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LXIX. *Observations on Larch: together with two Experiments of the Strength and Resilience of the Timber, and Size of largest Tree cut in 1817, or growing in 1819.* By JOHN, DUKE OF ATHOLL.

THE following remarks on larch were transmitted by the Duke of Atholl to the Commissioners of Naval Revision, May 1807; and will evince, not only the great importance which in his opinion attached to the subject, but also his wish to make the result of his practical knowledge known, for the advantage of his country.

Since the period of 1807, the wishes of the Duke of Atholl, that the larch might be tried for naval purposes, has been carried into effect; and a frigate of 28 guns is now building at the Royal dock-yard of Woolwich, to be constructed entirely of that species of timber.

The introduction of this most valuable tree into Scotland, at least into the county of Perth, took place in the year 1738; when a Highland gentleman, Mr. Menzies, of Glenlyon (Perthshire), brought a few small plants from London; his servant carrying them on horseback on the top of his portmanteau. Some of these plants he left at Monzie, near Crieff, some at Dunkeld, and the remainder he carried home, where some have been cut, within these few years, of a great size. The four left at Monzie are in full vigour (1807); the largest nearly twelve feet in circumference, at three feet and a half above the ground. Those left at Dunkeld are also in full vigour (1807); some were placed in a greenhouse, but not thriving, were turned out. The largest is about twelve feet in girth, at three feet and a half above the ground, and is computed to contain four load of solid timber, or two hundred feet. Some years elapsed before any more larch were planted at Dunkeld. A few, however, were planted at Blair in that interval. But the larch planted between the years 1740 and 1750 were inconsiderable in point of number. For the planting of the rocky mountains round Dunkeld, with a view to their growing wood, which has since been done, would at that time have been treated as a chimerical idea. The plantations on the lower grounds were necessarily small in extent.

Trials of Larch.

1777.—It is now thirty years since I have cut and used larch for different purposes; and as yet I have met with no instance to induce me to depart from my opinion, that larch is the most valuable acquisition, in point of useful timber, that has ever been introduced into Scotland: and I speak from having used and cut larch of from fifty to sixty years' growth.

The small larch I have used were thinned out of plantations for upright paling, rails and hurdles. Those fit for sawing, were sawn through the middle; the smaller used round, with the bark on. I have found young larch, so used, more durable than oak copse wood of twenty-four years' growth.

1795.—The larger and older larch which I have cut, have been used for a variety of purposes. Boats built of it have been found sound, when the ribs, made of oak forty years old, were decayed. I have for years built all my ferry and fishing-boats of larch.

In mill-work, and especially in mill-axles (where oak only used formerly to be employed), larch has been substituted with the best effect.

1806.—Last winter, in cutting up an old decayed mill-wheel, those parts of the water-cogs, &c. which had been repaired with larch about twenty years before, though black on the surface, on the hatchet being applied, were found as sound and fresh as when put up.

There is not a sufficient quantity of larch of fit growth, to bring that wood into general use for country purposes; but such as has been cut and sold, has brought two shillings per foot, in some instances more. About the year 1800 I received twelve guineas for a single larch-tree of fifty years' growth. I was at the same time offered twenty pounds for another larch, which I declined cutting. The tree sold had eighty-nine solid square feet of wood; and the purchaser cut two if not three axles for mills out of it.

1806.—Last year I cut out twenty larch-trees from a clump where they stood too thick. I left the finest trees standing, and received one hundred guineas for the twenty trees taken out, being at the rate of two shillings per foot. The largest of the twenty trees measured one hundred and five feet in length, five feet eleven inches in girth at four feet from the ground, and contained ninety-four square feet of timber. One tree measured one hundred and six feet; two, one hundred and seven; and one, one hundred and nine feet in length; but, being drawn up by standing too close, did not contain so much solid wood as the first.

It is not in the quality only of the wood that I consider the larch a great acquisition; but in the nature of the ground, where it will not only grow luxuriantly, but I am persuaded will arrive at a size fit for any purpose to which wood can be applied.

The lower range of the Grampian Hills, which extend to Dunkeld, are in altitude from one thousand to seventeen hundred feet above the level of the sea; a range of mountains to the height of twelve hundred is now in the course of being planted. They are in general barren and rocky, composed of mountain schist slate and iron stone. Up to the height of twelve hundred feet, larch are planted, and grow luxuriantly, where the Scotch fir,

fir, formerly considered the hardest tree of the north, cannot rear its head. In considerable tracts, where fragments of shivered rocks are strewn so thick, that vegetation scarcely meets the eye, the larch puts out as strong and vigorous shoots as are to be found in the valleys below, or in the most sheltered situations.

I have been employed for the last five years in forming a very extensive plantation of larch, on mountains similar to what I have described. The plantation embraces a tract of nearly eighteen hundred Scotch acres, nearly one thousand of which I have already planted (1807), mostly with larch, placing Scotch fir only in the wet grounds where larch will not grow, and mixing spruce on the highest points, finding from experience that that tree is next in value to the larch, and thrives in alpine situations almost equally well.

In all the larch which I have cut, I have never met with one instance of decay. But I have seen larch cut in wet situations and tilly soil on low moors some miles below Dunkeld, which at forty years of age were decaying at the heart. The larch is certainly an alpine tree, and does not thrive in wet situations.

In 1795 a species of blight appeared on the larch, which in low situations destroyed numbers. The season in which this was observed to any extent, the frosts were very severe late in the spring, and the clouds of frost fog; which rested on the larch, in calm mornings, when just coming into leaf, produced the blight. I did not find trees above twenty-five or thirty feet in height affected by it, neither did it appear at all on the higher grounds, where a slight breeze of air could shake the trees. For eight or ten years past severe frosts at the end of spring and beginning of summer, have partially brought a somewhat similar blight, which, though not essentially injuring the growth of the wood, except in a few instances, nearly destroyed the flower of the larch, which has prevented my having been able to obtain larch seed in the quantity I wished, in order to carry my intention into effect;—to cover all the mountainous tract near Dunkeld belonging in property to me, with larch, which I am persuaded, at the distance of sixty or seventy years from planting, will be fit for most naval purposes.

The comparative value of larch and Scotch fir will not bear calculation. In the year 1800 I sold a larch of fifty years old for twelve guineas; while a fir, of the same age, and in the same soil, brought fifteen shillings. A fall of snow will destroy in one night, and break and tear down sometimes more than one-third of a fir plantation. This I have often experienced at all ages. High winds also destroy firs in numbers.

The larch are never broken by snow, and very seldom torn up
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by winds, and then only in single trees. Scotch firs are bad and shabby growers (with me at least), at about eight hundred feet of altitude. Larch grow luxuriantly some hundred feet higher.

The late Duke of Atholl, my father, was the first who formed plantations around Dunkeld or Blair, to any extent (in 1765). The quantity of old larch I could at present spare, therefore, cannot be considerable; but should the Board, from any thing I have said of its durability in boats, &c. &c. be inclined to make trials for naval purposes, I could perhaps furnish for *that purpose* forty or fifty load: or, I should be extremely ready and happy to carry into effect experiments, if the Board should think fit to direct the making of any, to prove the strength, weight, durability, &c. &c. of larch wood.

I would not, Gentlemen, have troubled you with the foregoing detail, but from a thorough conviction that larch timber may be used, in many instances, as a substitute for oak.

That this substitute may be had of a prime quality in sixty or seventy years from the period of planting.

And, lastly, that this substitute may be the produce of otherwise barren and unprofitable mountains. Whereas oak timber will always be found to thrive best in lands either taken from, or well adapted to, agricultural purposes, and more particularly to the growth of *wheat*.

The further and various trials made by the Duke of Atholl of the quality and endurance of larch; the extent of plantations of that species of tree formed and forming on dry, and of the *Pinus alba*, or Norway spruce, on wet lands; and the surprising fertilizing quality of the leaves or spines of the larch, which in the course of between twenty and thirty years convert the most barren and rugged mountains, formerly not worth nine-pence per acre, into an herbage worth from ten to fifteen shillings per acre;—it is the intention of the Duke to put together, and make known, for the general good.

In the mean time, he confines himself to the observations formerly transmitted in 1807, to the commissioners for naval revision, along with two trials of the strength of larch, made in 1812 and 1818*, and the age and dimensions of the largest larch-tree that has been cut, or is now growing on his estates.

* The description of the trials in 1818, here referred to, is a quotation from the Philosophical Magazine for March 1818 (see our fifty-first volume, page 214), and needs not therefore to be repeated in the present article.

Experiments on Larch.

423

Results of the Experiments made on the Strength of Larch Timber received at Woolwich Yard in the Year 1808, and proceeding from the Estate of His Grace the Duke of ATHOLL, in Scotland, compared with Riga Fir Timber, and American White Pine.

Date of the Experiments.	Description of the Timber.		Dimensions of the Battens.		Weight of the Battens at the time of Experiment.		Distance of the Fulcrum from the end of the battens to which the weights were affixed.		Curvature received by the Battens under the pressure of		Curvature remaining after the removal of the weight.		Weight under which	
	Quality.	How long kept in Store.	Length.	Size.	lbs.	oz.	ft.	in.	Half hundred weight.	One hundred weight.	inches.	inches.	The fibres upset or crippled.	The Battens broke.
1812. 16th June.	Larch. { Outside Heart	4	6 0	2 by 2	5	8	5	0	7½	16½	cwt. qrs. lbs. oz.	cwt. qrs. lbs. oz.
	{ Outside Heart	4	6 0	2 x 2	5	10	5	0	3½	7½	1 0 14 0	1 0 14 0
	{ Outside Heart	4	6 0	2 x 2	5	5	5	0	5½	10½	1 0 25 0
	{ Outside Heart	4	6 0	2 x 2	5	8	5	0	3½	6½	1 1 20 0	1 1 22 0
1812. 16th June.	Riga, dry	6	6 0	2 x 2	7	6	5	0	3½	10½	1 0 7 0	1 0 7 0
	American White Pine, wet	8	6 0	2 x 2	6	7	5	0	3½	10½	1 0 7 0	1 0 10 0

The average and relative strength of the three species will therefore stand as under; viz.

	Average Strength.		Relative Strength.	
	cwt.	qr. lbs.	cwt.	qr. lbs.
Larch	1 1 8	1,000
Riga, dry	1 0 7	,804
American White Pine, wet	1 0 10	,824

Or about 1-5th less strength than the larch.

The above experiments were tried in the presence of Captain Baynton, R.N., and the first was also witnessed by His Grace the Duke of Atholl, Commissioners Peake and Thomson, George Yeats, Esq. &c. &c.
J. LE BARRALLIER.
JOHN PEAKE.

Dimensions of Larch Tree, cut at Blair Atholl, 1817.

<i>Feet. In.</i>	<i>Girth.</i>	<i>Root Cut.</i>	<i>Contents.</i>	Woolwich Yard. Home use. Home use.—Under six square inches. Age—79 Years.
	<i>Ft. In.</i>	<i>Length.</i> <i>Ft. In.</i>	<i>Cubic Feet.</i>	
At 1	12 0	1st.—31 6	172	
	19 8	2d.—25 4	60	
	3 3½	3d.—14 3	16	
57	4 10		248	
To 82	2 0	4th.—10 11	4·8	
Top, } 20				
102		82	252·8	
		Top, 20		
		102		

DUNKELD.

A Larch Tree planted 1738, measured February 15, 1819.

<i>Above Ground.</i>		<i>Contents.</i>	<i>Age.</i>	This Tree is in full vigour.
<i>Feet.</i>	<i>Girth.</i>	<i>Feet.</i>		
At 1	Ft. In.			
	17 8		80	
	2 14			
	3 12			
	4 11			
	5 11			
	6 11			
	10 10			
	20 9			
	30 8			
	40 7			
	50 6			
	60 4			
	70 3			
	1 10			
75				
To 75				
Top, } 14				
90	Total Height.			