

the case of the two native woods, rimu and tawa, after exposure to the unusually severe drying conditions which prevailed during the summer of 1927 in this locality. Except in the case of tawa and insignis pine, sap-stain of the wood was negligible at the outset of this study. That of tawa gave rise to a very light greyish cast, as shown in Plate 1, fig. i. The discoloration, however, did not appear to affect the pulping quality of the wood, whereas with insignis pine it was marked enough to introduce a factor into the pulping processes, as will develop later in the report. The radial depth to which the blue stain will penetrate is clearly indicated in Plate 1, fig. ii, the photograph for which was taken not more than nine weeks after felling the tree. The longitudinal penetration of the blue stain is still greater, and occurs also at a more rapid rate. Towards the end of the study this same blue stain developed rapidly in both Austrian and Corsican pine, but was not nearly so serious in European larch.

#### SECOND SHIPMENT FOR MILL TESTS.

For the commercial pulp- and paper-mill tests 910 cubic feet of insignis pine and 2,090 cubic feet of tawa were railed from the Auckland and Rotorua Forest Conservation Regions respectively, shipped at Auckland by the R.M.M.S. "Aorangi," and railed from Vancouver, B.C., by the Canadian Pacific Railway, arriving at Ladysmith, Wisconsin, on the 25th January, 1928, only nine weeks after cabled instructions for its collection had been despatched. Owing to the ease with which the two species are distinguished, no special identification marks were necessary.

As scaled by the rule in use at the Great Western Paper Co.'s plant, the wood delivered comprised 8.5 cords of insignis pine and 27.9 cords of tawa. The logs were in 12 ft. lengths, and much larger than those in the previous shipment, varying from 8 in. to 26 in. in diameter. As received they were quite green, but, due to its frequent transshipments, the tawa was almost completely barked, indicating the ease with which the bark of the species may be removed. Being cut in some cases from mature trees, however, the tawa logs were often dark in colour and contained a discoloured centre, a portion of which was found, on splitting, to yield dark-blackish deposits along the shakes of the log, similar to hemlock shake, one of the defects in this important pulpwood species of North America. Infiltrations from these same deposits appeared to have been responsible for the discoloration of the wood. It was necessary, therefore, to hack off this defective shake material, and to thus discard about 10 per cent. of the tawa available.

#### PHYSICAL PROPERTIES OF THE WOODS.

The major physical properties of the woods as received at the laboratory are shown in Table 2, which includes for comparative purposes the average values for these properties as determined by the New Zealand State Forest Service under Madison working plan No. 124.\* The density determinations are based upon volume green and weight oven-dry, and the moisture content upon the oven-dry weight of the wood. This density (specific gravity) or unit weight of the wood is an important consideration affecting the economical production of pulp, since the yield per digester charge depends directly upon the weight per cubic foot of the wood. The native woods, with their comparatively slow rate of growth, are noticeably denser than the introduced rapidly-growing softwoods, and both in turn are denser than the standard North American pulpwoods.

In texture the wood of rimu is fine and even, the colour of the sapwood being pinkish-white and that of the heartwood varying from light brown to a deep reddish-brown. As this deep-brown colour develops only in the larger trees, few logs received at the Laboratory showed a colour deeper than light brown, as in Plate 1, fig. iii. Even in the slab and mill waste, few specimens of the deeper-coloured heartwood were found. There is little difference between spring and summer wood, the transition from one to the other being gradual. Free resin does not appear in small pulpwood-sized logs, but is common as resin shakes in the central heartwood of large mature trees. Such material would require to be excluded from mill waste used as pulpwood.

The tawa yields a wood of fine and even texture, with small pores prominent on every section. It is difficult to distinguish between heartwood and sapwood by macroscopic means, since the colour of both is much the same, varying from a creamy to a greyish white. In some of the larger and more mature trees, as previously indicated, a blackish stain develops in the heartwood. As with rimu, there is little difference between the density of early and late wood.

In logs from mature trees the sapwood and heartwood of insignis pine are distinctly marked, the sapwood being a very light brown in colour, and the heartwood a darker reddish-brown. Those shipped to the laboratory, however, were all cut from comparatively young stands, probably under twenty years of age, and did not, accordingly, display much heartwood, since the transformation from sapwood normally begins only when the tree is from twenty to twenty-five years old. As a pulpwood the logs display two serious defects, containing, as they often do, a rotten core or pith varying in diameter from  $\frac{1}{4}$  in. to  $\frac{1}{2}$  in., and whorls of knots at distances of several feet along the log.

The sapwood of the three minor species—Corsican pine, Austrian pine, and European larch—is typically light-brownish in colour; but whereas the heartwood of the two pines is only slightly darker in colour, that of the larch is a deep reddish-brown. The differences between the three woods are indicated in Plate 2. Unlike the insignis pine, all three minor species displayed fairly heavy exudations of resin on their ends. The cores of either of the minor pines did not appear to be as large or as rotten as in the insignis pine, although whorls of knots were quite prominent.

\* See "Current Tests of Timber Strength." Mimeographed report by the New Zealand State Forest Service Branch of Forest Products.