

occasional. It appears also necessary to preserve and properly to cultivate woods in quicksands, or the summits and ridges, as well as on the steep sides of mountains, along the sea coasts, and other exposed localities.

"In Germany, and especially in my more narrow-bounded Fatherland, Prussia, it is regarded as of the greatest importance, not only to preserve the forests already there, but to extend them as much as possible.

"In the National Appropriation Bill large sums are set apart for the purchase of such lands as are unfit for cultivation, and for utilizing the same by planting trees.

"With reference to forests owned by private individuals, they are not restrained in the use of their forests, and may, according to their own judgment, clear the same and till the soil, in short, do what they like, and yet there may be certain restrictions placed upon the free use of the same as soon as danger to the common welfare is feared; these restrictions are prescribed by the law of July 5, 1875, relative to forest protection.

"This law is applicable in cases:—

"1. Where, by reason of the sandy nature of the soil, adjoining lands, or public grounds, natural or artificial courses, are in danger of being covered with sand.

"2. Where, through the washing away of the soil, or through the formation of cascades in open places on the ridges of hill and on hill-sides, the arable lands, streets, or buildings lying below are in danger of being covered with earth or stone, or of being flooded; or the lands or public grounds, or buildings lying above are in danger of sliding.

"3. Where, through the destruction of forests along the banks of canals or natural streams, riparian lands are in danger of caving, or buildings, hitherto protected by the woods are in danger of iceflows.

"4. Where, through the destruction of forests, rivers are in danger of a diminution of the stage of the water.

"5. Where, through the destruction of forests in open places and near the lakes, neighboring fields are seriously exposed to the detrimental influences of winds.

"In the cases above mentioned, which have been copied verbatim from the statute book, the manner of use as well as the culture of forests may be legally ordered, in order to prevent those dangers where the dangers to be averted are considerably in excess of the damages which would result to the owner by reason of the restrictions."

SAXONY.

The state forests are nearly 400,000 acres, worked at an expense of \$500,000, receiving \$1,750,000, leaving a clear rental of \$3 per acre. The expenditure is planting, draining, roads, improvement of inferior woods, felling, transport, killing insects, etc. About five thousand acres are planted yearly, at an average cost of \$7.50 per acre.

The fixed establishment is one inspector, fifteen over-forest-masters, one hundred and twenty district foresters, sixteen cash-keepers, thirteen engineers, twenty-seven foresters, and eighty-three sub-foresters.

There is a forest academy at Tharandt, with a separate staff of professors.

The system of planting now principally experimented on is much the same as that previously described; the young trees being several feet high before the old trees are all removed. One operation is noticeable. It was decided to convert a mixed hardwood forest, patchy and irregular, with impoverished soil, in 1820, into a coniferous forest, and maps were drawn showing what it would be in eighty years. Private intersecting lands have been bought up, and by 1,900 the ideal chart will be actual. Already, in place of a straggling wood, irregularly covered with timber trees of inferior growth, we have now a compact close forest, regularly wooded in sections of different ages, principally spruce and Scotch fir, but containing also fine oak, ash and beech, with straight and clean stems. In many cases the young oaks have been left where pines were planted, and the introduction of the latter has a wonderfully good effect on the oaks.

All private rights were abolished and com-

pensated in these forests by a Bill passed in 1832.

BAVARIA.

The state forests are 3,000,000 acres. They return, after paying all expenses, about \$1.50 per acre per annum. About 30,000 acres are planted or sown annually, taking 35,000,000 plants and 1,000,000 lbs. seed. Persons found guilty of breach of forest rules have been punished by enforced labor in the woods. Private forest rights are being bought up by the Government.

The system of management is much the same as that previously described. There is a forest academy at Aschaffenburg, with one hundred and sixty-five students.

It will be interesting to notice the injury and process of repair in the fine forests of the Spessart in Bavaria. The deterioration was caused by felling the forest trees as soon as, or before, they were mature, the impoverishment of the soil by the removal of leaves and litter, and the allowing dense underwood to grow unchecked. Inferior trees got the upper hand and prevented the growth of good, while they drained the already impoverished soil and gave nothing in return. Early in the present century the matter attracted attention, and every means have since been adopted to grow oaks, beech, and conifers. The result is, though not yet equal to the uniformity of other forests, nowhere can one find finer clumps and individual trees. Inferior trees will soon be rare in the whole forest. In remote portions where the humus had not been destroyed, the growth of beech and oak is truly magnificent, tracts of 120-year old beech and 300-year old oaks being common, the latter with clear trunks running up to 100 feet high. When we compare these with other portions where the crippled and stunted appearance of the trees shows the effect of unregulated grazing and loss of litter, burning of the decayed wood, and forest theft and mischief, or the soil and vegetation, the result is marked. The circumstances, says the Indian Commissioner, are analogous with what has gone on in India for centuries, and is still more or less permitted. The vast extent of forests, which once clothed the hill sides and extended far out on the plains, and the luxuriant growth of the tropics, have hitherto, or until the last two years, prevented the gradual deterioration of our forests being marked or felt, but the subject has now attracted attention, and none too soon. If any have doubts in the matter, let them visit the Spessart, study the history of its forests and judge for themselves.

The forests are sharply protected by law, the average number of prosecutions annually being thirty per thousand acres. The crimes are mischief to wood, pasture, grass, straw, and miscellaneous.

AUSTRIA.

Scientific forestry is not so far advanced as in Germany, but officials are busily introducing a reorganization, by means of which, there is no doubt, it will soon be on a par with other states.

The state forests have been largely sold to meet state necessities, but there still remains nearly 2,000,000 productive acres, which yield, however, after expenses are paid, little over 25 cents per acre.

The existing establishments of forestry are not uniform, but there are about twelve hundred employees, of whom twenty-two are forest-masters. Some of these have almost sinecures, while others have six times too much to do, and it is the same with those in the subordinate ranks. The forest academy is at Mariabrunn, near Vienna. There are about thirty-five students.

The collections are fine, possessing specimens of all instruments and appliances made use of in felling, squaring, sawing, carting, and preparing timber, models of saw mills and machinery of all descriptions, plans of river beds improved and embanked for floating, sluices of all sorts, dams and piers for directing rafts in their course and catching firewood, models of rafts, and specimens of home and foreign timber of all kinds. The damage done by animals and insects is also exhibited here comprehensively. There is also a forest garden attached to the academy for the instruction of the students.

The staff of the academy consists of the director, thirteen professors and assistant professors, with subordinates in the account office, laboratory, etc. There is also a forest school at Bruhl, for training young men (of whom eight were there) as practical foresters.

The greater number of those trained here are intended for private and not for Government service, their expenses for board and lodging being paid by noblemen and large proprietors, from whose estates they come, and to whom they return as forest officers and workmen. The state maintains the schools, and pays the professors salaries, and there are no extra fees. This cannot fail to assist the intelligent management of the private forests of the empire, which are very extensive. The absence of numerous candidates for the government forest service, and preference for private employment is noteworthy, when compared with the opposite state of things in Prussia. The irregular promotion, lack of system, and low salaries in the Austrian forest service are the explanation.

The Austrian crown forests have been neglected; they are patchy with a low and decreasing yield per acre. There has been till now no attempt at rotation of blocks or working in periods. As is found in India, a glance at the outskirts of the forests would lead one to suppose it fairly stocked with timber, but a more careful inspection proves that this is not the case, and that only in the valleys and more remote portions, where the soil is particularly good and the axe has not been so frequent in its inroads, is there a fair and regular crop.

Herr Schuppitch, the present director, is trying hard to change matters, and is changing the hardwood crop, which has exhausted the soil for that class, with pine growths, which besides grow quicker and pay better. He is also dividing into blocks and periods, and planting up many bare or ill-covered tracts, where natural reproduction is impossible owing to the absence of standard trees.

GRAND DUCHY OF BADEN.

We shall now notice a private forest, that of the Prince of Furstenburgh, in the Black Forest. The receipts and expenditure are not obtainable, as are the public ones, but we are informed that the forests are economically worked, and that the liberal sums expended in road-making, attaining rivers for floating, housing foresters, &c., were well repaid by the facilities secured, and contentment and zeal of the employees. In the case of this, as of other private forests, it is evident that a private individual is not burdened with considerations of policy and public good as in a State. The forests are, therefore, worked with the best profit compatible with their retention as capital.

There are about 72,000 acres, in charge of 18 foresters and over-foresters, who of course have many subordinates. The method employed in the slow felling and continual reproduction before mentioned, a block being about forty years in clearing before all the old are replaced by the new trees. Attention and intelligence are necessary, for seed will not grow nor the seedlings flourish without enough light, and the forest officer must watch that they get it; and again much greater care is needed in felling and hauling away when the trees are surrounded by lofty saplings and young trees than when the seedlings of the next crop are not more than a foot or two high. In this the axe-men of the Black Forest are adepts, and the damage very slight to what it would be in other hands.

It may be useful to describe their manner of bringing timber down the rivers. It cannot here be done when the stream is in flood; in fact, the less water in it the better so long as sufficient is stored up above to float the rafts. Reservoirs are made, and the water poured into the river bed when the raft is ready. The streams are often small, of only fifteen or twenty feet in width, and have to be prepared for floating, by being cleared of any large rocks or boulders, and "sloped," if we may use the expression, by pieces of wood firmly fixed in the bed of the stream every few yards. These prevent the formation of holes in the bed, and serve for the raft to slide on if it touches the bottom. The first impression of the Indian commissioner when he saw the float,

composed of stems from twenty to sixty feet in length tied together with withes at the ends, and lying zigzag in the bed of the mountain stream, up and down which they extended sixteen hundred feet, was that it was simply impossible they ever could be floated down the stream, with all its windings, and over the locks and rocks which occurred pretty frequently. It contained 880 stems, eight or ten of which abreast formed as it were a link in the raft. There were thirty links, not fastened laterally, but only at both ends to the next link. The breadth is greatest at about two-thirds from the prow, which is narrow, and consists of only three stems abreast, with in front of all a piece formed of old wood and raised out of water like the bow of a whale-boat, so as to lead the raft and the largest and heaviest stems placed in the broadest part and towards the stern or hinder part, which does not taper at all. There are two or three breaks, by which the speed is slackened or the raft stopped if needed. When all is ready, the water from above is let loose, and the raft, perhaps not now lying in a foot of water, begins to float a little, but is not let go till two-thirds of the water is passed, as it is a curious fact that when let go, if there is much descent, it travels faster than the water, and has to be stopped to let the water get ahead again. The raft has eight or ten men and boys, one or two of whom stand by the master at the chief break, on which the safety of all depends. When let go it is exceedingly curious to see the forward part dart off at the rate of five miles an hour, and the several links which have been lying zigzag and perhaps high and dry uncoil themselves and follow in its wake till the whole dashes along at great speed and apparently uncontrolled. Accidents are rare, as they are well trained (lads of six or eight can be seen going down in miniature floats); but for one not accustomed to it, it is nearly impossible to stay on the raft at all, as it literally springs out of the water on touching a rock, dashes around a rapid turn, or jumps a weir with a fall of several feet. Forty or fifty miles can be got over in a day if stoppages to let the water ahead are not too frequent or the stream is not swollen by rains.

REMARKS ON GERMANY.

The Indian commissioner proceeds to remark on the German history of forestry. Perhaps it will be here admissible that I make one myself. Let me say that, when we consider the immense extent and rapid growth of forests in India, the vast amount in Government hands, and yet find that they are so rapidly deteriorating as to necessitate the despatch of commissioners to Europe to learn the methods of preserving the forest, it is likely that Canada has just as much reason to beat her breast in the matter. Let us notice also, by some of the valuable tables Capt. Walker has furnished, that in Germany & Prussia alone that there are nearly two hundred and fifty millions of acres of forests. We will well have already understood, by the foregoing pages, how different the great mass of these forests, with their great reserves of growing and well cared for trees, planned and prepared for many years, so that the forests can be depended on to give its regular and annual yield of valuable timber in perpetuity, are from our Canadian reserves, which are cut without regard to the future, and are fast disappearing before the combined assault of the settler and the lumberman.

On asking, where are we to look for a model or precedent on which to work, he replies "To Germany, where the management of forests by the State has been carried on for hundreds of years. Not the mere planting of a few hundred acres here, or reserving a few thousand acres there, but a general system of forest management, commencing by a careful survey, stock-taking, definition and commutation of all rights and servitudes, careful experiments in the rate of growth, the best soil for each description of tree; in fact, in every branch of the subject, and resulting in what we find to-day, hundreds of thousands of acres mapped, divided into periods and blocks, and worked to the best advantage both with regard to present and future, and the annual yield of which now, and for many years to come, is known and fixed to within a few hundred cubic feet."

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