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“Notes upon Useful Japanese Timber.”

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THESE notes deal only with the timbers commonly used for constructive purposes. Out of the one hundred and twenty kinds of Japanese timber catalogued by the late Dr. Geesto,¹ the six following have been selected for notice, as those which chiefly concern the builder, namely, Shira Kashi, Keyaki, Aka Matsu, Kuro Matsu, Hinoki, and Sugi.

Investigations into the mechanical properties of these, and of numerous other, native timbers, have been conducted by the Tōkiō Engineering School, and, in a less complete manner, by several observers, not, however, with satisfactory results.

The engineering pupils experimented upon small bars of wood, $1\frac{1}{8}$ inch by 2 inches in cross-section, and their conclusions were published with the reservation, that the individual results of weight, elasticity and rupture, were too irregular to admit of the averages being of value. The other observations published, which are upon weight only, exhibit striking divergencies, due probably to the state of dryness of the wood. For example, the average weight of Keyaki, the most important timber of the group, is given as $56\frac{1}{2}$ lbs., 52 lbs., and $43\frac{1}{4}$ lbs. per cubic foot, by three observers respectively. The prices are those now ruling in Tōkiō, reduced to English money, per cubic foot.

The Shira Kashi (*Quercus glauca*) is a hard close-grained brown wood, traversed by numerous fine medullary rays. It is elastic and durable, much used for shafting tools and vehicles, for wedges, wheel-work, and in all situations where exposed to frictional wear as in the native mill-machinery. It does not attain sufficient size to be generally useful in engineering work. Mostly felled at about fifty years of age, its girth reaches, but seldom exceeds, 3 feet. The present price is 55 sen, or 1s. 8d. per cubic foot.

The Keyaki (*Zelkova keaki*) is the most important of Japanese timbers. The wood is light brown, with the annual rings of growth distinctly marked. Strong and durable, although often

¹ Transactions of the Asiatic Society of Japan, vol. iv.

knotty, it is easily worked, and is procurable of sufficient size for all kinds of construction. It is durable even in situations alternately wet and dry, and is used for piles in bridge work and in the best class of structures. It remains sound and in good condition to a very great age in some of the temples—a proof of its durability when properly seasoned. When cut the wood is handsome, and for this reason, as well as on account of its susceptibility of high polish, it is much prized by furniture-makers. It is chiefly felled when about fifty years old, the girth then being about 4 feet; but in the temple groves, and alongside of the great high roads, there are specimens upwards of 12 feet in girth. The present price is 60 sen, or 1s. 10d. per cubic foot.

The Aka Matsu, also called Me-Matsu (*Pinus densiflora*), in the log is easily recognised by its red bark, whence the name, literally, red pine. The wood is yellowish, slightly resinous, with distinct annual rings of growth. It is straight-grained, easily worked, strong and durable, especially when constantly immersed in water. It is extensively used in roofs of good class, for beams, floors, railway-sleepers, and for all kinds of carpentry. The trees are felled at about thirty-five years of age, when the girth is from 3 to 4 feet. Under favourable circumstances it attains a girth of 15 feet. The present price is 35 sen, or 1s. 1d. per cubic foot.

The Kuro Matsu, also called O-Matsu (*Pinus Thunbergii*), is very similar to the Aka Matsu in form, size, and rate of growth; but is easily distinguished from the latter by its darker bark. Of a hardy nature, the Kuro Matsu is the common timber of the hill forests. Although coarser and less resinous than Aka Matsu, it is frequently used indifferently with the latter in dry situations. The present price is 30 sen, or 11d. per cubic foot.

The Hinoki (*Chaecypario obtusa*) is a tall and straight-growing tree. The wood is straw-colour, free from knots and winds, and is valued as mast-timber. It is light, tough and elastic. When fairly seasoned it does not warp, and is very durable in damp situations. It is selected for floor-beams and uprights in house construction, for railway-sleepers, and is extensively used for pattern-making and cabinet work. Felled usually at about fifty years of age, its average girth is 4 feet. Specimens having a girth of 12 feet may be seen in the groves. The present price is 50 sen, or 1s. 7d. per cubic foot.

The Sugi (*Cryptomeria japonica*) has a coarse fibre, and the annual rings of growth are distinctly marked. The heart-wood is ruddy brown, and the sap-wood straw-colour. It is a feeble and perishable timber; but being very straight-grained, it opposes

considerable resistance to longitudinal stress. This property renders Sugi a useful timber for uprights in houses of light construction; though it is most extensively employed in the characteristic scaffolds of the country. For timber, the felling age is about thirty-five years, when the average girth is 3 to 4 feet; but for poles it is felled much younger. When full grown, a girth of 15 feet is not uncommonly attained. The present price is 25 sen, or 9*d.* per cubic foot.

All the above timbers are inferior in strength to their European analogues, as they are, under the climatic conditions of Japan, of more rapid and exuberant growth. The trees are generally felled long before their full growth has been attained. Felling is carried on through all seasons, the summer months indeed being the favourite.

The prices quoted are subject to extraordinary fluctuation. There is no timber market in Japan. Timber is usually purchased from the grower as it is wanted, and is then converted to the required scantling. In addition to the effect of the state of the building trade upon prices, these are influenced by the season and by the condition of the roads where water-carriage is impracticable. The railway tariff for this class of merchandise is at present prohibitive.

It must be noticed that fire and tempest, and not decay, generally determine the existence of Japanese structures; and durability comes to hold a place second to the consideration of prime cost of the building material. This affords an explanation of the immature age at which the timber is usually felled, of the disregard of season exhibited by the wood-cutters, and of the slight attention paid to seasoning and preservative processes.

Neglect of seasoning is, however, seldom aggravated by the use of paint of any kind, but it is not unusual to stain wood with shibu (the juice of persimmon), darkened with lampblack or ashes. Shibu is a powerful astringent, and does not hinder the sap from leaving the green timber, whilst it affords some protection from the weather. Nevertheless, rot prevails throughout such woodwork as may be found to have escaped fire and storm for even a few years; and although extensively employed for ordinary constructive purposes, the difficulty of readily obtaining timber in good condition prohibits its use in important structures. This is much to be regretted, for good building stone is of unfrequent occurrence, brick-making is imperfectly understood, and ironwork must be imported.

Viewing the favour which timber obtains as a building material

for earthquake countries, the improved methods of construction which are being introduced, and the protection against disastrous fires afforded by proper water-supply—a subject hitherto unknown but now attracting attention in this country, it seems not improbable that due regard may yet be paid, upon economical grounds, to the development of the good qualities of Japanese timber, and to their retention by efficient treatment.