

# How Germany Makes Forestry Pay

By Frederic Blount Warren in the Scientific American.

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 woodlands 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 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 (23,250,497 cubic feet), representing woods used for fuel and for all other purposes. To this must be added a field of brushwood cut and sold for fuel use principally of 190,415 cubic

Country.	Total Net Revenue from Government Expenditure Net Rev.	Per Acre.	Per Acre.
Saxony	\$3,250,000	\$2.06	\$5.30
United States... 1906-7	12,000*	0.007	0.0001
United States... 1906-7	128,000	0.0025	0.00088

\* Represents deficit.

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 \$3,274,385 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 \$1,457,580, 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 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 1854, by Prussia in 1875, and by Württemberg in 1879. Now all of the German states practice 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 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 re-stocked 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 used 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 from 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 46 per cent of its area. It is doubtful if there are more than 2,500,000 acres for this purpose. If 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

## A Interesting Day Under the Kite

Forty years ago the artificial kite, in the shape of a hawk, but one which mostly flew backwards; was an institution in Scottish grouse shooting when birds grew wild, and was quite as popular in overcoming reluctance of English partridges to stop in the same field as the shooters. Sometimes in these days the kite is also used, and when properly understood is just as useful as ever. That is only where grouse and partridges are not numerous enough for driving.

Very few people like to use the kite, very often in the season. They say it drives the game away, which is quite true, and equally false, according to usage. In the first place there must be enough wind, and there generally is enough on the grouse moors; to keep the machine flying all the time. For if it comes down that spells disaster for that beat, and the best thing then is to move off to another one. Various accounts of the behavior of wild creatures under flying machines have lately been published. That is a question I was the first to raise, and in these columns. Any definite facts are of great value, but those who have recorded their observations of the behavior of elk, deer, foxes, horses, cows, domestic poultry, partridges and quail, in the most important particular of all have failed to make their observations of use. They have not always said whether they referred to dirigibles or aeroplanes—that is, to gigantic snails or to winged things; and the birds at least will distinguish between these two. I am less sure about the foxes and quadrupeds generally. They, I dare say, will be startled by either, but probably not much alarmed. Still, not the greatest fear, but the less, will do the most harm with game birds. That seeming paradox is simple truth, and simply explained. First of all, it should be known that a brood, or covey, scattered is one which will quickly return to its own ground to find relations. It is the brood that rises as one bird that goes far and leaves no hostages to fortune to bring it back again. Scattered birds usually begin to call together again ten minutes after they have settled. When they are too far off from their own relatives to receive acknowledgment and response, they begin to return whence they were scattered. That spot is the loadstone acting on the magnetic influence of blood that is thicker than water.

The kite that makes birds lie is an influence that enables them to be scattered when flushed by man or dog. That is, they have been subjected to a fear greater than theirs for man or dog, and, being flushed in that state of terror, fly singly, and scattered in all ways, or any direction that chance dictates, so that, whether shot at or not, no harm is done. They will not go further than the nearest good ground covert, will hide in that, and never come forth to call until the horror above has long since disappeared and they have regained their nerves. When that happens they will still be on their own ground, and will soon get together, apparently thinking no more of the incident.

### Do Birds Reason?

But in order that this real terror should occur, and not the minor fright, the counterfeiter of the woodcraftsman must not be seen coming. If it be detected low down, and no bigger than a man's hand on the horizon, it forbodes a clearing of the ground, and few, or no, close lying birds. That is so for the very obvious reason that if it were really a bird of prey seen thus far off, and so low down, near to the sky-line, any game bird by using its wings could put itself in safety and out of sight long before the swiftest flying raptorial could get within blood-curdling

range. Then, having no terror, but only that self-preservation instinct that wild things are hatched with, the covey or the brood will rise as one bird, and will fly far before it settles down again. It may go for miles, and the fact that its memory of its own ground is that there are dangers there, may prevent its return, and most likely does so. That is if game birds can reason, a mere precaution without terror, for the simple reason that they have been driven away by a thing in the air above their own ground, one that remains there for all they know to the contrary. That is why the kite may do harm, or do damage, according to its use, and also why some lucky sportsmen have each shot forty brace of grouse under it in the day, and others with work as hard, and a kite as good, have only succeeded in driving the game to their neighbors, and have condemned the artifice for a fraud ever since.

I have just assisted in both performances on the same day. It was the fringe of the moor, where grouse are too few for driving, and in a county in which that proceeding is still held to be a foreign practice. The ground is rough, with lots of "knowies," and the grouse could lie out of the wind and in the sunshine of a September day. The heather on these knowies is long, so that from the leeward side the heather and the hill between them protected the down-wind floating kite from avian sight until the former was fear, and almost vertically above. Thus grouse sat tight, and wanted finding, for although they crouch so close and are themselves almost scented then, they cannot reabsorb the scent exuded previously to their terror, and left clinging to the herbage. This enabled dogs to point, with uncertain dogs requiring cautious lest they, believing the birds flown, emulated them, as well, as four legs can.

### Influence of Ancestors and Airships

It is a fate of kite-flying of more sorts than one to be not quite satisfactory at the best of times, and we gunners were at the end of our down-wind beat, because our ancestors had not the forethought to stick up their land marks a few miles further down the wind. Compelled, then, to go in the direction of least resistance, a parallel line to the previous one was taken dead up wind; that, of course, compelled the kite man to go ahead far in advance of dogs and men, to pull the kite after him. That would always be best for giving dogs the wind if it were practicable in other ways. It was not; for although points were many, birds were few. The game was still basking on the lee and sunny side of the "knowies," but the heather, sloping away below them, was no obstacle to their sight of the kite afar off down the wind. There was not a grouse to be seen, although the puzzled dogs pointed just as they did on the down-wind beat, and at foot scents as before. The makers thereof had vanished before the shooters got within viewing distance, and for birds' sometime previous presence there was the circumstantial evidence, that every shooter knows, besides the corroborator of the still more bewildered pointing dogs. They, by this time, thought every foot-scent stood for grouse underfoot. That delusion lasted for the rest of the day, and may last still, for aught I know; for although a good nose can instantly discern that statement applies only to natural conditions, and not when the foot scent is strong as ever, and has been made by creatures since become as scentless as they are scared.

Then we tried the marsh for snipe, beat-

ing, like Hawkerites, first down wind. But the snipe, too, had seen the kite low down, and had gone off in whiffs. Yet sometimes they will lie well under such circumstances. Even a wild goose has done so, and if a goose will cower to be shot, what game will not, provided the sportsman's artifice can be presented vertically before it gives horizontal warning? I wonder what the dogs think of the thing itself? The effect on them is not all caused by the physical changes of the methods of scents. They do not like the look of this unusual object in the air, and although they come to investigate before it gets up, and after it is down, they are just a little scared all the time it is in the air, and while they are hunting. Still, they do not run howling into houses, as a German paper describes dogs doing in the presence of an airship. There are no houses to run into, and gun-dogs do not howl. How the black storks, and wild ducks that perceived the German dirigible from afar and flew off would have treated an aeroplane is not suggested by the incident. And whether the partridges and quail and other game birds that cowered and hid did so because of a machine with wings, or one without them, is not stated, although it is said that they and a domestic cock behaved as if they "beheld some gigantic bird of prey." Nor is it notified by these observers, or by a Swedish aeronaut, what their machines were when elk, roe deer, foxes, hares, and other wild animals took "flight," and dogs rushed howling into the houses. In spite of all this, I shall expect further observations to confirm the reasoned behavior of game birds, as when they behold an artificial or real bird of prey, and shall believe that the feathered creatures will either cower or fly, according to the vantage elevation of the supposed raptorial. But as to a dirigible with no wings, and like nothing in heaven, earth, or the sky, I do not believe that it will terrorise game, or make it cower, although it may "put it away" like any other strange sight.—Manchester Guardian.

### IT SOUNDED WELL

"Arry and his best girl were discussing recent events in the High Street, Bethnal Green, one day recently.

"Arry—'Did you read the list of presents Ann Smith had for her wedding?'

"Arriet—'Yes, I did. The hidea for such as them 'avin' the wedding' put in the paper! They might be bloomin' haristocrats.'

"Arry—'Fancy her mother giving her such a 'andsome present as a 'orse and trap!'

"Arriet—'Garn! It was a close 'orse and a mouse trap. I seed 'em. That's their bloomin' pride!'

The adjutant had lectured a squad of recruits on company drill, battalion drill, and every other form of movement that he could think of, and at last threw in a little instruction of his own on personal behaviour in the face of the enemy. "On the field of battle a brave soldier will always be found where the bullets are thickest, you understand. Private Jones, where would you be found, then, on the battlefield?" Private Jones—"In the ammunition wagon, sir."

The druggist at the corner shop had rolled back the woman's eyelid, and relieved her of untold agony by removing several grains of sand that she had accumulated at the seashore. She smiled at him gratefully.

"What do I owe you?" she asked.

"Nothing at all," said he. "You buy nearly all your postage stamps here, you know."

volume by which timber is generally purchased, called the "testmeter." 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 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 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 88 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 practiced. 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 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 practiced 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 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 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 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 practice 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 "Oberforster," with a salary of 4,500 marks (\$1,071), and a dwelling especially suited to his needs.

### AFTER SHEEP AND CANADIAN

(By C. F. Lane, in

The first link in the chain that led to my making goat took place on board Liverpool to Montreal terminate at the latter called on business, but we had become during—was merely starting land with the intention peeled to him. Our first soil was spent together night, agreeing, at part residence. Like many pond this promise never was some two years ago any word from my father morning when thinking to spend a month's vacation I received the following:

Dear Lane:—I am not time in explaining why I fact is, there is no explanation you what happened to and then will come to the letter. After saying good evening I stuck to the track. Here I was for a position as "chairman" of the survey party, and in the wilds, certainly seen with little intention of my home therein. However, berta we passed through am now located, its beauty once, and the desire to amidst such enchanting scene that at the end of six of returning home had made arrangements to buy cows, had fenced 480 acres mountains, put up a house, ing on a small scale. It was natural beauties of the local me, but the vague recollections plentiful in the almost to the west. So here I am with the exception of a thirty miles south of the northern boundary of the War Reserve. Now to business come and visit me in Scotland as to what date I you; leave the train at Pind will find "yours truly" ready to escort you to the cost you your train fare a license of \$25, and I will not only enjoy every moment but that you will go home sor of hunting trophies the spent thousands of dollars thousands of miles in the train.—Yours ever, Bob.

A decision was at once the budding rancher, and like acting promptly, a letter stating that I would be at September 2nd. The week the day of departure seemed last starting time came. T pleasant and interesting, by to my story, any description the sensations experienced the Rockies, must be omitted that by the time the ranch remembrance of city life had

The first morning we personally I cannot say during the night owing to that disease known in England in the states as buck fever, as I must call in Alberta, she intended on this first day short tramp so that muscles get into something like deer defer going after the big game," therefore we only took .22 rifle in order to shoot a and a fishing rod, so that we mountain trout for dinner. from the ranch we entered small canon and had scarcely yards when a touch on the me to drop to the ground. direction of my friend's game mule deer—one an enormous scrubby mountain side above yards distant. A suggestion at starting that the heavy Sav along in case big game should the sight of the deer almost you so," but knowing that experiencing the same feelings absence of the rifle as much was wisely omitted. There ved them feed for a while, else to be done, for the little no effect at the distance. Ev disappeared over the ridge sighted us, so we continued 300 further on we came to a ning down the mountain side, which resembled a small plain greens, and thinking that here a bird or two, we plunged down had almost reached the bottom of eleven deer which had been themselves on the bank just four feet. Eight of them yands across the gully and bank, but three, including a go up the gully, and when about