

on silted stands that were being eroded by river action. One washed out trunk was observed with two additional root tiers above the primary system (fig. 6), the lower tier being 2 feet above the primary system and the upper tier 3 feet above the lower tier. This tree must have been silted up for seven or eight feet. This production of auxiliary root systems is a result of the vigorous vegetative capacity of totara. Totara trees in the pole stage have been observed lying half buried in sand and shingle on the lower reaches of rivers having been washed down stream during a flood. These trees were putting forth a quantity of vigorous shoots from their upper surfaces. Rows of totara shoots in the sand are frequently seen and mark the position of a buried branch or small tree. Kahikatea on the other hand does not possess this power of responding to silting up on account of its poorer vegetative capacity.

As in kahikatea the actual areas affected by silting are not extensive. Naturally, silting is local in its action and affects only comparatively small stands in certain parts of the river valleys.

8. Conclusion.

It is thus seen that the two important stands of the Westland river flats, kahikatea and totara, differ markedly in the effects of silting up. The fact of periodical inundations is brought into prominence. A stand arises and is silted up: if totara it lives, if kahikatea it dies and another type of vegetation replaces it. Then comes a time when a profound change in the river course occurs and the silted stands are washed out completely, and so the process goes on.

This paper deals with a certain silvical aspect of the river-flat forests. The forestry aspect does not really concern us because these river flats of Westland contain the only good agricultural and pastoral land available. Kahikatea swamps when cleared and drained make good pasture land. Totara sites, especially if silted up, make excellent pasture land. Thus it is recognised that these river flat forests must pass; they are rapidly passing now, and it is deemed necessary to put on record while still possible some data concerning their life histories.

Timbers of the World.

(Arnold Hansson, M.F.)

With maturing years, we generally discover that in our younger days we felt we knew more about things in general than was actually the fact, mainly because we find out, that there is so much more to "IT" whatever "it" may be, than we knew there was.

This outlook applies to many things in life, and to a very great extent to the knowledge of the timbers of the World.

When we first commence our schooling, timber is timber,—there is no difference of species as long as it can be nailed and burnt. An advance is made when it is possible to differentiate between pine and timber,—pine being any kind of soft-wood and timber any other kind. By gradual education we may go through to the stage where we can recognise Oregon, Rimu and Totara. At this the average man probably draws the line, and those are to him the timbers of the World.

If we take up the study of timbers, we soon find that there are about twenty-five various timbers growing in New Zealand and more or less generally used. By adding to these timbers some five Australian species and the more common ones from the northern hemisphere, we may feel that our knowledge of the timbers of the World is complete. Then, unfortunately, some day some furniture-maker drops into the office with some piece of wood which he claims he was sold as,—something or other which we may have heard of before,—and that he suspects the wood to be,—worse luck,—something which we never knew existed.

A few instances such as the one mentioned will set the average technician searching for the root of the trouble,—or, in other words—some information about these new timbers.

If we are in the very fortunate position of having a complete library available, we might be able to find,—not half-a-dozen books dealing with the subject, but according to P. Ahern's "Bibliography on Woods of the World," about one thousand five hundred books. This, in itself, is, of course, a drawback, because if there were only a dozen books, we might assimilate the total

information available and again get that feeling of superior knowledge,—but fifteen hundred books are a bit discouraging. The only bright spot about the business is, that the other fellow has just about as little chance as we have of knowing it all, so that is some consolation.

The amount of the literature on woods must, however, bring home to us the fact that the subject of the timbers of the World is a big one.

If we look into some of the most readily available works on timbers, we find that the Oak Family alone embraces some three hundred species, the Eucalypt Family over four hundred species, and the Conifer Group three hundred species.

These are only the families and groups which we may class as the common or garden varieties, because at least some of the species of the families are very commonly known. Of the one thousand species mentioned, probably five hundred are in common use somewhere in the World, and may be encountered in the timber trade.

In addition to these common families, we have other hardwoods,—mainly in the tropics,—which are becoming more common in use in all parts of the World.

The Callophyllum family covers one hundred species, of which a high percentage is used commercially.

In the Dipterocarpaceæ we find fifty-four species,—mainly of commercial interest, while the genus Eugenia covers one hundred and fifty species.

From only touching on the subject, we already find that the numbers are becoming too big to handle readily.

The Teak family is generally combined with thoughts of one tree. There are, however, seventy-five genera and some thirteen hundred species belonging to the family and with a very extensive distribution. And so we can go on, the more we seek the more we find, with the consequence that one may well identify the simplest looking wood with reverent care, knowing that there are some hundred other woods very much like it. The wonderful variations which are revealed by studying the woods under the microscope, make the work most fascinating. Each family seems to have at least one distinguishing mark which is not found in any other family,—or, if found, then not in the same combination with other distinguishing marks.

It soon becomes evident to one, that no

study of books will ever enable one to identify timbers. One may read what others have done and found, but the actual knowledge of the woods must be acquired by observing their peculiarities while working the woods with tools, and through studying the structure of the woods both macroscopically and microscopically.

Here we may seem again to be up against a difficulty, because as a rule there are not many species available for working with tools and for microscopic investigation. At the best, hand specimens for permanent exhibition are available from different parts of the World, but in all instances they are so small that no cuts are permitted to be taken from them, and the working of the specimens with tools is entirely out of the question. It then remains for the few fortunately situated persons, who have access to timbers from most parts of the World, to enrich their knowledge of these timbers, with the result that men with a real knowledge of the timbers of the World are rare and far between.

It should, however, be possible for the average trained man in the forestry profession, whether he is trained in a college or in the school of life, to have an intimate knowledge of the timbers of his own country, and also those timbers of foreign origin which are commonly used in this country. This, in itself, is not such a small task as it might seem at first, as we can readily find about twenty-five New Zealand woods which are fairly commonly used for some purpose or other, while about the same number of woods are imported from foreign countries, such as Australia, Phillipines, East Indies, Africa, South America, North America, Europe and Asia.

This claim may seem extravagant, and need substantiation. From Australia we import Jarrah, Karri, Ironbark and Stringybark; also Queensland Maple, Rosewood and Blackwood.

From the Phillipines we get three species of Shorea and Pentacme, which are sold as Phillipine Mahogany.

From the East Indies we get one of the Dipterocarps, which is marketed as East Indian Walnut. From South America we get true Mahogany; while from North America we get Western Red Cedar, Redwood, Longleaf Pine, Douglas Fir, Western Hemlock, Western Larch, Ash and some Oak.

From Africa we get various African Mahoganies, mainly Caya and Carapa. From Europe we get Baltic Red and White Wood (*Pinus sylvestris* and *Picea excelsa*), Oaks

and Walnut. From Asia, Japanese Oak and Ash.

The field available for investigation into the various timbers is, therefore, not quite as small as we at first thought. Casual specimens may also be obtained in unexpected places. When cutting up a crate which the grocer had sent along for kindling wood, a banana crate from Fiji, I obtained four species of wood from one crate, and among the specimens a very interesting one of *Alstonia* showing radial canals which look more like borer holes than parts of the anatomy of the wood.

A proper knowledge of the various timbers and woods which various climes produce, is a necessity to the working forester, for how can he operate when he does not know his own wares, how they behave under the saw, how they behave under the plane, and how they behave after they have been put into use of some kind or other.

Some woods work "sweetly"—take a good surface and stay put. These are ideal woods, and when, in addition to these qualities, the wood does not readily split for nails, we have a wood with the characteristics of Mahogany, and these qualities have more than the actual appearance of the wood made it a most excellent all-round wood.

Some woods may have many good qualities, but fail severely in one direction, causing the wood to be of little value. Brittleness and lack of durability are undesirable features in a wood, while irritating substances in the wood are not appreciated before one is actually working with the wood. Our own common *Ratas* (*Metrosideros* spp.) while of excellent structure for turnery purposes, contain some substance which irritates the nasal membranes and causes quite severe bleeding. Some of the *Dipterocarps* are irritating in the same manner, while *Cocobola* is notoriously poisonous and injurious to the men who work the wood up. It is therefore not sufficient to judge a timber on its appearance alone and neglect those peculiarities or qualities which will be apparent when the wood is actually put to some definite use, peculiarities which can only be appreciated by the working of the wood.

The subject of the timbers of the World is a tremendous one if seriously tackled, and a complete knowledge of the subject cannot be hoped for in the general run of forest technicians. It must, however, be expected that the average technician possess a wide general knowledge of the subject, so that he may at least deal with care when attempting to identify timbers of commerce.

Studies in Rimu.

(F. E. Hutchinson, B. FOR. SC.)

A Popular Exposition.

There have been a number of references in recent numbers of "Te Kura Ngahere" to the work being done by the School of Forestry for the State Forest Service, in the native forests of Westland. This is the major research project of the School, engaging the attention of the staff, assisted by students, for the greater part of the long vacation each year. It has been suggested that it would be of interest to a great number of those of our subscribers who are not technical foresters if the broad general aims of the investigation were set out in a way that would permit of a ready grasp of the situation as a whole, thus making for a fuller understanding of the detailed accounts of sections of the work which appear from time to time in the journal.

The investigation centres about two main points in regard to the rimu forests of the terrace land of Westland. The first point is the rate of growth of the forests, and the second is the conditions under which the forest will reproduce itself, and develop to maturity.

The investigation of the rate of growth of the forests is one easily grasped by the layman. Its underlying principle may be summed up thus:—How long does it take, under average conditions on a large scale, to produce trees of good usable size, and how many such trees, or what quantity of super feet of timber may be expected per acre at the end of that time. In other words, what will our forests yield us? Increment, or growth is expressed as an average increase in volume per acre per year. Knowing this average rate of increase for a number of species, in regard to the same quality of soil and climate, direct comparison may be made, and, provided the relative quality of the final product is duly considered, the most profitable species to grow under the given soil and climatic conditions would be the one showing the highest increment, or growth per acre per year. The State Forest Service is experimenting with a number of exotics, while the School of Forestry is studying the rimu stands adjacent. When the respective studies are completed, we will know which type of forest will give us the greatest volume of timber in a given length of time.

To determine yield, three points must be known—area, age, and volume, for yield is defined as volume per acre at known age.