in volume of the tree. It is clear that the height and diameter of the tree at periods of 3 years are known and the diameter at similar periods of each section is known. It is therefore merely a matter of working out the volume at these periods from each section and adding them up. Tables III. and IV. show how this is done. A curve can then be drawn showing the mean periodical increment in volume.

There is one more figure that is required to complete the data regarding the growth of our tree, and that is the rate of growth in volume compared with the volume of the tree at that particular time. It is clear that, as we have taken the mean periodical growth in volume, the figure that will be obtained is always the mean figure for the period dealt with. It is usual to express this as a percentage of the volume. Thus, if V is the volume of the tree at the beginning of the period and v is the volume at the end of the same period (which we will call P) then $\frac{V - v}{P}$ is equal to the mean annual increment in volume, and the mean volume during that period is $\frac{V + v}{2}$. Therefore, the periodical rate of growth in volume compared with the volume of the tree during the period is $\frac{2 \times V - v}{P \quad V + v}$. This is usually expressed as a percentage. Graph 5 shows how this figure starts relatively high, and decreases as the tree grows.

The study of stem analysis forms part of the work of the Forest Apprentices at Hamel State Nursery, and the tables and graphs that appear on page 15 are the work of Apprentice W. A. Ross.

An Australian Forestry School.

(By C. E. Lane-Poole, Conservator of Forests, West Australia.)

ONE of the great difficulties that confronts every Forestry Department of the Commonwealth is the lack of trained foresters. It is only of recent years that the value of the forests as a national asset has been realised. In the early pioneering days the forests were regarded as serious drawbacks to settlement and progress, and the people were encouraged to destroy timber. The period of forest destruction is drawing to a close, and, while it cannot yet be said that we have reached the age of construction, each State is aiming at that goal. With the exception of Tasmania each State has laid down a forest policy and placed on the Statute Book legislative enactments calculated to protect the policy and to render it as little as possible subject to the ever-changing whims of political parties. During the period of destruction we have been passing through, Governments have been content to collect royalty and officers of the Forest Department have been little more than tax collectors. Even where certain restrictions have been placed on the operations of the timber-cutter, where girth limits have been fixed and the cutting of immature timber forbidden, the large timber corporations work on so extensive a scale that it has been impossible for the forester to exercise any real control over the cutting, nor has he been able to initiate any sylvicultural work, as he has been fully occupied in collecting revenue or inspecting timber for export. For this work advanced education is not required, and since there was at the time no definite forest policy, no attempt was made to give the forestry officers opportunities to obtain a higher training in forestry.

The time has now come when working plans must be laid for the treatment and regeneration of the cut-out areas and for the control of operations on any fresh sawmilling permits that may be granted. The working plans require careful laying out, and can only be undertaken by trained foresters with a thorough knowledge of sylviculture and forest management, and before these two main branches of forest training can be taught the forester must have a sound grounding in the sciences. Sound legislation alone will not protect our forests. We must have a trained Australian Forest Service to administer the Acts in each State. It was Monsieur Mathey, Conservator of Forests, Dijon, France, at the Forestry Conference held in Perth last year, who likened the heads of the Forest Departments of each State to generals without officers, and his last words of advice before leaving Western Australia were: "Establish an Australian Forestry School to train your

officers." The number of trained foresters in the Commonwealth is so small that, unless steps are taken to train more men, it will be difficult for the Forest Departments to carry on their work at all efficiently. Certain of the other States are attempting something to remedy matters. Victoria has a school for training working foresters at Creswick. South Australia has a forestry school attached to the University of Adelaide. New South Wales has founded a forestry school at Narrara, near Gosford, but, owing to the war, has not been able to secure the services of a Director.

There is grave danger that Australia may make the same mistake that has been made in England and America. Both countries founded numerous forestry schools when one good school would have amply sufficed for each. The United Kingdom has schools at Oxford, Cambridge, the Forest of Dean, Cirencester, Edinburgh, Newcastle, and Dublin, while in the United States there are so many schools of forestry that it would take too long to enumerate them. The multiplication of forestry schools in these two countries has not led to the best forestry training. France, on the other hand, has only one school for professional foresters, and this is the famous Ecole Nationale des Eaux et Forets at Nancy. By concentrating the teaching of forestry in one school France obtains excellent results. Sixteen students destined for the State Service are admitted annually to Nancy, and in addition certain foreign students are also trained there. It is an interesting fact that all the officers of the Indian Forest Service were in the early days trained at Nancy, and India owes her wonderful department to these men, whose training enabled them to lay the foundation of the Indian Forestry Service as we see it to-day.

A forestry school in each Australian State would mean six second-rate schools, while by concentrating on one it would be possible to establish a school second to none in the Empire. Such an institution would serve not only Australia but, in all probability, other British Dominions in the Southern Hemisphere. The Union of South Africa from Cape Point to the Limpopo River relies on Australian Eucalypts for her constructive forestry, and there is no doubt that for South Africa the training given at an Australian Forestry School would be preferable to any other. New Zealand also will doubtless welcome the close proximity of the first-rate forest school. The work of an Australian Forestry School would not be confined to the training of foresters. Attached to it would be a Research Institute, where the many problems that must be solved before the sylviculture of each type of forest can be fully understood would be initiated. Another of its functions which cannot be overlooked would be to act as a centre of forest knowledge, and by means of journals, bulletins, and pamphlets to radiate that knowledge throughout the Commonwealth, thus awakening the public to a true conception of the value of the national forests and the meaning of forestry. Soon the men who have fought for the Empire will be returning to Australia, and the time is ripe to establish a forestry school, so that those who wish to embark on the finest profession in the world, instead of learning their forestry in the oak, beech, and pine forests of other lands, may obtain the necessary training in their own country among their own eucalypts, acacias, and sheoaks.

"The National Forests of the United States."

There are 160,000,000 National forests in America under the control of the Forest Service, of a total area of 160,193,996 acres. To these must be added those of Alaska, with an acreage of 26,748,850 acres and of Porto Rica 65,950 acres, giving a total area reserved and controlled by the Forest Service of 187,006,796. Within some of these forests what are known as "National Monuments" are specially dedicated for the preservation of objects of historic or scientific interest. These "National Monuments" have a total area of 1,424,940 acres. Within the forests there are also certain National Game Preserves, and these also are dedicated specially by Acts of Congress for the protection of wild animals. These dedicated areas amount to 2,000,000 acres, the greater part of the area being in Arizona.