion to one or more of the noted forests of France. In these ways the French Forest School had no little influence on many of the men who later went out to take their places in forest work in British India.

During the war the work of the school was interrupted, not to say disorganized. For a time Nancy was under bombardment. Normal conditions have not as yet been entirely restored, although they are rapidly becoming so. At present, too, the school is at a disadvantage because of reduced appropriations and the low value of French money in the world market. But reorganization is rapidly progressing and in due course the school should once more be in smooth running order.

No forester can visit Nancy and not be impressed with the spirit that characterizes the forest school. The standards that it has set are in very large measure responsible for the splendid esprit de corps that is so marked a feature of the French Forest Service. The record of the school is one of continued accomplishment. There is no possible question but that Nancy deserves the place it holds as one of the great forest schools of the world.

**EDUCATION IN FORESTRY IN GREAT BRITAIN**

Education in forestry in Great Britain is at present in a period of transition. The great forestation program on which the United Kingdom embarked in the autumn of 1919, when the British Forestry Commission was definitely established, has brought about conditions that call for adjustments in the existing forest schools. Various plans are under discussion as to how the situation can most wisely be met. Cooperation through realignment is the objective. But it is a task that is not easy to accomplish. The path is strewn with obstacles. All of which of course adds greatly to the interest which an outsider takes in a visit to the British forest schools today.

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One of the outcomes of the Empire Forestry Conference held in London in the summer of 1920 was a plan to co-ordinate forestry work in all parts of the empire. A start has been made in this direction in the organization in 1921 of the Empire Forestry Association. Further interest will be shown to this and related projects when the Empire Forestry Conference meets again in Canada in 1923. One part of the empire program has to do with forestry education. In a word it is proposed that there be established, probably at Oxford, a central graduate forest school that shall head the system and with which the other forest schools of the empire, at home and overseas, shall co-operate. It is an ambitious program, but one that is justified by the importance of the forest interests in the many far flung lands that make up the British Empire. And as the proposal concerning education in forestry is as definite as perhaps any that has so far been made in the whole program, it is a matter that merits consideration.

THE FOREST SCHOOLS OF ENGLAND

As was indicated at the outset of this letter the British Forest Schools differ in material ways from those on the continent. In the first place there are now several of them, in England and Scotland. Secondly, while working in conjunction with the government, and in some cases receiving state aid, they are not directly under government control as are those on the continent, but rather, as is the case in the United States, branches of endowed universities. Clearly to understand the situation as it is today one needs to go back and review a little history.

Although the United Kingdom has been slow about practicing public forestry at home, in British India the English foresters have a long record of honorable accomplishment. That service was really started by the appointment of Dr., afterward Sir Dietrich Brandis as inspector general, in 1864. Under Brandis' leadership the Indian Forest Service developed rapidly along sound lines. But both he and his successor, Dr., now Sir William Schlich, had difficulty in finding men to manage the forests. Various devices were resorted to, including the transfer for temporary periods of young army officers to the forestry work. Finally the home government was prevailed upon to make definite provision for supplying trained foresters. Dr. Schlich returned to England and in 1885 a forest school was opened at Cooper's Hill, in connection with the Royal Engineering College. This school continued to function until 1905, when it was transferred to Oxford, where it now forms a part of the University of Oxford, under the name School of Forestry.

Sir William Schlich is perhaps best known to American foresters through the five volumes of his "Manual of Forestry," which 25 years ago were practically the only authoritative texts on forestry in the English lan-

...guage. Dr. Schlich remained director of the forest school upon its transfer to Oxford, serving up to within a short time before the war. Subsequently he was recalled to that duty, and only this winter has he finally retired from active service, at the age of 83. One of the pioneers of the forestry profession, Sir William Schlich is a man whose influence has been felt in many countries; a forester well deserving of the honors that have been conferred upon him. Although advanced in years, he is active in body and keenly awake to the problems of the moment. No one on meeting him thinks of his age. Out of his ripe experience it is to be hoped that the literature of forestry may be enriched by additional contributions from his pen.

SCHOOL OF FORESTRY AT OXFORD UNIVERSITY

The school of forestry at the University of Oxford occupies a relatively small building consisting of lecture and class rooms and a museum in which the emphasis rests on collections of woods from India and other British possessions. This building was provided by the university, and in later years, through privately contributed funds, a wing has been added, of fireproof concrete construction, in which are laboratories and the offices of some of the faculty. The present head of the school is Dr. R. S. Troup, also in earlier years a member of the Forest Service of British India.

The course at the Oxford school covers a period of three years. Graduates receive the degree of B.A. in agriculture and forestry. There is also a two-year course, on the successful completion of which a diploma is granted. Men holding the degree, or the diploma, may become candidates for appointment, under specified conditions, in the Forest Services of the United Kingdom, India, or the Crown Colonies, as opportunities offer. An arrangement with the Colonial Office certain students may, after two years, become "probationers" for positions in forestry in the Crown Colonies or in India. At the present time opportunities for appointment at home, under the British Forest Service, are not particularly good, especially since the recent report of the Geddes Economy Committee, which recommends against any expansion of the forestry program.

Every candidate at the Oxford School of Forestry is required to spend six months in what is termed a "practical course." This period is passed in the study of the management of well regulated forests, in the preparation of a working plan for a small range and in visits to other forests, upon which a report is required. This work is usually done in installments during the vacation periods. In former years, when the school was at Cooper's Hill, a visit to typical forests in Germany and in France under the leadership of Dr. Schlich, and sometimes of Sir Dietrich Brandis, formed a part of the regular program. As has been previously noted, many English foresters at that time also studied at Nancy before going out to India.
Oxford has a college forest, Bagley Wood, an area of over 600 acres, within two miles of the university. To the school is attached an institute of research into the diseases of trees, conducted by members of the staff. An important contribution has recently appeared from this station, "The Fungal Diseases of Larch," by W. B. Hiley. Besides its regular courses of instruction, the Oxford School also offers work in special subjects, as British estate forestry, and particularly topics dealing with forestry in India, including botany of Indian trees, tropical silviculture and forest law. It may be of interest to mention here that among the textbooks used at Oxford and other of the British Forest Schools are two by American foresters: Toumey's "Seeding and Planting" and Recknagel's "Working Plans."

**SCHOOL OF FORESTRY AT CAMBRIDGE UNIVERSITY**

The school of forestry at the University of Cambridge is a younger institution. Instruction was instituted in 1907, when a "Reader" was appointed. In English usage, unless a chair is endowed with this title, or that of lecturer, is given the occupant, instead of professor. Originally the school at Cambridge was under a forestry committee of the Board of Agricultural Studies. In 1921 the two schools of agriculture and of forestry at Cambridge were placed under the Board for Agriculture and Forestry. There has been rapid development in the so-called science group at Cambridge in recent years, several large buildings having only lately been completed and occupied. The forest school building was erected in 1913, but owing to the war the interior has not yet been entirely finished. The several rooms are panelled in different woods. The effect is distinctly good. The building is four stories high, 62 by 38 feet. It is designed with a view to future extension.

A striking feature of the forest school at Cambridge is the extensive collection of wood specimens from all parts of the world. A large number are in the form of 5-foot planks, which is regarded as the standard size. This collection cannot fail to impress any visitor, for at the present time it overflows the museum rooms and has in part to be displayed in parts of the building that are designed for other uses. Visiting Cambridge in vacation time, the writer was fortunate in finding Herbert Stone, whose books dealing with wood and timber are well known in the United States. Mr. Stone, as special lecturer on foreign and domestic timbers, is in charge of the wood specimens collection.

The director of the Cambridge school of forestry is William Dawson. Several other lecturers, some on part time only, complete the forestry staff; instruction in allied subjects like botany and entomology being handled by men in the college of agriculture. As at Oxford the course leading to the B. A. degree covers three years, but students may secure a diploma after two years. Before the war the diploma candidates spent six months, under direction, in the forests of Switzerland and France. At present increasing use is being made of the Forest of Dean, in the Midlands. Local facilities for practical work in the forest are provided on the Midhurst estate in Sussex. At present the number of students is small, in part as one result of the unsettled conditions following the war, and in part because of the uncertainty regarding opportunities for employment that now obtains. The income of the Cambridge school of forestry is strictly limited, about half coming in as tuition. A small grant has been made by the British Forestry Commission. In almost all forest schools, in every county, the members of the staff see opportunities for useful service which they would be glad to follow up did funds permit. In this the English forest schools are no exception. It is planned to conduct extensive work in forest research at Cambridge as soon as circumstances permit.

What is now being done in that way is largely the result of those working in an honorary capacity, without salary.

**FORESTRY SCHOOLS IN SCOTLAND**

In Scotland there are two universities having departments of forestry, Edinburgh and Aberdeen. The former is under the directorship of Prof. E. P. Stebbing, one of whose books, "British Forestry," issued during the war, is known to many American readers. That volume is mainly a plea for the practice of forestry in the United Kingdom, but it has chapters dealing with the forests of Russia and Siberia as potential sources of timber supply, that contain data that are not available elsewhere. The writer of this letter was unable to visit the University of Edinburgh. He regrets that he cannot at this time speak adequately of the forestry work in progress there.

The department of forestry at the University of Aberdeen is a branch of that institution that is not to be overlooked. Through the energetic personality of its director, P. Leslie, it has developed rapidly and become a decided factor in forestry in Scotland. To Mr. Leslie belongs as well much of the credit of establishing and getting under way the large forest nursery at Craibstone, since taken over by the British Forestry Commission, of which mention was made in the first letter of this series. In 1920 Mr. Leslie made a rather extended tour in Canada and the United States. He may therefore be personally known to some of the readers of this article.

Under present conditions the department of forestry at Aberdeen is content to offer what we in America should call an undergraduate course in forestry, that is, one that does not carry the students through advanced work, as do Oxford and Cambridge. For this reason Aberdeen looks more kindly on the proposals for a central institution for graduate work in forestry than do several of the other forest schools. The department of for-
estry occupies rooms in one of the main buildings of the university. A feature of its work is the excursions taken by the students to various points of forest interest, especially to some of the privately owned estates in the Scottish Highlands. In common with other schools of like character, in all countries, the courses in the fundamental sciences are handled by the staffs of the departments concerned. In the forestry work proper Mr. Leslie is assisted by two or three instructors.

OTHER FOREST SCHOOLS IN GREAT BRITAIN AND IRELAND

Instruction in forestry is also given at the University of Wales at Bangor and at the Armstrong College, University of Durham. It was not the privilege of the writer to visit either of these institutions. It is his understanding that they are organized more as is Aberdeen, giving work that does not lead beyond the baccalaureate degree. At the Imperial College of Science and Technology in London, investigations on wood have been conducted during the past dozen years or so by Professor Percy Groom and Professor Dalby, under the auspices of the research department. At the Royal College of Science for Ireland, at Dublin, a diploma in forestry is awarded after a four-year course. The director of this school is Prof. A. Henry, whose work as an investigator is well known in forestry circles. There are also, in England and Scotland, five lower grade, or ranger schools, for the training of forest apprentices. That on the Forest of Dean has been in operation since 1904.

PROPOSALS FOR A CENTRAL INSTITUTION FOR FORESTRY EDUCATION

As one of the results of the British Empire Forestry Conference, held in London in July, 1920, a committee was appointed, under the chairmanship of Lord Clinton, to report upon the feasibility of establishing a central institution for training forest officers. From its chairman, this body is usually referred to as the Clinton Committee. After visiting the various schools and hearing evidence, the committee reported, February 1, 1921, (1) in favor of a central institution, which it recommended be located at Oxford, as a part of the university; (2) that there should be a governing board to determine questions of policy; (3) that a properly qualified staff be provided, and that the school be suitably housed; (4) that the students entering the school should have taken a forestry degree at a recognized institution and that their work at the central institution be of advanced grade; (5) that the institution be the center of forest research.

It is the idea of the committee that forest schools throughout the empire, as well as those located in the United Kingdom, should send certain of their graduates to the central institution, and that financial aid be rendered, in connection therewith, by the several Dominion governments overseas, under which these schools are organized.

As yet no definite action has resulted from the recommendations of the Clinton Committee. But the matter is under discussion that may lead in time to another important forward step in forestry education. If such a policy as is proposed is put into operation it can but have an influence on other countries as well as those under the British flag.

THE NET CONCLUSIONS

The net conclusions that the writer of this letter brings back from his sojourn in Europe are that the forest schools of all the countries he visited are live, active institutions, that not only are giving their students full and careful preparation for their professional work, but also are exercising no small degree of influence on the development of forestry in each of these countries. Throughout he found that the men on the teaching staff were in close contact with practical affairs in the forest, that they were keeping up the traditions of earlier years by noteworthy contributions to professional literature, and that they were in the leadership in the field of forest research. These things, coupled with the records of the graduates who have gone out from these institutions, all point conclusively to the conclusion that the European forest schools have in the past and are now performing well the task that is theirs to carry on. It should be the ambition of the forest schools of America to show, after the passage of a century, as creditable a record as do the forest schools of Europe.