

HOW GERMANY MAKES FORESTRY PAY.

BY FREDERIC BLOUNT WARREN.

Germany has the highest developed system of forest management and conservation. It has nearly 35 million acres of forest, of which 31.9 per cent belongs to the State, 1.8 to the Crown, 16.1 to communities, 46.5 to private persons, 1.6 to corporations, and 2.1 to institutions and associations.

For each citizen there is a little more than three-fifths of an acre of forest; and though 53 cubic feet of wood to the acre is produced in a year, wood imports have exceeded wood exports for more than forty years, and 300,000,000 cubic feet, valued at \$80,000,000, or more than one-sixth of the home consumption, is imported each year.

In forestry, Germany has always led in scientific thoroughness; the scientific knowledge has been applied with the greatest technical success; and it has procured an increasing forest output together with an enlargement of profits. It will be interesting at the outset to state the European forestry theory, the basis on which Germany and other nations have conducted their conservation work, and statistics and summaries to come later to show that there has been a profit in the practice of the theory.

In the cultivated forests of Germany the absence of underbrush and decayed logs and limbs, the density of the forest, and the even distribution of the trees, often planted in long straight rows, immediately arrest the attention. One can walk with ease, or drive anywhere among them, except where the hills are too steep or stony or where the trees stand too closely together, this always being the case in young woods. The trees are not permitted to reach the full limit of their life and then, as the result of decay, to fall and remain rotting on the ground. They are considered as wood capital, which adds interest to itself as long as the trees continue to grow, at first slowly when the trees are small, more rapidly when they are of medium size, and more slowly again when they become large. When the trees die the wood interest ceases entirely, and as they decay the capital is reduced. The forester leaves this wood capital as long as the interest continues satisfactory. Then, when the growth declines, it is removed, the forester taking the trunks and limbs, and the peasants gathering up the brush and often digging up the stumps, although these, too, are frequently taken care of by the forester and sold in the market to pay the cost of their removal. In some German districts all the products are marketed. In Mecklenburg a good layer of leaves and moss sells for \$16 an acre. In some sections a nominal sum is charged for brushwood; in the Spessart, Bavaria, it has long been the right of peasants to gather the forest litter without charge. Sometimes this permission applies to the gathering of nuts, which are used as food for domestic animals.

The United States has 164,000,000 acres of land in the 165 national forests, besides 2,722,726 acres of State-owned forests and 40,000,000 acres of woodland in the Philippines. And the table below, taken from official government statistics in a United States Forest Service bulletin, is what our national forests return as a federal investment, compared with the Saxon figures.

In this statement the American may learn the difference between advanced European forestry at almost its highest profit and the lesser profit just beginning to accrue to the United States as a result of its endeavor to foster its wood-producing resources. Saxony's total area amounts to 5,789 English square miles, of which almost one-half is covered with private and governmental forest. The last the State treasurer places as the highest revenue producer after the State railway, and they exceed the revenues from all other sources, taxation included. The total quantity of timber cut in 1906 is estimated at 1,231,472 cubic yards (33,250,497 cubic feet), representing woods used for fuel and for all other purposes. To this must be added a yield in brushwood cut and sold for fuel use

principally of 190,415 cubic yards (5,140,906 cubic feet), raising the total quantity of timber and brushwood cut and sold to 1,421,887 cubic yards (38,391,403 cubic feet), for which \$3,374,385 was obtained. This amount was increased by additional revenues from the leasing of meadows, hunting privileges, and other rights to the total of \$3,483,616. Deducting from the total figures the cost of forest cultivation, with salaries and wages of the entire service included, amounting to \$1,357,580, the net profit of \$2,126,036 was added to the treasury in 1906. There is nothing unusual in this result, as the ten preceding years show equally high figures, a few slightly exceeding the 1906 revenues, and others being lower in a very slight degree.

More and more accustomed to weighing questions, whether national or individual, in dollars and cents, there is contained for the American public in the above official statement the most potent argument for increased conservation of forest lands. Systematic state

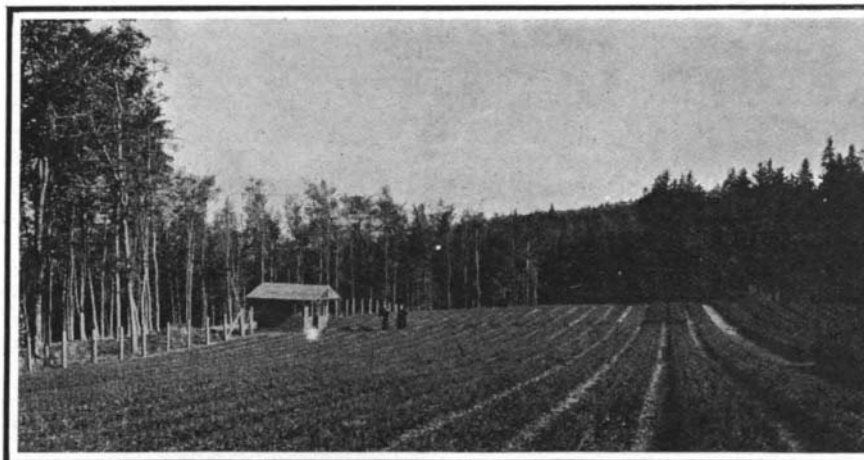


Part of forest tree nursery, Thüringen, Germany.

forestry began in Germany 150 years ago, when the country felt the pinch of a wood shortage, but there were also contributory causes, such as the effect upon agriculture and stream flow, due chiefly to erosion. Just across the border, France, denuded of its forests, was having trouble with its mountain torrents, and the Germans opened their eyes to the dangers of floods in their own lands. Protective forests were provided for by Bavaria in 1852, by Prussia in 1875, and by Württemberg in 1879. Now all of the German states practise forestry with success.

In Prussia the forests cover nearly 7,000,000 acres, and methods of management adopted call for a sustained yield. In consequence, the productivity has been multiplied threefold in seventy-five years. In 1830 the yield was 20 cubic feet an acre; in 1865, 24 cubic feet; in 1890, 52 cubic feet; in 1904, 65 cubic feet.

Saxony has 430,000 acres of State forests, and its



Forest tree nursery in the Thüringen Wald, Saxe-Gotha.

HOW GERMANY MAKES FORESTRY PAY.

yield rose 55 per cent between 1820 and 1904. It is now 93 cubic feet an acre. These increases are not limited to Germany, since other European nations, notably Italy and Switzerland, are now reaping large revenues from their timber lands.

Where Saxon forests are yielding \$5.30 an acre, those of Württemberg yield a net annual revenue of \$6, and those of several smaller administrations exceed this! There are also a large number of private forests managed with great success, whose revenues equal or exceed \$6 an acre. For 15,600,000 acres of state, municipal, and private forests included in a canvass, it was found that the average net annual revenue an acre—from good, bad, and indifferent land—was \$2.40.

The forests are managed largely in compartments, each of which, when the mature trees are considered ready for removal, is cut clean and planted with a new crop. Sometimes the compartments are located so that the cutting proceeds regularly in one direction

as a protection against the prevailing winds, and at intervals of perhaps ten years, in which case the forest shows distinctly ten or twelve "age classes," arranged in a series of progressive heights. If a compartment is harvested and restocked each year, the number of age classes will of course equal the age to which the trees are allowed to grow. "Cutting clean" is most commonly in use in pine and spruce forests of Germany. These trees are mostly started in nurseries where the seeds are sown. In two years they are transplanted when six inches high. They grow in two or three years more to be twelve or fifteen inches tall, and then they are moved again to denuded fields and replanted about four feet apart, so that in a short time they will begin to crowd each other. This condition compels the trees to grow tall and slender and to shed their lower branches, thereby permitting a growth of timber free of knots. The trees are usually planted in straight rows, and in about twenty years a thinning is necessary. In spruce forests sometimes more than half of the trees are removed at the first "thinning." These are sold for firewood, poles, and various other uses. The fuel wood, laid at the roadside, brings about \$2.25 a cord. Subsequent thinnings are necessary about every ten or fifteen years. Building material laid at the roadside brings nine cents a cubic foot; good spruce fuel wood, \$3 a cord. On the poor sandy soil of Mecklenburg a thinning in Scotch pine, when the trees are twenty years old, yields only about \$2 an acre; when forty, \$5; when sixty, \$10; when one hundred, \$30. In the Erz Mountains, Saxony, thinnings when twenty years old bring \$4; when forty, \$15; when sixty, \$80.

Every product of the forests of Germany and southern Europe finds ready utilization. This is due to the good market, population, low wages, and good roads. The effect of the market is everywhere apparent in the great economy of wood. In hotels heat is a luxury for which guests often pay an extra charge. Village and forest houses are seldom constructed of wood. Walls of plaster or cement are the rule. Floors are made of stone in many cases, and tiles and iron take the place of shingles. Wooden fences, board sidewalks, and block pavements are uncommon.

Yet the forests, which cover one-fourth of the area, fall far short of the requirement. Germany imports more than 300,000,000 cubic feet of timber, paying the duty of 28 cents for every 210 pounds of rough timber or logs and \$1.15 for every 210 pounds, or one cubic meter (35.3 cubic feet) of dressed timber. Germany's own production of timber amounts to more than 600,000,000 cubic feet. If Germany were to supply the deficiency from its own soil, it would need an additional 20,000,000 acres. The percentage of forestry soil would be increased from 26 to 40 per cent of its area. It is doubtful if there are more than 2,500,000 acres for this purpose. If every available spot were utilized, and all the waste lands that are not well adapted for agriculture were planted in pine, spruce, fir, and other trees, it would require fifty years for them to be ready for market, and then the supply would not equal the demand. Only Bavaria and Württemberg have a surplusage of home timber.

It is the custom to buy individual trees rather than forests. There is a market unit of volume by which timber is generally purchased, called the "festmeter." It is a cubic meter (35.3 cubic feet) and is equivalent to 1.44 markets, or 19-inch standards, or about 288 feet board measure. In America large and small logs are scaled and sold together. In Germany, when the trees are felled, each one is marked with a number stamped in the butt. They are then sold by number in five or six classes according to size.

Recently in the Hartz, \$22.65 a thousand feet, board measure, was offered for spruce tree trunks containing more than 300 feet; \$18.56 for trunks containing from 150 to 300 feet, and for smaller sizes about \$15. The live market for wood appears also in the number of metal railroad ties, being used in one-fifth of the entire mileage. The use of wooden ties in recent years has been greatly encouraged, however, by the discovery of methods of impregnating wood with such preservatives as creosote, chloride of zinc, or sulphate of copper.

As the forests are to be lumbered perpetually, the roads are made for permanency. They consist often of stone, laid with much expense and not infrequently

Country.	Total Net Revenue from Government Forests.	Expended per Acre.	Net Revenue per Acre.
Saxony	\$2,299,000	\$2.05	\$5.30
United States ...	1905-6 12,000* 1906-7 128,659	0.007 0.0093	0.0001 0.00086

* Represents deficit.

macadamized. In 1903 Saxony spent \$175,000 on forest roads, and larger sums have been expended since by several States in the German federation. The roads at Geroldsau, in the Schwarzwald, are especially fine for forest hauling.

Germany's sawmills are usually small. Most of them would not cut more than 25,000 feet, board measure, in a day of ten hours. Almost any fair-sized American sawmill cuts 100,000 feet a day. But the small mill of Germany is permanent, being supported by perpetual crops of timber hauled to it by wagon or shot down streams. While some railroads carry logs, and rafts are still floated down the Rhine, Elbe, and other rivers, the method of hauling is very largely

56 cents an acre is expended, and that most of the area is located in the rugged Alps and Carpathians, where administration and logging are costly. The forest department was started in 1872, and reorganized in 1904 into three departments—administration proper, reforestation, and the correction of torrents and forest protection. Forestry is successfully practised on 60 per cent of all the State forests, and on 82 per cent of the private forests. The most conspicuous fruit of the State forestry is the restoration of the "Karst," a stretch of barren lands in the hilly country of Istria, of Trieste, Dalmatia, Montenegro, and neighboring territory along the Adriatic Sea. It comprises 600,000 acres. This work has been carried on

is but little loss from fires. In Saxony this is rarely more than \$300 a year; Württemberg, about \$650; and the Duchy of Baden, with 240,000 acres, had only 99 acres burned in nine years. Fires are started mostly by careless smokers and workmen. Locomotives cause about ten per cent. In many places along the forested side of a railroad track there is a ditch about eight feet wide which is kept free of vegetation. Frequently a strip of forest about a rod wide, running parallel with the railroad, is prepared in the following manner: A path along the edge of the woods is spaded about four feet wide. In the forest, about a rod from this and running parallel with it, a second path is made. Cross paths are made at intervals of about a



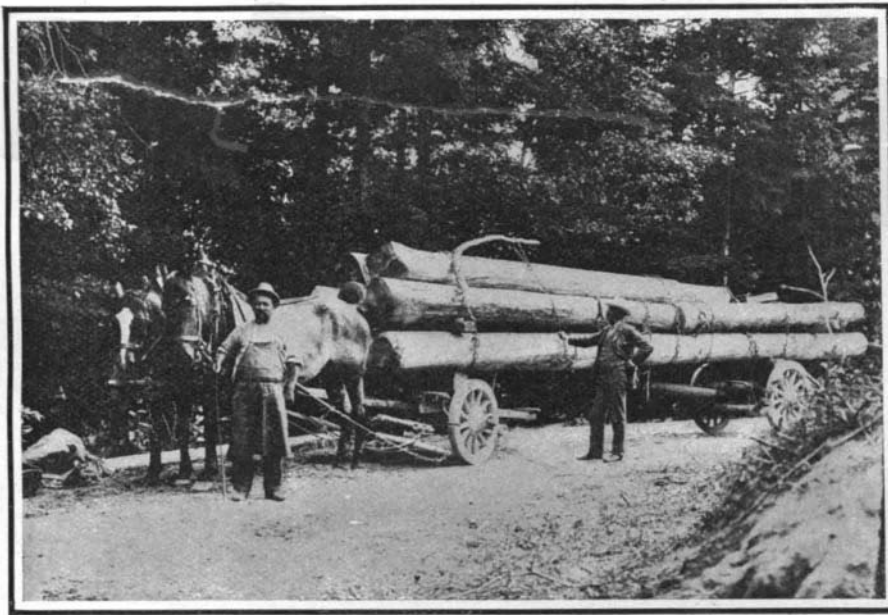
A good seed year for Norway spruce near Eisenbach, Thüringen Wald.



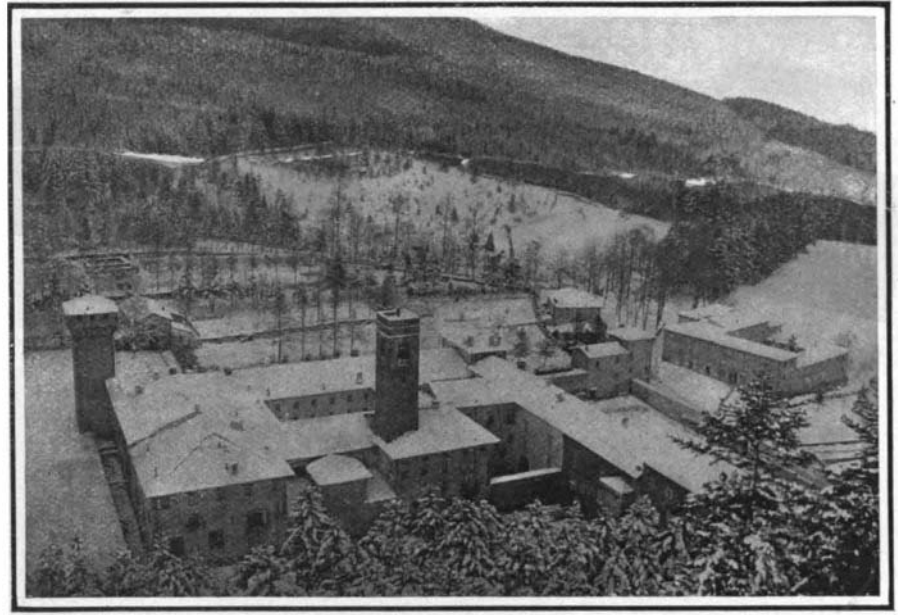
Prince Bismarck's forest at Friedrichsrh, North Prussia. Fire lane.



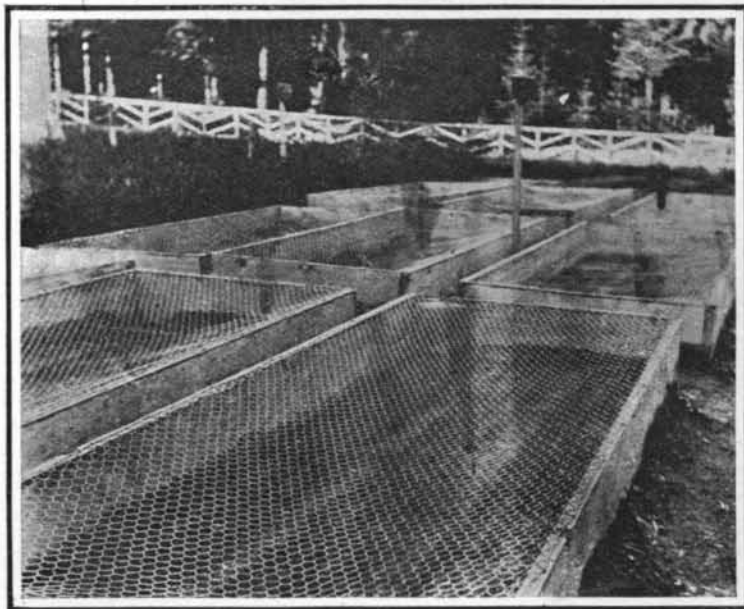
City forest of Grabow, Mecklenburg, Germany.



Hauling timber in the Schwarzwald, Geroldsau, near Baden-Baden.



Royal forestry institute, Vallombrosa, Italy. Nursery in the background.



Forest tree nursery near Gerardmer, France.



Preparing ground for a forest plantation in the Spessart, Northern Bavaria.

HOW GERMANY MAKES FORESTRY PAY.

by wagon or by the old-fashioned American "carry-log." Along the Enz River in the Black Forest are located some of the largest mills, and to these the stock comes mostly on the railroad in long large logs, much of it being brought from Württemberg and Swabia. For each load of logs two cars are necessary.

In Austria there are 24,000,000 acres of forest, of which 7 per cent belongs to the state. Private owners hold 58 per cent. As Austria has been independent of the German Federation only since 1866, its forestry system, in the main, has followed German lines. Private forestry is encouraged by a system of taxation which relieves forests in which forestry is practised. The total net annual state forest revenue is \$5,000,000. The net yearly revenue of 21 cents an acre is comparatively low, due mainly to the facts that only

by the Forest Protective Service, which was first created for Tyrol in 1856.

In Hungary there are 23,000,000 acres of forest, of which the State owns 16 per cent, corporations 20, other institutions 7.5, and private persons 56.5. From ten to twelve million dollars' worth of wood is annually exported, and the State forests yield \$600,000 revenue. Austria exports 3,670,000 tons of wood, the greater part of it going to Germany. About half of all the Hungarian forests is under working plans, by which the annual cut of 1,000,000,000 cubic feet is regulated. Forest planting is encouraged by the State nurseries, at which 10,000,000 seedlings are raised each year for free distribution, and by bounties paid for forest plantations on private waste lands.

Since dead timber is not left in any forests, there

rod. These paths are free of vegetation, and the ground in the strip is raked of leaves and twigs.

In Germany forestry is a well-established profession, for which the candidates must prepare themselves thoroughly. They must learn the science in a forestry school, where the course of study requires much hard labor. After graduation they must practise the science under masters for several years. These masters are usually officers having charge of ranges. A candidate takes first a position called in Germany "Forstreferender," at a salary of about 1,200 marks (\$286). In two or three years he is advanced to that of "Forstassessor," at 3,000 marks (\$714). With successful service he may then be promoted to the position of "Oberförster," with a salary of 4,500 marks (\$1,071), and a dwelling especially suited to his needs.