In America, Professor J. B. Johnson made a large number of tests for the Forest Department of the Board of Agriculture of the United States between 1891 and 1895. More than 300 trees were cut down and experimented with, the species under test embracing ten different kinds of pine and five different varieties of hard-wood trees. Records were made as to the nature of the soil and climate where the trees were grown; their conditions of growth, their age and size, and the season of felling. As in the tests made by Bauschinger, the per­centage of moisture contained in the wood was very carefully observed, and it was found that this amount of moisture has a very great influence upon the resisting power of the wood, the strength increasing with the dryness of the material up to 3 or 4% of moisture, at which point the greatest strength of the wood is reached. Wood in such a dry condition, however, is never found in actual practice, timber in an ordinary well-warmed and well-ventilated situation probably containing at least 10%.

One general conclusion arrived at both by Bauschinger and Johnson was that the strength is much affected by the specific gravity of the timber. In all cases the strength increases pro­portionately with the density of the wood. A most complete series of tests upon the physical characteristics of the hard woods of Western Australia was completed for the govern­ment of Western Australia by G. A. Julius in 1907. This work was carried out in a most thorough manner, and as many as 16,000 tests were made, the conditions of test being based upon those laid down by Johnson. The results serve to show the great value of Australian timbers, and the comparisons made with the typical timbers of many other countries emphasize the fact that the Australian woods are equal to any in the world for hardness, strength and durability.

For use under special conditions a wood suited to the par­ticular requirements must be selected. The following is a list of the best timbers for different situations: for general con­struction, spruce and pine of the different varieties; for heavy constructions, pitch pine, oak (preferably of English growth), teak, jarrah; for constructions immersed in water, Baltic pine, elm, oak, teak, jarrah; for very dry situations, spruce, pines, mahogany, teak, birch, sycamore.

There are no regulations in England limiting the working stresses that may safely be placed upon timber, although in some districts the least sizes that may be used for timbers in roofs and floors are specified. In some European and other countries, however, the safe working stresses of timber used for constructional purposes are defined. The building by-laws of the municipality of Johannes­burg, in South Africa, contain the following table:—

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Safe Working Stresses for Timber.* | | | *In tons per square inch.* | |
|  |  |  |  | Bending. |
| Material. | Tensional. | Compressive. | | Extreme Fibre Stress. |
| Timber | — |  | *—* | — |
| Fir and Pine | ' |  | *ì* | ï |
| Hardwood | ⅛ |  | *ì* | i |

*Note.—*The compression stresses are for short struts and columns where the length does not exceed for timber 15 times the least transverse dimension, and where the ends are fixed. Where the ratio of the length to the least transverse dimension is higher, the load per square inch shall be proportionately reduced. No post of timber shall exceed in length 30 times its least transverse dimension.

References.—T. Tredgold, *Principles of Carpentry,* § xii. ; R. E. Grandy, *Timber Importer's Guide·,* G. A. Julius, *Report of a Series of Tests upon the Physical Characteristics of the Hardwoods of Western Australia* (1906-1907); J. B. Johnson, *Report of Tests upon Timber made for the Forest Department of the Board of Agri­culture of the United States* (1891-1895); J. Bauschinger, “ Report of Tests made upon Timber at Munich,” *Mittheilungen aus dem Mechanisch-Technischen Laboratorium der K. Technischen Hochschule in München·,* F. E. Kidder, *Building Construction and Superinten­dence,* vol. ii.; Rivington, *Notes on Building Construction, vol.* iii. ; T. Laslett, *Timber and Timber Trees·,* H. Stone, *The Timbers of Commerce and their Identification·,* H. Μ. Ward, *Timber and some of its Diseases;* R. Hartig, *Timbers and How to know them* ; J. Brown, *The Forester;* G. S. Boulger, *Wood.* (J. Bτ.)

**TIMBER-LINE,** in physical geography, the line of elevation above sea-level above which trees do not grow. In any hilly locality, which is not of too high latitude to allow of trees growing near the sea-level, this line is generally clearly marked. It varies not only with general but also with local conditions of climate, just as does the snow-line.

**TIMBER-WOLF** *(Canis occidentalis)*, or grey wolf, an American species, or, perhaps, a geographical race of the European *C. lupus* (see Wolf). The length of good specimens is about 64 in., of which the tail forms’ nearly a quarter, and the range of colour is from black to white. Cattle ranchers and shepherds have established a war of extermination against this wolf and the coyote; several states offer bounties ranging from $2 to $10 on wolf-scalps. In Montana in 1901 during a month in the saddle an observer saw no wolves, which have become so scarce that the occupation of the professional wolf-hunter is almost gone. These animals are, however, far from being exterminated, the “ bad lands ” forming an absolutely secure refuge.

**TIMBREL,** or Tλbret (the *tof* of the ancient Hebrews, the *deff* of Islam, the *adufe* of the Moors of Spain), the principal musical instrument of percussion of the Israelites, identical with the modern tambourine. The word timbrel is used in the Old Testament in both singular and plural form, so as to suggest that the former referred to a hoop of wood or metal over which was stretched a parchment head; while the plural was perhaps used to designate the tambourine with bells or jangles fixed at intervals in hoops. The Israelites learnt to use the timbrel during their sojourn in Egypt, and it has been suggested that as the Egyptians used it to scare away their evil spirit Typhon, the word *tof* is derived from the latter. The tabret or timbrel was a favourite instrument of the women, and was used with dances, as by Miriam, to accompany songs of victory, or with the harp at banquets and processions; it was one of the instru­ments used by King David and his musicians when he danced before the Ark. It was also used in the valley of Hinnom at the sacrificial rites, when human victims were “ passed through the fire ” to Moloch. (K. S.)

**TIMBS, JOHN** (1801-1875), English antiquary, was born in Clerkenwell, London, on the 17th of August 1801. He was edu­cated at a private school at Hemel Hempstead, and in his sixteenth year apprenticed to a druggist and printer at Dorking. He had early shown literary capacity, and when nineteen began to write for the *Monthly Magazine.* A year later he became secretary to Sir Richard Phillips, its proprietor, and permanently adopted literature as a profession. He was successively editor of the *Mirror of Literature,* the *Harlequin,* the *Literary World,* and sub-editor of the *Illustrated London News.* He was also founder and first editor of *Year-Book of Science and Art.* His published works amounted to more than one hundred and fifty volumes. In 1834 he was elected a fellow of the Society of Antiquaries. He died in London on the 6th of March 1875.

**TIMBUKTU** (French spelling Tombouctou), chief town of the territory of Timbuktu, French West Africa, 9 m. N. of the main stream of the Niger in 16° N. and 5° W.

Timbuktu lies on a terrace formed by the southern scarp of the Sahara, about 800 ft. above sea-level, and overlooking a chain of *dhayas* or marshy hollows, fringed here and there with a few mimosas and palm thickets, amid the surrounding sandy wastes. These dhayas, which are flooded every three or four years, converting the lowland tracts between the terrace and the main stream into a labyrinth of channels and backwaters, mark the bed of a navigable creek which formerly branched from the Niger northwards to the foot of the scarp, and which in 1640 inundated a low-lying quarter of the city. It is conjectured that the main stream followed this course before it took its present easterly curve to Burrem, where it bends southwards to the coast. Here also it was probably joined at some remote period by the now dried-up Wadi Messaura front the Tuat oases south of Algeria, although the rough levels taken by Oscar Lenz and others make it uncertain whether the flow through this depression was northwards or southwards. In any case Timbuktu has been left, so to say, high and dry by the general process of desiccation going on throughout the Saharan region.

Timbuktu has been described as “ the meeting point of the camel and the canoe,” “ the port of the Sahara in the Sudan,” and (more correctly) “ the port of the Sudan in the Sahara.” It is a great “ exchange ” for the produce of North Africa **and**