2. FOREST-PRODUCTS INVESTIGATIONS.

Comprehensive strength tests of the principal hardwoods, and of all classes of wooden ware, such as spokes, handles, cross-arms, boxes, cooperage, &c., manufactured from hardwoods, have been amongst the investigations carried out by the Forest Service during the reporting period.

One of the most important problems which the Branch of Forest Products must solve in the immediate future is to stimulate the use of hardwoods by demonstrating their use value for industrial purposes. The present normal cutting of timber is 95 per cent. softwoods and only 5 per cent. hardwoods, and the indefinite continuation of such conditions will exhaust the softwood-supplies within a generation. The use of both classes of timber according to their suitability for various purposes should balance up our consumption approximately 75 per cent. softwoods and 25 per cent. hardwoods.

During the year a close study of the building codes used throughout the Dominion was made, and as a result of representations a conference of Government, local authority, and consulting architects, and engineers, builders,. sawmillers, and others, will be held in Wellington early in June to consider ways and means whereby waste of timber in the building industry may be eliminated. An accurate and standardized grading-system is required to remove restrictive regulations drafted to guard against the use of poorly graded timber. A tentative grading rule for structural timbers, based on the scientific limitation of defects, as investigated by the U.S.A. Forest Products Laboratory, has been drafted to give some significance to allowable working-stresses. The Engineering Schools at the Auckland and Canterbury University Colleges will undertake an exhaustive series of tests of native structural timbers for the purpose of finalizing these recommendations.

Approximately 16 per cent. of all the timber consumed is employed in the manufacture of boxes and cooperage. Continued attention was given during the year to the redesign and construction of industrial packages and containers, and several new types of butter-boxes have been investigated. The use of some form of metal strapping offers considerable economy in their construction, saving timber, and yet giving a cheaper and stronger box. It is a certain development of the near future.

A long series of tests of cross-arms and poles commenced in 1922 was continued, and an interim report on the cross-arm tests was circulated during the year.

A valuable contribution to our literature on wood technology was made by Mr. G. A. Garratt, M.F. (now Professor Garratt), who, working under Professor Record (Yale University), the foremost authority on this subject, made a study of twenty-eight of the native timbers and supplied an identification key for eighteen species of hardwoods. This will form a companion work to the identification key for the softwoods, now being prepared by Professor Kirk, of the Victoria University College. Average working values for the specific gravities and shrinkages of the chief commercial timbers have been established. These will be used to standardize sawing dimensions for green timber, and to assist in kiln-drying investigations.

Confirmation of the investigations regarding the successful treatment of eucalypt timbers has been received from California. Experiments so far have been confined to New-Zealand-grown eucalypts, but the work will be extended to include imported species. The success of the investigation now permits of many species of mixed Australian hardwoods being treated and used in place of the more expensive durable woods.

The subject of timber pathology has received considerable attention during the year. With the enthusiastic co-operation of the Agricultural Department, a large number of wood-destroying insects and fungi have been examined, and their destructive works reported upon. A special study of insects introduced into New Zealand by poles, piles, &c., imported from Australia showed that by prohibiting the entry of such timber with bark attached, and by insisting upon the production of a certificate issued by an authorized Government officer of the exporting country that the timber was free from injurious forest and timber insects, fully 90 per cent. of those now entering the Dominion would be eliminated. An investigation of the sap-stain occurring on white-pine and of the methods for its prevention has been carried on at Victoria University College. The work has a twofold significance, as it is suspected that a mould sometimes found on butter may be due to infection from boxes manufactured out of sap-stained white-pine. The work of co-operating institutions and companies, notably the Auckland and Victoria University Colleges, the National Timber Company, Limited (Ngongotaha), H. Baigent (sawmiller, of Nelson), and the Woolston Tanneries (Limited), is gratefully acknowledged. Publication of results in a number of departmental circulars dealing with various aspects of forest-products research was effected and distributed during the year.

Investigations in Forest Economics.

During the year serious attention has been given to the impending reorientation and recasting of the national forest policy which must take place during the current year. Forestry in New Zealand has come to the cross-roads. It must go ahead to its ultimate objective or become a mere bureaucratic organism for the collection of forest revenue. In the 1920 report made to the Government by the Director of Forestry it was stated that "at the end of the first five years of foundation-building a wider and more permanent forest policy must be established." It was for that reason that earnest attention was given during the year to the many social and economic problems bearing on a permanent plan of action—such factors as population-growth, the trend of basic timber-values, probability of substitution, intensification of industrial activity, probable future national needs, and foreign sources of wood-supply. This important investigation will be completed during the current year, and in conjunction with the technical data now in hand will be used in the formulation of New Zealand's permanent forest policy.

There are two outstanding features of the forestry situation in New Zealand.

The first is that within the space of eighty years three-quarters of the virgin forests have been destroyed. The remaining stands are being used up at such a rate that their complete disappearance within another two generations is threatened. (The increase in average mill values (all species) from 6s. 7d. per 100 superficial feet in 1895 to 20s. per 100 superficial feet in 1922 reflects the exhaustion of local forests.)