Competition with second-growth.—In most parts of the first years underplanting, felling operations had preceded it by one or two years, so that a secondary growth of wineberry (*Aristotelia serrata*) rangiora (*Brachyglottis repanda*), karamu (*Coprosma* spp.), five-finger (*Nothopanax arboreum*), had a proportional start on the newcomers. In nearly all these localities the exotics are now overtopped to varying degrees and may require a cleaning. Where planting has followed felling within 12 months there is little fear of competition provided well-grown 3 year old stock is used. In many cases the exotics are standing well above the wineberry, etc., and the latter will serve the useful purpose of a “nurse” crop until complete canopy has been achieved, after which they will be suppressed since they are generally light-demanding species.

Specimens of Lawson’s cypress, western red cedar, and redwood, growing as plantation trees in the Nursery Area, surpass all others of the same age and species, presumably on account of nursery cultivation. In the case of these trees, surrounding weeds were pulled periodically and the soil stirred with a fork or hoe. No measurements were made since their conditions of growth are impracticable in plantation practice.

TREE-GROWING IN THE NURSERY.
The Practice and Value of Wrenching.

By H. A. GOUDIE.

Of the many factors which influence the cost of an afforestation scheme the quality of the trees used is a very important one. A high death rate caused by using poorly grown trees and the subsequent cost of replacing failures has, in a number of instances which have come under the writer’s notice, more than doubled the original estimated cost of the work. Although failures could, in some cases, be traced to the use of a species unsuitable for the site or locality, or to the planting of large sized trees by the notching method yet the use of poorly rooted trees has been accountable for much loss. In some cases an incredibly large number of trees were needed to obtain a satisfactory stocking of the land and in such cases a small extra expense upon the growing of the trees would have been a distinct saving.

Since the advent of Proprietary Forestry concerns forest-nursery technique appears to have retrograded and it is with the object of arresting this deterioration that the important operation of “Wrenching” is now being described.

Wrenching is a term commonly used by nurserymen to indicate a process which is designed to control the root growth of trees in order to fit them to withstand transplantation. It is, and always has
been, regarded as an essential and highly important operation. It is not merely the cutting of the roots but is the promotion of a biological process akin to many methods of cultivation commonly practiced. In practice the operator goes through all the process of lifting the trees except that he allows them to remain in the ground. The term suggests a violent interference with the roots and in this sense it rightly describes the operation if effectively carried out. Merely to cut the tap-roots of the trees and carefully close up the spade-cut with the boots will serve no useful purpose. In such a case it will be found that the tap-roots repair and send down new growth and in less than a month it is almost impossible to see where they were cut. To obtain satisfactory results the operator must, besides cutting the strong roots which descend deeply into the soil, aim at a real disturbance of the soil around the roots so that the surface is raised slightly and left with open cracks which allow the air to penetrate to the roots. If done in this manner, wrenching induces the formation of numerous secondary roots and produces, what nurserymen are in the habit of describing as fibrous roots. Wrenching is most effective if done in the middle of March when the soil is fairly dry and warm. A small proportion of losses may occur under such conditions but they will be negligible, whilst the improvement in the root-growth will be better and quicker than if delayed until the soil is wetter and colder. In poor soil the improvement is much less than in soil containing a suitable amount of organic plant food.

There is considerable difference in species in respect to their adaptability for transplantation but there are few which will survive unless they are wrenched. Many require particular care e.g. the following—Eucalypti, Pinus canariensis, P. Torreyana, P. radiata, Sequoia, the group of Cupressus classified as Eu-cupressus, of which C. macrocarpa is a type. These should not only be carefully wrenched but they should be so raised that the colour of the foliage will turn to a yellowish or bronze tint through the plants being partially deprived of their accustomed moisture. C. macrocarpa is particularly difficult to transplant with open roots unless it is prepared in the manner described. Plants with lush, green foliage are almost certain to fail; when the foliage is bronze coloured success is more assured. A tree properly wrenched may be easily drawn out of the soil with the hand. When sufficient time has elapsed after wrenching for the production of new roots, the plant will come out with a ball of earth and if it is then dropped back into the hole, which has become partly filled up by the removal of the tree, and left practically on the surface of the soil it will survive any condition of winter weather.

In general nursery practice there are few trees or shrubs that will not respond satisfactorily when wrenched. One difficult subject the writer has in mind is the Japanese Flowering quince, (Cydonia Japonica) a handsome spring-flowering shrub. This species develops a strong, spreading, irregular root system which can best be likened to a handful of tangled wire. If a plant has not been wrenched it is impossible to remove it with soil adhering to the roots and there is
very little chance of its surviving if transplanted. Wrenching, however, makes a difference which causes one to marvel that an apparently simple operation can produce such a change, for in a comparatively short time a mass of fine rootlets will have sprung from the strong woody stumps and the plant can be pulled out of the soil by hand with a mass of soil adhering to its roots.

In these days it is customary to ask for a scientific explanation of phenomena such as that caused by wrenching. Without such our knowledge seems incomplete and essential details in carrying out the work are apt to be overlooked. Wrenching appears to have always been practised by nurserymen and hitherto the observed result has sufficed to warrant its continuance. From his observations the writer is of opinion that the acceleration of the root growth caused by wrenching is due to the invasion of the soil by air entering through the surface cracks caused by the uplifting of the soil. It is a common practice when preparing seedlings for lining-out to lift them from the seed-bed, trim off the straggling roots and heel them in where they may remain perhaps for two months. If the soil is thrown lightly over the roots and not tramped hard the root growth will be greatly increased, but if the soil is rammed hard there will be very little improvement in the roots. This, and the abundant evidence of the beneficial effect of tillage upon plant growth seems to support the contention that aeration of the soil is a most important detail in wrenching.

Wrenching is not an expensive operation and is best done by manual labour. The results of machine wrenching are never as effective as those obtained by an intelligent workman armed with a sharp spade.

THE HIGH PRUNING OF CONIFERS.

By J. F. Lysaght.

These notes are inspired by a statement by Dr. Craib* that pruning of conifers to heights of 15—30 feet can be carried out for sixpence per tree, using white labour. As sixpence compounded at 3 per cent. for 20 years does not amount to one shilling, surely it would be worth one shilling per tree to ensure several inches of clean timber on the outside of the bole, even if this was confined to one log length.

Some experimental pruning operations were carried out in certain exotic plantations to determine the ultimate costs of these operations under New Zealand conditions.

The tools used were the axe and long-handled saw. The latter, a pruning saw fixed to a pole, made climbing unnecessary but its

* Review of World's Forestry : The place of thinning in wattle silviculture, and its bearing on the management of exotic conifers, by I. J. Craib, Research Officer, Wattle Investigation, Forest Department, Union of South Africa.