

Spark-nullifiers for Logging-locomotives.

After full investigation and trial of several designs the Service during the year decided upon a thoroughly efficient spark-arrester. This device while checking the emission of sparks also assists in keeping an even head of steam and in conserving fuel. Arrangements are being made for the application of this apparatus to logging-locomotives and other steam-engines and haulers operating in State forests.

Underplanting of Exotic Trees in the Indigenous Forests.

Observation of the sample plots at Mamaku show that Lawson cypress and *Thuja plicata* are the most promising species, the former having now for the most part topped the heavy growth of ferns. A third shade-tolerating species, *Abies pectinata*, is vigorous even in quite dense shade, but is of slow growth.

Tapping of Kauri for Kauri-resin.

This project, which is intimately connected with the silvicultural management of the kauri forests, was commenced on an experimental scale and will be continued for another two years.

AFFORESTATION STUDIES.

During the year detailed co-ordination studies were carried out at the four main forestation centres, and reports submitted dealing with technique, cost, and method of all operations in the nursery and in formation of plantations. A standard method of record-keeping and costing has been prepared for use throughout all the State forestation operations, and a co-ordinated system of experimental work has been established.

Tree-propagation and silvicultural-improvement investigations carried out during the year have given certain results which indicate a much increased efficiency in the methods adopted and show a substantial reduction in operative costs.

Nursery Procedure: Weed-eradication Experiments.

With the object of reducing the large annual costs expended on weeding nursery stock, investigations have been made in regional nurseries to test the efficacy of various mediums as weed-eradicators or weed-smotherers.

Experiments started last year with zinc sulphate applied to seed-beds as a weed-eradicator have been repeated, with negative results. The effect on growing stock of the four strength variants employed (1.25 per cent., 2.5 per cent., 5 per cent. solutions, and chemical applied dry) has been the same—viz., after germinating and growing for about two months, reaching a height growth up to $1\frac{1}{2}$ in., the roots of the seedlings have apparently been entirely destroyed by the chemical and the entire stock lost. The effect on weed-growth was total prohibition of germination.

Trials of sawdust laid down to a depth of about $\frac{1}{2}$ in. between seed-lines has proved most effective at the two stations where this was tried, and economical in cost. The application of this mulch has resulted in almost entire suppression of weed-growth and elimination of labour on weeding: a cost of approximately 7½d. per 1,000 plants for material and application, compared with 11d. per 1,000 for ordinary weeding.

Trials with oiled Kraft paper and Pabco-Thermogen paper mulch, applied between lines, were instituted rather late in the season, and preliminary results indicate the method is efficacious, but cost of application and material is high.

Experimental sterilization of the ground by burning with "Hauck" hand-burner was carried out at one station, with good results. This preliminary trial indicates that both in efficiency and cost this method promises well, the cost of trial weeding during one season showing 33 per cent. reduction on the treated plot.

Nursery-line Method of Tree-propagation.

Seed-sowing in open nursery lines was adopted this season at six stations with consequent reduction in sowing-costs. At Hanmer Springs the use of a Planet multiple seeder resulted in a reduction per pound of seed sown of 96 per cent. in the actual labour-cost of sowing operations.

The comparison of cost of raising two-year Corsican pine seedlings in the South Island in beds sheltered for the first season and in open lines shows that a labour-cost saving of 4s. 7d. per 1,000 plants may be effected by adoption of the open-line method.

Season of Sowing.

Sowings were carried out early in the season in several nurseries, and information gathered shows that in northern regions, at least, an earlier spring sowing season can be adopted for many species. Further experiments in autumn and periodical sowing with different species are being carried out; the present season being abnormally damp and cold, this year's results are not reliable on this point.

Plantation Procedure: Establishment by Direct Sowing.

During the year 177.9 acres were established in the North Island by sowing *in situ*, the crop being estimated at 124,600 trees, or approximately seven hundred per acre. Preliminary results are now available of experimental broadcast sowing on the lower foothills of North Canterbury. Half a pound of pondosa-pine seed was scattered promiscuously on patches of natural tussock grassland at varying elevations from 1,500 ft. to 2,000 ft. with south-east to east aspect, on shingly clay loam soil in a region of 36 in. average annual rainfall. The land was not fenced or protected from rabbits, and sheep have