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PARASITIC CONTROL OF SHEEP MAGGOT-FLIES.

NOTES ON CURRENT WORK.

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IN the issue of this *Journal* for June, 1921, and for the same month in the following year, accounts were given of the species of sheep maggot-flies and their habits in New Zealand. It was then pointed out the golden-haired blow-fly (*Pollenia stygia*), the European greenbottle (*Lucilia sericata*), and the Australian greenbottle (*Pycnosoma rufifacies*) were the three species responsible in the first instance for wool-blowing, though other secondary species bred in the wool rendered putrescent by the attacks of the three former species.

Sheep maggot-flies are becoming more apparent in their attacks each year, and, though they attack sheep in any part of the Dominion, are most noticeable for their annual persistency and extent of damage in the districts of the South Island northwards of and including North Canterbury. One of the most important phases in the blow-fly problem is the increasing amount of clean wool that is blown.

Control of maggot-flies presents two phases—the use of insecticides and of parasitic insects respectively. This preliminary note deals with the latter. Several species of blow-fly parasites are known both in Australia and Europe, and if one of these could be successfully established in New Zealand a natural check to blow-fly development should result. The more important of the known parasites are *Mormoniella (Nasonia) brevicornis, Alysia manducator, Aphaereta cephalotes, Syntomosphyrum glossinae,* and *Tachinaephagus australiensis.* These insects all belong to the order Hymenoptera, which includes bees, wasps, and ants.

In 1922 consignments of *M. brevicornis* were received from Mr. W. W. Froggatt, late Government Entomologist, Sydney, N.S.W., and large numbers were liberated.* Some time earlier Mr. C. G. Teschemaker, of "Avondale," Blenheim, also secured this species from Australia and liberated it on his station. But up to the present this parasite

* *Journal,* April, 1922.

has had no effect upon the blow-flies. *M. brevicornis* lays its eggs in the blow-fly pupæ, and it is very probable that a high proportion of parasitism under natural conditions cannot be attained, since most of the blow-fly maggots, prior to pupating, burrow underground, where

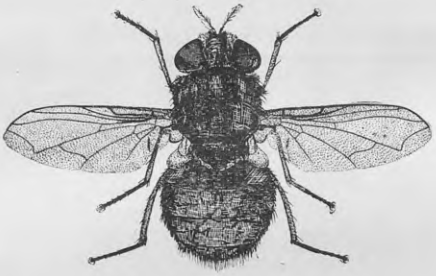


FIG. 1. GOLDEN-HAIRED BLOW-FLY (POLLENIA STYGIA). × 2½.

FIG. 2. MAGGOT OF POLLENIA STYGIA. × 3.

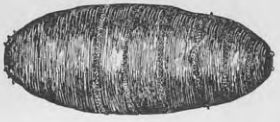


FIG. 3. PUPARIUM OF P. STYGIA. × 3.

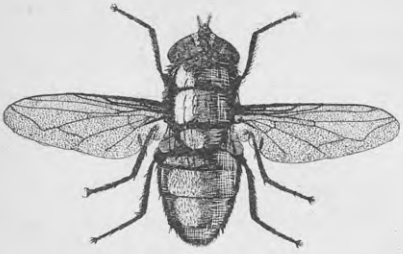


FIG. 4. EUROPEAN GREENBOTTLE (LUCILIA SERICATA). × 3½.

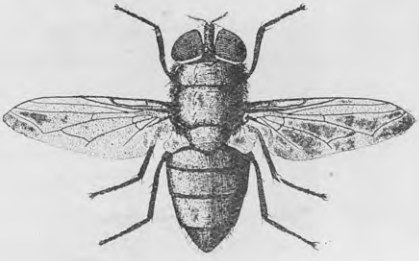


FIG. 5. AUSTRALIAN GREENBOTTLE (PYCNOSOMA RUFIFACIES). × 3.

FIG. 6. MAGGOT OF P. RUFIFACIES. × 3.

it would be difficult for the parasite to follow. Only a small proportion of fly pupæ lying in more or less exposed situations would be subject to its attack.

On this assumption it was decided to secure another species of parasite and one that would lay its eggs in the maggots before the latter

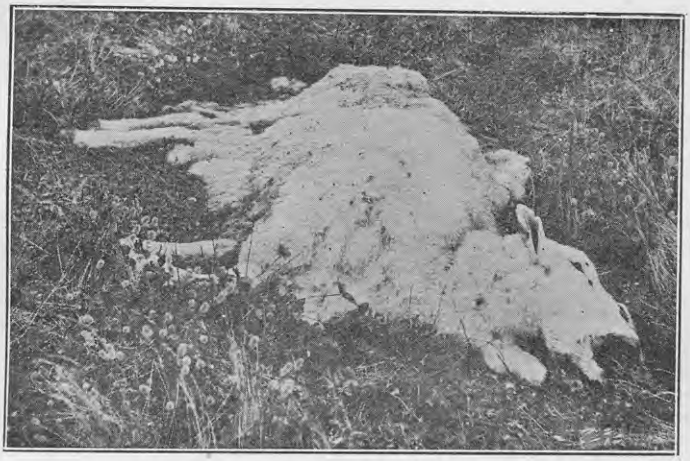


FIG. 7. DEAD SHEEP ON A STATION.

Sufficient maggots breed on such carcases to infest country for many miles with maggot-flies.

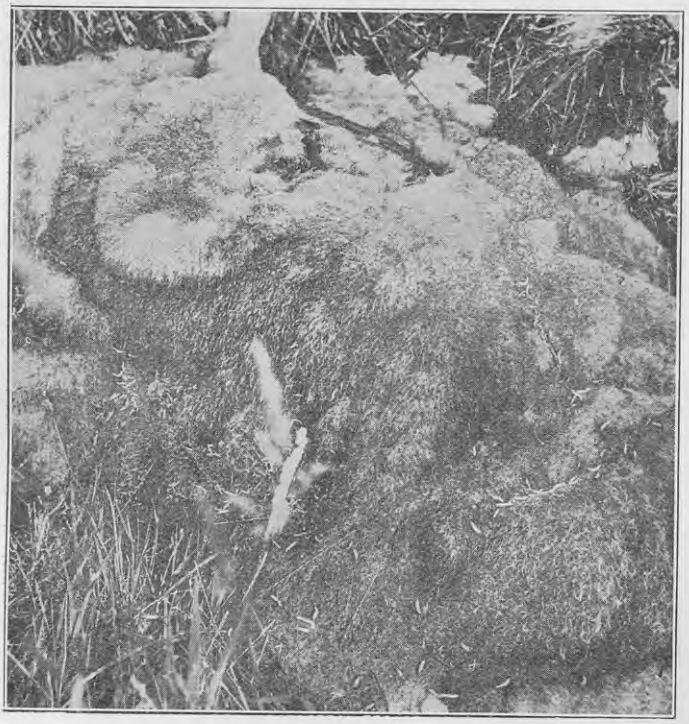


FIG. 8. SHOWING MAGGOTS LEAVING SHEEP-CARCASE TO PUPATE IN GROUND.

sought shelter for pupation. Of the aforementioned species there are three that have this habit—*A. manducator*, *A. cephalotes*, and *T. australiensis*. The Imperial Bureau of Entomology, London, has been active in this matter, and we have recently received from Dr. G. A. K. Marshall, the Director, two consignments of blow-fly pupæ, from which about ninety adults of *A. manducator* have been reared to date of writing (New Year). These are being worked with now in the Biological Laboratory, where they are put into cages with maggots of four species of blow-flies (*P. stygia*, *L. sericata*, *Calliphora erythrocephala*, and *C. hortona*). The female parasite has been observed actively laying eggs in the maggots, but, so far, from none of the resultant pupæ have parasites again emerged. It is too early, however, to expect definite results.

Through the generous interest of Dr. G. H. Hardy, of Brisbane University, four blow-fly pupæ have been secured. Dr. Hardy states that he observed the four maggots before transferring to the pupal stage to be attacked by *Tachinaephagus*, which, however, has not yet emerged from the pupæ.

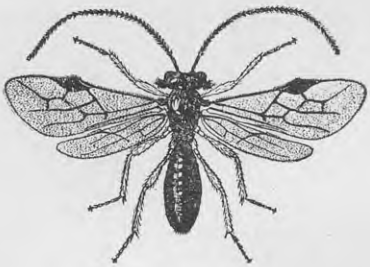


FIG. 9. MALE ALYSIA MANDUCATOR (MAGNIFIED).

FIG. 10. FEMALE ALYSIA MANDUCATOR LAYING EGG IN MAGGOT (MAGNIFIED). [*After Altson.*

It is intended at present to concentrate on *A. manducator* before liberating any other parasites. The life-history of this insect has been studied by A. M. Altson, and the results published in the Proceedings of the Zoological Society of London for 1920. *A. manducator* is shiny black and easily seen. According to Altson the female lays a single egg in each maggot, which latter, though frantic in its movements when first attacked, becomes temporarily paralysed while the parasite's egg is being placed in its body, owing to a poison injected through the attacker's ovipositor. Shortly after the egg is laid in the maggot the latter pupates; from the pupæ an adult parasite emerges in place of a blow-fly. Altson found that the time taken by *A. manducator* to develop from egg to adult varied considerably, but the mean average was fifty-two days.

In this maggot-fly work Mr. C. G. Teschemaker has been giving a great amount of active assistance in the field, by observation of experiments, and by supplying sheep from his flock whenever required, as well as in many other important associated matters.

WEEDS AND THEIR IDENTIFICATION.

(Continued.)

STRAWBERRY-RASPBERRY (*RUBUS ILLECEBROSUS*): A NEWLY REPORTED BLACKBERRY-LIKE PLANT.

ESMOND ATKINSON, Biological Laboratory, Wellington.

SOME months ago specimens were received at this Laboratory from a farmer near Dargaville, North Auckland, of a plant which he said was spreading fast on his land and which he considered likely to prove a worse weed than blackberry. The specimens agree with the description of *Rubus illecebrosus*, a Japanese species grown in the United States—where it is considered troublesome if allowed to spread—and there known as "strawberry-raspberry."

DESCRIPTION.

The accompanying illustration (*a*) shows something of the general appearance of a flowering branch of the plant with its raspberry-like fruits and its characteristic leaves. Towards the top of the stem there are often only three leaflets in each compound leaf, or those at the side may be undeveloped so that the whole leaf appears as a simple one. Farther down the stem five, seven, or more leaflets make up each compound leaf. The appearance of these at once separates the plant from any of the forms of blackberry, as they are pinnate—that is, like those of the sweetbrier—and not palmate with all the leaflets springing from one point. The leaflets are elegant in shape, with a long-drawn-out tip, strongly veined, and with their edges sharply and irregularly toothed. Most parts of the plant are covered with a very slight soft down.

Prickles are present both on the main stem and on the stalks of the leaves and flowers, but are not strongly developed. No fully opened flowers appear in the illustration (*a*), only buds and unripe fruits, the latter showing the long pointed sepals (the outermost part of the flowers). The drawing marked (*c*) shows how the fruit falls away when ripe, in the same way as does a raspberry. The fruit is said to be sour, but good for cooking. In New Zealand it is borne all the year round, although the plants carry a heavier crop in the summer months. The outline drawing (*b*) shows more or less diagrammatically the lower parts of the stems and the horizontal roots which radiate from the main plant, spreading widely at a short distance below the surface of the soil. Numerous small pointed projections will be seen scattered about on the roots. These are shoot-buds, and each is capable of developing into a new plant with its own root-system.

The plant when growing gives off a strong sickly smell, and it is stated that no stock will eat it.

DISTRIBUTION AND CONTROL

It is not known how the strawberry-raspberry originated in New Zealand, and it has not previously been recorded as an introduced plant in this country. It may have been imported as a garden-plant

STRAWBERRY-RASPBERRY (RUBUS ILLECEBROSUS).

(*a*) Flowering shoot; (*b*) outline of rooting-system; (*c*) fruit. All natural size.

[*Drawing by Esmond Atkinson.*

and escaped from cultivation, but nothing certain is known. What is more important is that it is definitely established here and is capable of rapid spread — the account of the root-system shows its potentialities. It is also likely that birds eat the fruits and so carry the seeds. Some field notes made by Mr. A. W. Christie, Inspector of Stock, Dargaville, may be quoted here :—

The land on which this plant is growing is bush country, the bush having been felled for about seven years. The block of country is about 350 acres in extent, and the plant is growing in small bushes here and there all over the block in the same manner as blackberries grow ; but if put together the plants would not cover many square yards.

The plant is shallow-rooted, and can be destroyed by fire. On some of the patches the landowner had heaped wood and made a fire, which killed the plants. The roots, however, travel a long way just under the surface of the ground, and shoot up outside the edge of where the fire has been. In my opinion it would be much easier to kill than blackberry, as the plants can be pulled up from the root by hand.

About six weeks after this was written Mr. Christie reported that the weed was showing signs of spreading again.

In the case of most well-known and long-established weeds it is easy enough to lay down definite rules for their control under many different conditions, but with a weed like strawberry-raspberry little more than suggestions can be given. These include burning and hand pulling, followed by a careful watch on the area outside that apparently occupied by the plant, also the use of sprays as for blackberry. Further, in spite of what has been said about stock not touching the plants, the possibilities of feeding off with goats in cases where it is covering large areas must be considered—though as regards blackberry this latter method is still more or less in the experimental stage.

The primary objects of this article are to call general attention to the weed by giving some idea of its appearance, and to ask for information from any one who may have been fighting it in some way evolved from his experience under particular circumstances while remaining unaware of the plant being a weed new to this country.

The writer wishes to thank the owner of the property where strawberry-raspberry has appeared for his promptness in sending specimens and notes ; Mr. Christie, who has the weed under observation, for the valuable help he has already given ; and Mr. W. R. B. Oliver, of the Dominion Museum, for assistance in identifying the plant.

Importation of Seeds into New South Wales.—Regulations governing the importation of seeds into New South Wales, made under the provisions of the Agricultural Seeds Act of that State, were published for general information in the *New Zealand Gazette* of 9th December, 1926. The regulations deal mainly with noxious-weeds seeds, seed nomenclature, and seed impurities. The following treatment is prescribed concerning lucerne :—Lucerne-seed other than that grown in Australia shall, before being sold, be treated in the manner following : Not less than 5 per cent. of such seed shall be stained by immersion in an aqueous solution of safranin made by the addition of not less than 1 ounce of safranin to 7 gallons of water, and such stained seed shall thereafter be thoroughly mixed with the unstained portion of the seed ; provided that such treatment shall not be necessary if such seed has been treated in accordance with any Proclamation in force for the time being under the Customs Act.

FOREST NOMENCLATURE.

WITH SPECIAL REFERENCE TO THE EUCALYPTS.

Paper read by J. H. SIMMONDS, Takanini, at the Annual Conference of the New Zealand Association of Nurserymen, Auckland, January, 1927.

IN all civilized countries trees as well as other plants have two sets of names. Those of the one set have been derived from the common or vernacular language of the people: they vary from country to country. Those of the other set have been deliberately given by learned men; they have been derived from Greek and Latin, or have been modelled in accordance with the usages of those classic languages: they are the same in all countries. The common or vernacular names are without descriptions of the plants to which they are attached. They are what in Latin would be called *nomina nuda*, or naked names: that is to say, they are names without the clothing of descriptive information about the plants. In contrast with this nakedness of the common names, each scientific botanical name carries with it an exact description of the plant or group of plants to which it is applied.

The familiar English word "oak" is commonly associated with a group of trees that bear acorns and produce hard and durable wood. It has a noble place in the history and poetry of the English people; but it does not carry with it a definite description of the trees it designates. With a plastic language and changing circumstances it may easily become detached from the acorn-bearers and attached to other genera. In Australia this has actually happened. There were no oaks in the indigenous forests of that country; but early bushmen, prompted by some fancied resemblance of the fruits to acorns, called *Casuarina* trees and *Grevillea* trees "oaks"; and the name has clung to those trees ever since. This shows that even the most dignified of vernacular names may be unstable in their attachments.

The generic botanical word for the acorn-bearing group of trees is *Quercus*. It has the same scope and meaning in all countries, and cannot anywhere be used as the name of another genus. The names of its numerous included species are similarly registered and fixed in application. A common name may wander about from one object to another. A botanical name must keep always to the same object, unless competently changed by the consent and authority of learned men. Without a uniform and constant nomenclature progress in any science would be impossible. Only the exact language of science can record discoveries and pass them on to another generation. Ignorant people sometimes rail against the so-called technicalities of the learned. If they knew a little more they would understand that without technical terms and records we should still be groping our way amongst the most common objects in nature.

Trade is dependent in a hundred ways upon science. This is more clearly realized and more fully admitted every year. Education demands that science and trade shall be in agreement. Discrepancy in nomenclature is inconsistent with such agreement. The trades dependent upon botanical science pressingly need reforms in this respect. The timber trade especially is infected with the vice of

calling numerous things by names that are not scientifically defined. It would be easy to multiply examples in support of this statement, but as space is limited one must here suffice.

The student learning botany at college is told that the genus *Cedrus* includes three and only three species. He learns that one species (*Cedrus deodara*) is indigenous to the Himalaya region in India; a second (*C. Libani*) to the Syrian uplands in Asia Minor; and the third (*C. Atlantica*) to mountainous country in North Africa. He is assured that no true cedar-tree has ever been found in the natural forests of America. Later he discovers that north-west America is a large exporter of cedar timber. Only after long hours of patient searching in books on botany and forestry does he solve the puzzle by finding that American cedar is juniper-wood, or some other wood with the appearance and odour of cedar but not botanically connected with the genus *Cedrus*. If the botanical names and common names of the several timbers were always bracketed together students would be saved a great deal of trouble and waste of time. And, what is still more important, people engaged in the timber trades would be placed in a position to describe and discuss intelligently the various kinds of wood they have to handle or to offer for sale.

The Eucalypts.

Common or vernacular names are applied to trees and other plants in two quite distinct ways. In the one case they denote groups of species; in the other, individual or separate species. As group names they may be useful; as specific names they are generally unnecessary and often misleading. The distinction is very important. It is especially important in the study of the eucalypts. Botanical research to date has named and described over three hundred and fifty distinct forms of *Eucalyptus*. The great majority of the forms are ranked as species; a few as hybrids. A considerable percentage of the species fall into natural groups that have received vernacular names. The validity of the grouping and naming of the groups has been admitted generally by botanists. Where the vernacular names conspicuously fail is not in their application to groups, but in the attempt to use them as specific names. The position will be made clear if we present the case for three of the principal groups by way of illustration.

"GUMS."

A large number of the eucalypts shed their dead bark from their branches and stems, and present a pale-coloured and naked appearance to the eye. These smooth or naked-barked trees are technically called "gums." They vary over a wide range in botanical characters, and are divided into several subgroups, the one common character being the naked bark. There are the "red-gums": they are so called from the red colour of their timber. There are the "blue-gums," which are supposed to be distinguished by a bluish aspect of foliage and bark. There are the "white-gums" and "grey-gums," so named from the appearance of the bark alone. The one thing common to all these "gums," let us repeat, is the shedding of the dead bark and naked appearance of branches and stems. The grouping cannot claim to be scientific, but it stands in a general way for truth, and does not necessarily lead to confusion.

But the moment we attempt to separate one "gum" tree from another by means of vernacular names we find ourselves in difficulties. We have to use adjectives and epithets that are always liable to be misunderstood and misapplied. If we call *Eucalyptus rostrata* "river red-gum," and *E. tereticornis* "forest red-gum," we leave other "red-gums" still to be distinguished and load ourselves with long names to no useful purpose. In a similar way we cumber ourselves with long and quite unnecessary terms if we call *E. globulus* "Tasmanian blue-gum," and *E. saligna* "Sydney blue-gum." If we name *E. viminalis* "manna-gum" we must explain that several other eucalypts exude from their leaves the white, sweet substance called in Australia "manna." If we tell people that *E. cladocalyx* is the "sugar-gum" we are suggesting a property not possessed by this or any other *Eucalyptus* tree. If we get a little lower down, and call *E. coriacea* a "cabbage-gum," we shall send people's thoughts to the vegetable-garden instead of to the forest.

Education by confusion is impossible. The first condition for discerning and remembering truth is clearness. A "gum" tree is not *any* eucalypt, but a smooth-barked eucalypt; and the smooth-barked group includes several species. To distinguish the species and to exclude all confusion we must use the botanical names and suppress the vernacular names. In this procedure science and trade must be in agreement.

"STRINGYBARKS."

Turning from the "gums," we find numerous eucalypts that retain their dead bark on their stems and more or less on their branches. In one group the persistent dead bark is distinctly fibrous or even stringy. The trees are called "stringybarks," and the name as applied to the group is obviously appropriate. But there are fifteen or sixteen members of this "stringybark" group, and the task of discriminating them by adjectives or other words in the vernacular language becomes bafflingly difficult. In strict truth, it becomes impossible.

E. obliqua has sometimes been called the "Tasmanian stringybark"; but the species has a wide range on the mainland as well as on that island, and cannot be properly designated by a name that restricts its habitat to Tasmania. It was thought at one time that "messmate" might be a good name for this tree, but other claimants to this name came in and spoiled the proposal. *E. Muelleriana* is sometimes called "yellow stringybark" because of the yellow colouring in its inside bark; but *E. eugenioides* often shows the same character. The name thus fails as having a dual application. "Brown stringybark," "white stringybark," and "red stringybark" are all in as bad a case. By different people and in different localities they are all liable to interchange and confusion. Even if these adjectives were appropriate and could stand there would not be enough of them to go all round the group.

The one feasible conclusion is that here, as in the case of the "gums," the whole of the common names should be suppressed and the botanical names brought exclusively into use.

"IRONBARKS."

"Ironbark" is a group name applied to eucalypts that carry dead bark of a very firm, deeply furrowed, and non-fibrous character on

their stems and main branches. With the progress of research the number of species included in the group has increased from five up to eleven or more. The tests by which we determine an "ironbark" are bark and texture of wood. Leaves and fruits differ with the several species. In the bush and in the timber-yards we hear about "grey ironbark," "red ironbark," "narrow-leaved ironbark," and "broad-leaved ironbark." The terms are familiar vernacular names for some of the most valued members of the group. Long usage seems to have given them a secure place in nomenclature. Upon close scrutiny, however, every one of them fails to make good its claim to permanence. *E. paniculata* is sometimes described as "grey," sometimes as "white," sometimes as even "red." No one of these adjectives is securely and exclusively wedded to it; no one of them carries a description of the species. The botanical name alone can rescue this eminently valuable tree from uncertainty and confusion. *E. sideroxylon* has very red wood and is commonly called "red ironbark," but, being unable to maintain a monopoly of the word "red," it, like its congener, must take refuge under the botanical name for positive identification. For a long time *E. crebra* was known as the "narrow-leaved ironbark," and *E. siderophloia* as the "broad-leaved ironbark," but now each of those names has another acknowledged claimant in the group, and we are accordingly confronted with uncertainty in using them. Again the botanical names offer the only refuge from confusion.

OTHER GROUPS.

Other fairly well defined groups of the timber-yielding eucalypts are the "boxes," the "peppermints," the "bloodwoods," and the "mahoganies." The group names are sufficiently appropriate to admit of defence; but when we come to scrutinize closely the common names applied to the several species in each group we find that most of them fail hopelessly in respect to the conditions that render names for natural objects appropriate, exclusive, and trustworthy.

LISTS FOR CATALOGUES.

Catalogue-makers perhaps need a word of warning against introducing into their lists the vernacular names of *Eucalyptus* species because of their sound or appearance. Such names as bangalay, bimbil box, coolabah, Camden woollybutt, mountain-ash, swamp-gum, tuart, York gum, and red tingle tingle may be thought to add interest to a catalogue, but in reality they only waste time by diverting the attention of busy foresters and nurserymen away from the things they most urgently need to know to things of relatively trivial importance. The proper place for all these vernacular names is in a historical monograph, not in a working catalogue for the twentieth century. There are strong reasons why even such familiar names as jarrah and karri should step back in favour of the botanically registered *E. marginata* and *E. diversicolor*. "Blackbutt" means in middle New South Wales *E. pilularis;* farther north in New England it means *E. Andrewsi;* away in south Western Australia it is the common name for *E. patens*. In New South Wales "spotted gum" usually denotes *E. maculata;* in Victoria we may find people calling *E. goniocalyx* or *E. Maideni* by that

name. Terms so variable in application are disqualified for use in exact language. Their fitting place, like that of so many others, would be in the suggested historical monograph on the *Eucalyptus* common names for all Australia.

SUGGESTIONS.

Very much that might be cited in discussing the nomenclature of the eucalypts has been omitted from this paper for the sake of brevity, but enough has been said to suggest the following conclusions:—

(1.) As applied to groups of species some of the vernacular names are permissible and even useful.

(2.) As applied to separate or individual species these vernacular names almost invariably lead to uncertainty, and frequently to confusion.

(3.) In the interests of both science and trade the botanical names should be brought more fully into use, and the use of vernacular names everywhere discouraged.

(4.) Omission from the catalogues of all vernacular names would make room for instructive notes on the derivation of the scientific names and on the natural habitats and characters of the plants.

(5.) Botanists, foresters, nurserymen, and the timber trades should combine to put the nomenclature of timber-trees and their product on a thoroughly scientific and businesslike footing.

WHEAT MANURIAL TRIALS AT CANTERBURY AGRICULTURAL COLLEGE, SEASON 1925–26.

M. J. Scott, B.A., B.Sc., A.I.C., Canterbury Agricultural College, Lincoln.

Up to the season 1924–25 wheat manurial trials at Lincoln College were undertaken in conjunction with the Department of Agriculture, Christchurch, chiefly to find out the value of organic nitrogen as blood. During that time attention was mainly directed to methods of estimating yields, &c., and when the Department took over the work of the Soils Improvement Committee it continued the work on blood. Readers are referred to the article by Messrs. Ward and Hudson—"Wheat Manurial Tests in Canterbury"—published in this *Journal* for August, 1925, also to the article by Mr. Hudson on the 1925–26 departmental experiments, which appeared in the issue for August last. In 1924–25 experimental work at the College was directed to the effect of (*a*) various quantities of the same kind of phosphate, and (*b*) the same quantities of different kinds of phosphate. This work was followed up in the 1925–26 season, and the results are recorded in the notes and data which follow.

(**A.**) The application of various quantities of the same kind of phosphate, basic super being used: The results from using 2 cwt. (average increase of 6·8 bushels per acre) and 3 cwt. (average increase of 9·5 bushels) over 1 cwt. per acre had been so striking that it was decided for the 1925–26 season to try 4 cwt. per acre. The results were quite a reversal of those of the previous season, thus forcibly stressing the point that seasonal variations are so dominant that all

Table 1.—Comparison of Different Quantities of the Same Kind of Phosphates.

Basic Super, per Acre.	Average Number of Sheaves on ¼ Acre (10 Counts).	Average Weight of Sheaves (80 Weighings).	Average Percentage of Grain to Total (40 Samples).	Yield per Acre.	Difference from 2 Cwt. per Acre.	Value of Difference at 6s. per Bushel.	Difference from 2 Cwt. per Acre in Cost of Manure.	Profit (+) or Loss (−) per Acre.
Field 39: Sown, 23rd–26th May, 1925; cut, 29th–30th January, 1926. Previous crop, peas.								
Cwt.				Bushels.	Bushels.	£ s. d.	£ s. d.	£ s. d.
1	140·9 ± 5·1	11·6 ± 0·09	41·3 ± 0·43	44·5 ± 1·6	−4·3	−1 5 6	−0 6 6	−0 19 0
2	156·5 ± 3·4	11·2 ± 0·11	41·8 ± 0·53	48·8 ± 1·3				
3	150·0 ± 2·8	11·4 ± 0·10	40·2 ± 0·46	47·2 ± 1·1	−1·6	−0 9 7	+0 6 6	−0 16 1
4	152·5 ± 5·0	11·45 ± 0·11	40·9 ± 0·48	47·2 ± 1·7	−1·6	−0 9 7	+0 13 0	−1 2 7
Field 15A: Sown, 12th–21st June, 1925; cut, 27th–28th January, 1926. Previous crop, Algerian oats.								
1	Yields estimated by threshing ten small plots from each treatment, as described by Hudson in his trials.			35·9 ± 2·1	−2·4	−0 13 5	−0 6 6	−0 6 11
2				38·3 ± 1·2				
3				39·4 ± 0·7	+1·1	+0 6 7	+0 6 6	+0 0 1
4				37·8 ± 1·2	−0·5	−0 3 0	+0 13 0	−0 16 0

experimental work must be carried on for many years before reliable information can be obtained. Details of the season's results are set out in Table 1 (preceding page).

Super is the universally used wheat-manure, but in view of the fact that 3 cwt. per acre destroys the germination of turnip-seed it was thought rather risky to sow large amounts over big areas. One small plot was tried, however, and the germination carefully compared with that on a plot having 1 cwt. of basic super per acre. The results of germination counts were as follows, averages being taken from ninety counts on 6 ft. rows :—

	Average Number of Plants on 6 ft.
Super, 4 cwt. ..	.. 46·3 ± 0·71.
Basic super, 1 cwt.	.. 46·6 ± 0·74.
Difference	.. 0·3 ± 1·01 (*i.e.*, non-significant).

(**B.**) A comparison of the yields from the same quantities of tricalcium phosphate supplied as (1) Walpole Island guano, (2) Ephos, (3) super, (4) basic super, (5) basic slag. An amount of 95 lb. of tricalcium phosphate per acre was applied in each case as shown in Table 2.

Table 2.—Phosphates used in "B" Trials.

Kind.	Quality.	Amount of Manure required to supply 95 lb. of Tricalcium Phosphate per Acre.	Fineness—Percentage passing through 100-mesh Sieve.
	Per Cent.	lb.	
Walpole Island guano ..	60	155	62
Ephos	60	153	75
Super	42–44	224	Water-soluble.
Basic super	36–38	260	68
Basic slag	36–38	260	72

The results are shown in Table 3 (opposite page).

Reference has been made elsewhere to the relationship between the variations in the number of sheaves per acre and the corresponding variations in the yield on differently manured plots in the same field. (See also *Journal of Agricultural Science*, Vol. xvi, No. 2, W. A. Mackenzie, note on a remarkable correlation between grain and straw obtained at Rothamsted.) This point is again strikingly brought out, and encourages the hope that wheat manurial trials of this nature may possibly be very much simplified in the future.

Correlation coefficients between yields and numbers of sheaves are as follows :—

Field.	Correlation Coefficient.
39	+ 0·955 ± 0·045
15A	+ 0·924 ± 0·075
15	+ 0·947 ± 0·045
25	+ 0·674 ± 0·202

The 1925–26 season in Canterbury was of an abnormal character on account of the very heavy winter rains, and it may be expected that the current season's results will be a complete reversal of those of last year. Reliable conclusions and explanations will be better made in five or six years' time.

Table 3.—Results with Different Kinds of Phosphates.

Kind.	Average Number of Sheaves on ¼ Acre (12 Counts).	Average Weight of Sheaves (80 Weighings).	Average Percentage Grain to Total (40 Samples).	Yield per Acre.	Difference from Super, per Acre.	Value of Difference at 6s. per Bushel.	Difference in Price of Manure per Acre (2 Cwt. Super as Standard)	Profit (+) or Loss (−) per Acre.
				Bushels.	Bushels.	£ s. d.	£ s. d.	£ s. d.
Field 25: Sown, 25th–26th May, 1925; cut, 30th January, 1926. Previous crop, pasture (good red clover).								
Guano ..	117·5 ± 4·2	11·5 ± 0·10	38·1 ± 0·49	34·2 ± 1·3	−3·8	−1 2 9	−0 2 9	−1 0 0
Ephos ..	122·5 ± 9·0	11·6 ± 0·08	40·6 ± 0·46	38·4 ± 2·8	+0·4	+0 2 5	−0 2 9	+0 5 2
Super ..	115·0 ± 7·1	12·1 ± 0·07	41·8 ± 0·42	38·0 ± 2·4				
Basic super	132·0 ± 6·5	11·8 ± 0·09	40·8 ± 0·41	42·4 ± 2·4	+4·4	+1 6 5	+0 1 9	+1 4 8
Basic slag ..	132·0 ± 3·9	11·6 ± 0·07	38·5 ± 0·50	39·3 ± 1·0	+1·3	+0 7 9	+0 1 9	+0 6 0
Field 15: Sown, 1st–8th June, 1925; cut, 25th–27th January, 1926. Previous crop, rape or oats and tares.								
Guano ..	153·8 ± 4·0	11·5 ± 0·14	39·0 ± 0·26	46·0 ± 1·4	−4·4	−1 6 5	−0 2 9	−1 3 8
Ephos ..	167·0 ± 4·9	12·8 ± 0·11	39·0 ± 0·39	55·6 ± 1·8	+5·2	+1 11 2	−0 2 9	+1 13 11
Super ..	153·7 ± 5·1	12·6 ± 0·07	39·0 ± 0·32	50·4 ± 1·7				
Basic super	161·0 ± 4·6	12·6 ± 0·07	38·7 ± 0·29	52·4 ± 1·6	+2·0	+0 12 0	+0 1 9	+0 10 3
Basic slag ..	145·0 ± 4·6	12·2 ± 0·11	38·4 ± 0·40	45·3 ± 1·6	−5·1	−1 10 1	+0 1 9	−1 11 10

CATTLE-TICKS AND REDWATER.

EXPERIMENTS INDICATE THE NEW ZEALAND TICK AS NON-CARRIER OF PIROPLASMOSIS.

PIROPLASMOSIS or redwater in cattle is a disease caused by a microscopic blood parasite which is carried from animal to animal by blood-sucking external parasites. In parts of Australia cattle are affected with *Piroplasma bigeminum*, and the disease commonly called redwater or Texas fever is carried by a tick, *Margaropus annulatus* var. *australis*. The latter differs in habits to a marked extent from our New Zealand cattle-tick, *Haemaphysalis bispinosa*, by attaching itself to one host throughout its growing stages, whereas the New Zealand tick, which requires three hosts, drops off one host to moult and then attacks a further host between moults until the adult stage is reached.

Cattle attacked by the piroplasm may be acutely affected and die from an intense breakdown of blood-cells which makes the urine claret-coloured, or they may be more chronically affected and die from emaciation and anæmia. Young cattle bred in a district where ticks and piroplasmosis are present may gain a tolerance to the disease, and imported cattle may be given this tolerance by inoculation of the disease intentionally at the quarantine station. If the tick is eliminated from diseased herds there can be no transmission of disease from animal to animal, but the blood parasite does not die out in the affected animal, and with a new advent of tick redwater once more breaks out in an intensified form owing to lack of resistance of the younger stock.

Piroplasmosis is not present in New Zealand, but it was considered necessary to clear up the point whether our cattle-tick might not act as a carrier should the disease ever reach this country. In order to obtain definite knowledge on this question an experimental investigation was undertaken, at the request of the New Zealand Department of Agriculture, by Mr. John Legg, Queensland Government Veterinary Surgeon, at the Government Laboratory at Townsville, in that State.

In his experimental work Mr. Legg was provided with a number of New Zealand cattle-ticks by this Department. These ticks were bred and at their different stages of growth fed by being allowed to engorge on the blood of infected animals. They were then allowed to go one step further in their life-cycle and were placed on animals free from disease. In no case was it found possible to transmit by this means the disease from affected to clean cattle. In control experiments, however, the clean cattle were later readily infected experimentally. Bulls from which infected blood was obtained were able to infect clean cattle at any time during the experiments, so that every opportunity was afforded the New Zealand tick to become a carrier of the disease. In the case of the Australian cattle-tick the blood parasite can be transmitted from the adult to the tick egg, and so to cattle in the young larvæ hatching from the egg. Experimental work shows this not to be possible with the New Zealand tick.

The important conclusions arrived at by Mr. Legg from his experimental work as to the non-carrying characteristic of the New

Zealand tick in connection with piroplasmosis are very satisfactory. Some further experimentation will be desirable, however, before they can be absolutely accepted, and we are in correspondence with Mr. Legg regarding this. Mr. Legg's interest and valuable work in connection with the investigation have had the highest appreciation of the Department of Agriculture.

An article on the subject of his investigation, contributed by Mr. Legg to the *Australian Journal of Experimental Biology and Medical Science*, Vol 3, part 4 (December, 1926), gives details of the experiments and results obtained.

—C. S. M. Hopkirk, B.V.Sc., Officer in Charge, Wallaceville Veterinary Laboratory.

THE GROWTH OF PHORMIUM TENAX.

G. SMERLE, Kaihere, Hauraki Plains.

IN order to determine the growth and age of phormium-leaves the writer selected two varieties of healthy appearance, cut them by the side-leaf method on 11th December, 1925, and counted the leaves on 13th October, 1926. By the side-leaf method the three centre leaves of the plant are not cut, but are left in the fan to enable the plant to continue its growth.* All the leaves were marked as soon as they appeared in the centre, and indelible pencil was used to write the dates on the leaves. The experimental plants were growing wild in the swamp near the writer's mill, and did not receive any cultivation or manuring.

The experiment showed that the fan produces from five to eight leaves a year, the average production here (Hauraki Plains) being six and a half leaves a year, and the age of the leaf from fifteen to twenty-two months. The twenty-two-months-old leaf is nearly dead, and for milling purposes would be of very little value. A leaf of twelve months in many instances shows signs of old age, and if left longer uncut would give lighter and discoloured fibre. Especially in the tip of the leaf the fibre would be poorer than in a younger leaf. The leaf would be at its best for fibre-production at the age of ten to twelve months.

By cutting with the hook every four years one gets from nine to eleven leaves to a fan. By this method of cutting the centre leaf is invariably lost in the stripping process, so there are only eight to ten leaves in four years from which fibre is obtained.

Following are the results of the experiment in detail, the dates given referring to the appearance of the respective leaves—one leaf in each case :—

No. 1 fan : 1st July, 1925 ; 3rd October ; — December ; 8th January, 1926 ; 12th February ; 10th April ; 30th May ; 12th July ; — October. Seven leaves in the twelvemonth between October, 1925, and October, 1926.

No. 2 fan : 1st August, 1925 ; 10th October ; 10th November ; 8th December ; 25th January, 1926 ; 25th March ; 5th May ; 8th July ; 10th October. Eight leaves in the twelvemonth, October to October.

* For a full description of the side-leaf method see article "Improvement of Phormium tenax for the Fibre Industry," published in this *Journal*, June, 1923.

No. 3 fan: 3rd July, 1925*; 28th September*; 17th December; 25th January, 1926; 27th March; 7th May; 10th July; — October. Six leaves in the twelvemonth ended October, 1926.

No. 4 fan: 20th September, 1925; 10th October; 6th December; 23rd January, 1926; 23rd March; 4th May; 16th July; — October. Six leaves in the twelvemonth ended October, 1926.

No. 5 fan: 25th August, 1925; 9th October; — November; 27th December; 10th February, 1926; 23rd March; 9th May; 17th July; 1st August. Seven leaves in twelvemonth ended August, 1926.

No. 6 fan: 10th July, 1925; 1st November; 17th November; 12th December; 25th January, 1926; 10th August; — October. Six leaves in twelvemonth ended October, 1926.

No. 7 fan: 29th June, 1925; 1st August; 10th October; 4th December; 2nd February, 1926; 12th April; 18th June; — October. Five leaves in twelvemonth ended October, 1926.

No. 8 fan: 20th July, 1925; 10th October; — November; 6th January, 1926; 10th February; 1st April; 22nd May; 12th July; — October. Seven leaves in twelvemonth ended October, 1926.

No. 9 fan: 26th June, 1925; 26th September; 8th October; 10th December; 17th January, 1926; 25th February; 12th April; 26th June; — October. Six leaves in twelvemonth ended October, 1926.

Another experiment was carried out on the growth in two years of a planted fan. This fan was planted on 8th October, 1924. Some of its leaves are about 7½ ft. long, and at time of writing there are two young fans with leaves from 3 ft. to 5 ft. in length. The leaves in this fan appeared as follows:—

27th October, 1924*; 10th January, 1925*; 20th June*; 22nd August; — November; 1st February, 1926; 26th March; — May; 25th June; 10th August; — September. Seven leaves in twelvemonth ended September, 1926.

The best growing season for phormium on the Hauraki Plains—and probably all over New Zealand—according to these experiments is from October to March inclusive; from March to June growth is medium; and the poorest season for growth is from June to October.

* Dead or dying at date of observation—18th October, 1926.

National Arboretum.—The last annual report of the State Forest Service states that the original area of 50 acres acquired for the establishment of the national aboretum at Rotorua has been extended by the acquisition of 29 acres of adjoining land. Stocks of about two hundred and fifty indigenous and exotic species are being raised in the Whakarewarewa Nursery for the arboretum, and the first instalment of specimens will be planted therein during the 1928 planting season. Every effort is being made to make the arboretum fully representative of the world's principal softwood utility and ornamental trees.

Orchard Production.—The quantities of fruit produced by commercial orchards in New Zealand during the season 1925–26 are given by the Census and Statistics Office as follows: Apples, 1,935,489 bushels; pears, 179,207 bushels; peaches, 105,171 bushels; nectarines, 15,007 bushels; apricots, 67,295 bushels; plums, 54,332 bushels; cherries, 8,149 bushels; oranges, 5,649 bushels; lemons, 22,369 bushels; quinces, 2,577 bushels. Walnuts, 1,394 bushels, and almonds, 11 bushels, are also returned.

Want of drainage is indicated mainly by the herbage growing on the land, such as rushes, sedges, &c. Unless the primary soil conditions that produce these undesirable plant-growths are removed the agricultural value of the land will remain low.

CHEESE-CRATE TESTS.

DEVELOPMENT OF BALANCED CONSTRUCTION TO MINIMIZE BREAKAGE DURING TRANSIT.

A. R. ENTRICAN, Engineer in Forest Products, and W. C. WARD, Forest Assistant, New Zealand State Forest Service.

COMPLAINTS have been received from time to time relative to the damage to cheese which takes place in export service, due to the failure of the containers used. This article presents the results of tests made by the Forest Service on behalf of the Dairy Division of the Department of Agriculture, with the object of improving the serviceability of cheese-crates at present used in the export trade. The work carried out is similar to that described in the article entitled "Butter-box Tests," published in the issue of this *Journal* for May last.

The laboratory studies here described combine practical experience—which is a knowledge of the designs in use, of what timber is available, and of crate-manufacturing practice—with actual scientific tests made on the package itself, packed as in actual service and subjected to strains that approximate actual transportation conditions.

The main purpose of the study was to develop a balanced and economical construction—that is, a crate which has enough strength in each part for the purpose for which it is intended, and no more strength in any part than is necessary to balance the average strength in any other part. The essential qualifications of an export cheese package are (1) that it be strong enough to stand up under exceptionally rough handling; (2) that it be able to resist punctures from the corners or edges of other containers; (3) that it occupy a minimum of space; and (4) that it be difficult to open or close without special tools—a preventive of concealed pilfering. It is necessary to secure these four qualifications without a burdensome cost.

Although the immediate purpose was to formulate a specification for a standard crate for the export trade, the scope of the work was extended to include a study of the various types of containers now in common use, and to provide data for the general instruction of crate manufacturers and users regarding certain fundamentals of crate design. The study may be still further extended at a later date to the investigation of other types of cheese-containers which appear to promise improvement upon existing packages.

Material tested.

STANDARD CRATE.

The standard cheese-crate now in common use for the export trade carries two cheeses weighing approximately 80 lb. each. The crate is an approximately cylindrical package, having two compartments, as shown in Fig. 1. It is constructed of two ends and one centre-piece, with these twelve-sided single pieces connected together by twelve battens approximately 27½ in. in length.

Most of the tests described in this report were made upon packages approximating to the foregoing standard, the length of all the battens used being kept constant at 27 in. One small series of tests was made upon a crate designed to carry only one 80 lb. cheese. The battens of this crate are 13½ in. in length.

The distance between parallel sides of ends and centres was kept constant at 15 in. for both standard and single cheese-crates. In assembling the standard crates the directions of the grain in the two ends are placed at right angles, the grain of the centre running diagonally between that of the ends. Each batten in the standard crate is attached to each end and centre by two smooth wire nails, 1¾ in. long. The whole crate is reinforced by three 14 B.W.G. soft iron wires, fastened around the centre and each end by ¾ in. staples driven into the ends and centre between all battens.

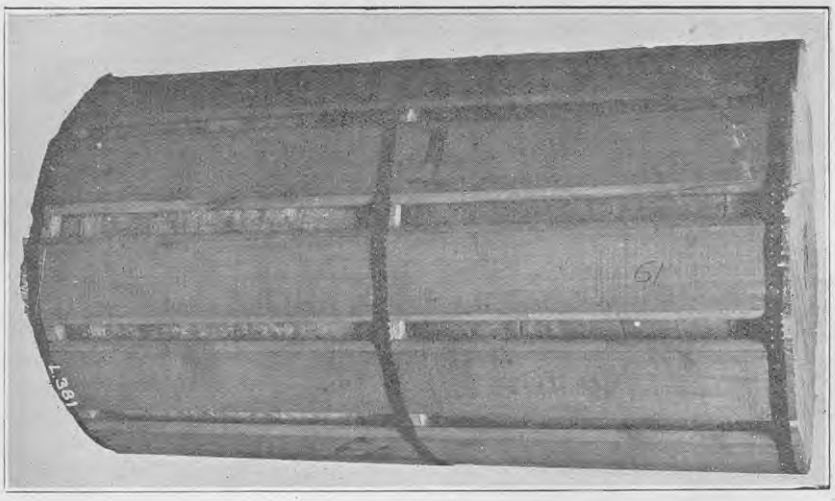


FIG. 1. STANDARD EXPORT CRATE.

Many failures or breakages in cheese-crates having been attributed to poor nailing and reinforcing, tests were accordingly made to determine the effect of substituting cement-coated nails for smooth wire nails, and flat nailed strapping and Acme flat nailless strapping in tension for the reinforcing-wire.

"MAT" CRATE.

As the standard crate is assembled and opened only with considerable difficulty, tests were made of other types of construction which appeared to minimize this disadvantage. One of these types—the "mat" crate—is shown in Figs. 2 and 3. Fig 3 shows a section of a "mat" delivered from a stitching or fabricating machine and ready to be nailed to the ends and centres. The battens are held to the wooden hoops by means of staples. The crate is assembled by folding the mat around the ends and centres, and placing another wooden hoop exactly

over the hoop to which the battens are stitched. Nailing through the hoops is commenced in the centre of the mat, and each succeeding batten nailed, working round to half-way, when the cheese is placed in position and the nailing completed. Fig. 2 shows the assembled crate.

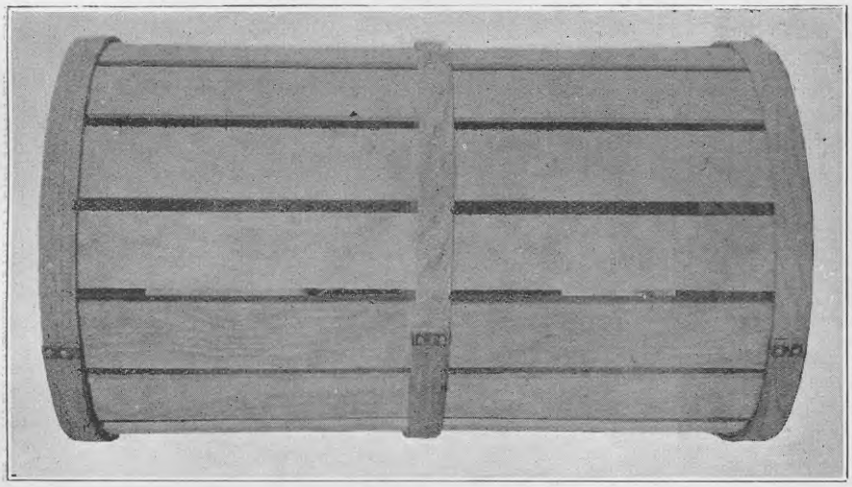


FIG. 2. ASSEMBLED "MAT" CRATE.

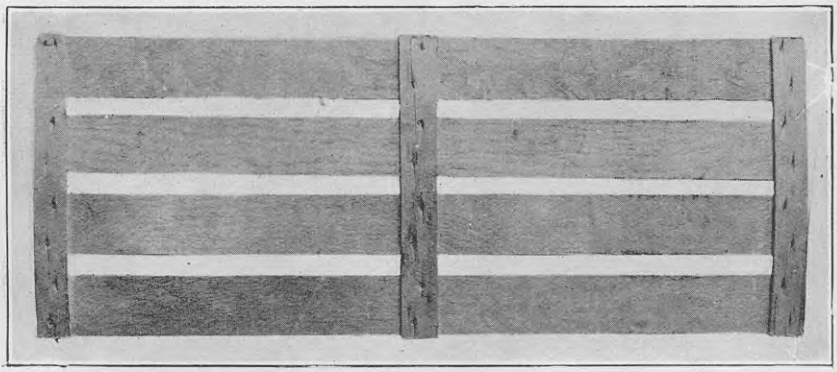


FIG. 3 PORTION OF MAT CRATE, SHOWING BATTENS STITCHED TO HOOPS.

"CLEATED" CRATE.

Standard-sized and single cheese-crates similar to those shown in Figs. 4, 5, and 6 were also tested. These crates are constructed in two halves, which are assembled around the cheese or cheeses and fastened together by cleats at the ends and reinforced by Acme flat metal strapping.

GENERAL.

Five crates were tested to study each variable. The results in all cases were consistent enough to give a reliable average based on this

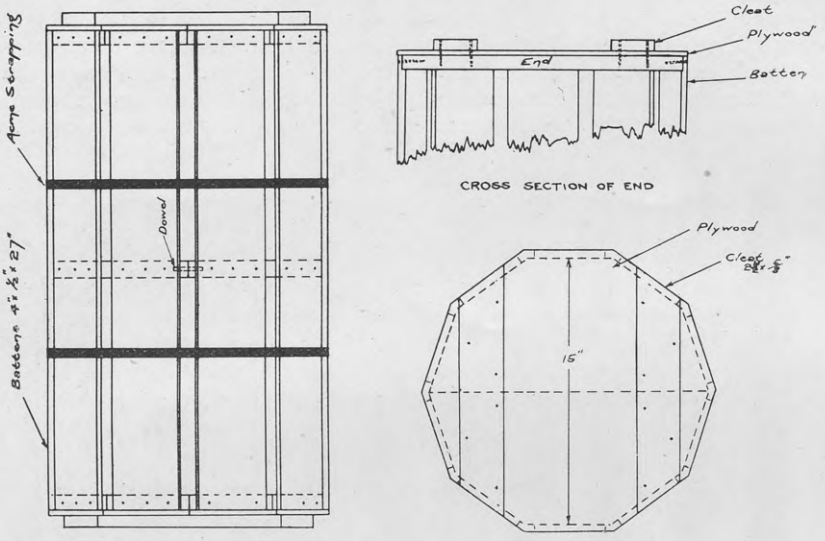


FIG. 4. CLEATED CRATE OF STANDARD SIZE.
In the tests reviewed the ply-wood packing was omitted.

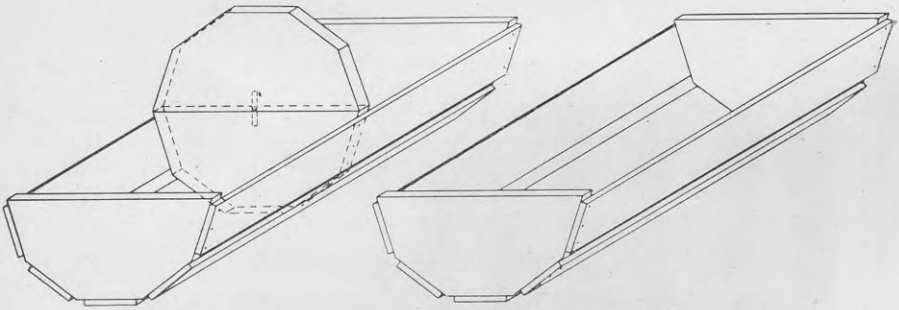


FIG. 5. CLEATED CRATES, SHOWING METHOD OF CONSTRUCTING CRATE IN TWO HALVES.

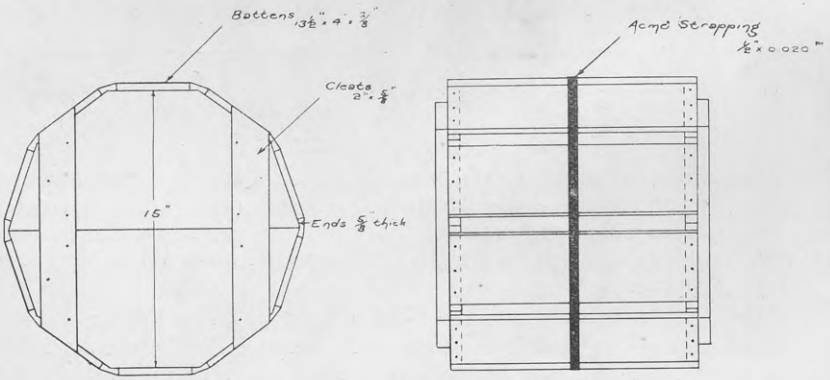


FIG. 6. CLEATED CRATE TO HOLD ONE 80 LB. CHEESE.

number of tests. The recommendations of the Madison Forest Products Laboratory, U.S.A., were followed in the nailing and strapping of crates. Only 5D and 7D cement-coated nails were procurable from local stock. It was therefore necessary to use these in some cases where 6D would have proved more suitable. Flat iron nailed box-strapping, $\frac{1}{2}$ in. wide by 0·015 in. in thickness, and No. 14 B.W.G. iron wire, both of soft (*i.e.*, annealed) metal, were used on crates bound with nailed or stapled bindings. Acme flat metal strapping, $\frac{1}{2}$ in. by 0·018 in. and $\frac{3}{8}$ in. by 0·015 in., both of hard (*i.e.*, unannealed) metal, were used on crates bound with nailless bindings.

NOTE.—The size of cement-coated nails is expressed in pennies and designated throughout this article by the letter "D." The dimensions are as follows: 4 penny (4D), $1\frac{3}{8}$ in. long, 14 A.W. gauge; 5 penny (5D), $1\frac{5}{8}$ in. long, $13\frac{1}{2}$ A.W. gauge; 6 penny (6D), $1\frac{7}{8}$ in. long, 13 A.W. gauge; 7 penny (7D), $2\frac{1}{8}$ in. long, $12\frac{1}{2}$ A.W. gauge. Cement-coated nails are designated by letters "c.c."

Methods of Test.

TESTS OF CRATES.

The most practical method yet devised for testing wooden packages is the revolving-drum test. For this purpose the machine shown in Fig. 7 was installed by the Forest Service at its timber-testing station maintained at the School of Engineering, Canterbury College, Christchurch. The drum is a hexagon-sided machine, and revolves slowly at a rate of $1\frac{5}{6}$ revolutions per minute. The crate to be tested is packed with cheeses of ordinary weight, as in commercial service, and

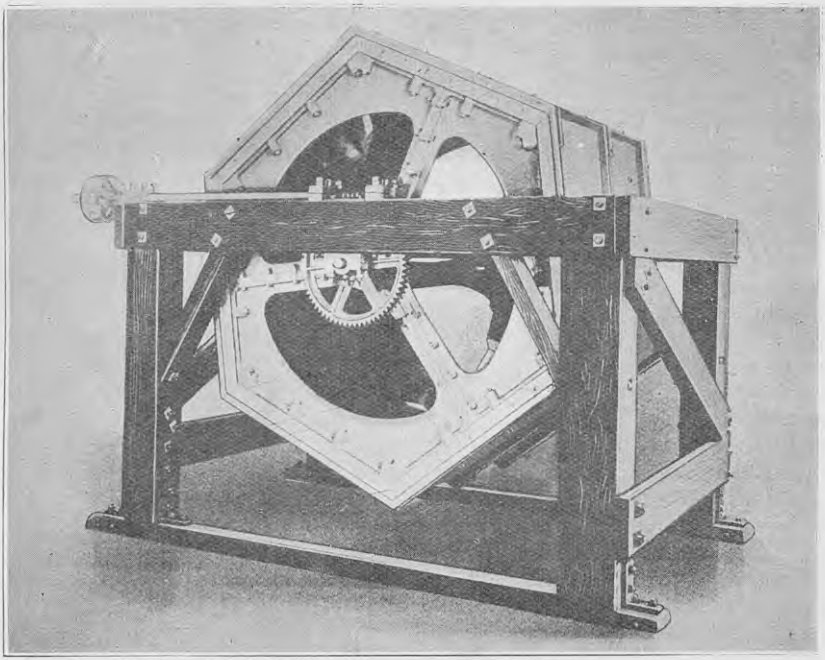


FIG. 7. REVOLVING-DRUM BOX-TESTING MACHINE.

placed in the drum. In the drum are arranged a series of hazards which cause a crate to follow a regular cycle of drops, falling on battens, ends, and edges, and flatwise upon a projection similar to the corner of a box. These drops simulate the usual hazards of transportation. Each face of the drum is counted as one drop.

To facilitate the recording of locations and character of failures the battens and ends of the crates were numbered. As the crate moves on from one drop to the next the observer notes the beginning of the failure of the weakest point of the construction, and follows its development and that of other weaknesses until the crate fails and spills its contents. The weak features of the crate may be too few or too short nails, thin battens or ends, or insufficient reinforcement in certain parts. Such weaknesses are studied by the observer until he is able to build up a crate having equal strength in every feature and capable of delivering its contents in the same condition as when first shipped.

TESTS OF REINFORCEMENTS.

The mechanical tests of the bindings and fastenings were made at the Forest Service timber-testing station maintained at the School of Engineering, Auckland University College.

Six tests of each type of reinforcement were made to determine the maximum tensile strength and percentage elongation of the metal used. As only the maximum tensile strength of the stapled-wire and nailed strapping was required, specimens were limited in length to 10 in. between grips. In tension strapping a low percentage elongation is necessary, and for this determination specimens 60 in. long between grips were tested. The speed of testing for all specimens was 0·024 in. per minute. Self-aligning grips were used throughout the work.

Results of Tests.

GENERAL.

The results of the tests confirm the practical experience of shippers both in New Zealand and abroad. They prove conclusively that the standard export crate as at present assembled is an unbalanced construction. The outstanding features of the tests were the weakness of the nailing and the low margin of safety given by the battens for the safe carriage of the contents of the crate.

Shippers and graders commonly remark upon both of these features. In practically every export shipment nails draw and protrude from crates, and where any laxity is displayed in the use of battens of any wood except beech, either below $\frac{3}{8}$ in. in thickness or of an inferior quality, excessive splitting and breakage occur. This is easily understood. In handling, if slips occur, the tendency is for crates to fall diagonally, and thus strike the ground or other surface where battens are nailed to the ends. Nails and battens are therefore called upon to absorb very high stresses. The use of a wire reinforcement round the ends and centres undoubtedly assists to absorb these stresses and to reduce the drawing of nails. The battens, however, tend to split, even with the best of reinforcement, and, strictly speaking, are too thin. The extent of these and other weaknesses, and the measures necessary to minimize them, are clearly set out in the analysis of results of tests.

ANALYSIS OF RESULTS.

The results of the tests are shown in a series of tables. A detailed description of the crates tested accompanies each table, which is confined as far as possible to the study of a single variable in design.

For convenience in making analysis, and in comparing other designs, the white-pine crate, requiring 330 drops to cause failure and conforming to the following specification, is taken as 100 per cent. :—

Battens—Twelve battens, each 27 in. long by 3½ in. wide by ⅞ in. thick.
Ends and centre—One piece, each twelve-sided, 15 in. between opposite parallel sides, by ⅞ in. thick.
Nails—Two 5D cement-coated nails into each end and centre of battens.
Reinforcement—Three 14 B.W.G. wires fastened around ends and centre with one ¾ in. staple between battens.

This is the standard export crate with cement-coated nails substituted for smooth wire nails.

EFFECT OF SUBSTITUTING CEMENT-COATED FOR SMOOTH WIRE NAILS

Details of Crates tested.

Number of Nails.—Two nails into the centre and ends of each batten.
Reinforcement.—14 B.W.G. wires fastened around the centre and each end with one ¾ in. staple between battens.

Table 1.

Timber.	Type of Nails.	Size of Nails.	Number of Drops required to spill Contents.	Relative Strength to Smooth-wire-nailed Crate.
White-pine	Smooth wire	5D	190	1·00
,,	Cement-coated	5D	330	1·74
Norway spruce ..	Smooth wire	7D	119	1·00
,, ..	Cement-coated	7D	210	1·76

Table 1 represents the results of tests upon four groups of crates nailed with ordinary and cement-coated nails. Crates manufactured from both Swedish spruce and New Zealand white-pine were used. The results were remarkably consistent, the cement-coated nailed crates of both species of wood showing a 75-per-cent. superiority over those fastened with smooth wire nails.

The method of failure of crates nailed with ordinary nails was typical of that which occurs in the export handling of cheese-crates. In all cases the nails tended to loosen early in the test, ultimately drawing where driven into the end grain and thus causing the ends to fail rapidly by splitting. This type of failure is illustrated in Fig. 8. It was sensibly reduced by the use of the cement-coated nails, which are recommended to shippers for both export and domestic service. The drawing of nails, in addition to weakening crates, also causes considerable damage to the clothes and hands of labourers. This is a serious disadvantage, largely eliminated by the use of cement-coated nails.

Cement-coated nails are used almost universally by box-manufacturers in Canada and the United States of America, as they have a much higher

resistance to withdrawal than plain uncoated nails. The cement coating of the nail consists of various resinous gums mixed by a secret formula and put on the nails by a baking process. Though the makers do not claim that the nails are absolutely rust-proof, they do claim that nails thus treated will resist the effects of moisture from 20 to 50 per cent. better than the uncoated wire nail. But it is when in use that the non-rusting quality is most evident. There is more coating on the nails than is actually necessary for holding-power. The heat caused by the friction in driving the nail softens the coating, and the surplus is forced towards the head, completely closing any opening; this prevents the admission of moisture between the wood and the nail. Under similar conditions of use the life of a cement-coated nail will be about twice as long as that of an uncoated one. They are claimed to require less force to drive, as the softened coating forms a lubricant. The advantages to be gained by the use of cement-coated

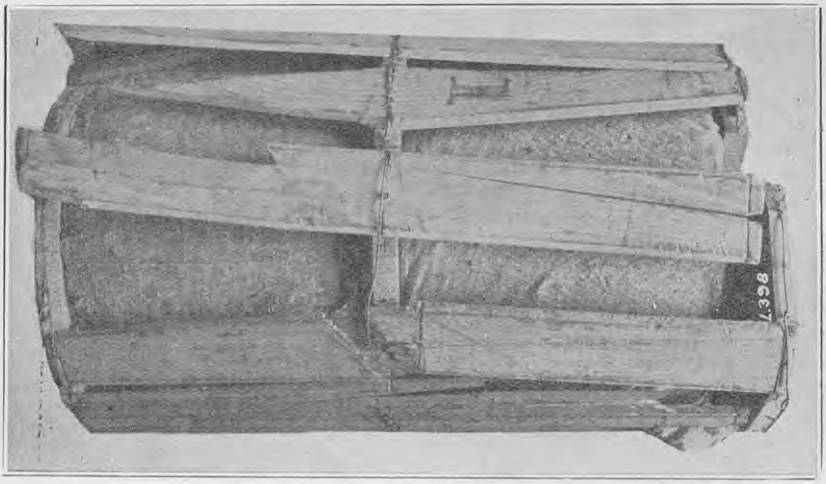


FIG. 8. TYPICAL FAILURE OF A CRATE NAILED WITH SMOOTH WIRE NAILS.

The nails have loosened early in the test, ultimately drawing from the end grain and causing splitting of the ends.

nails are so great that it is very desirable that they should be universally adopted for boxing and crating work throughout New Zealand. Whereas a 2 in. cement-coated nail driven $1\frac{5}{8}$ in. into the side grain of a piece of American pine required a force of 226 lb. to withdraw it, a common nail under the same conditions was withdrawn with a force of only 106 lb. Complaints are sometimes heard regarding their flow in the nailing-machines, but no real difficulties will be experienced if powdered soapstone is mixed with the nails and the pans of the machines are not filled too full.

That cheese-producers have been alive to the poor holding-quality of the ordinary smooth wire nail is clear from the increasing use of barbed and twisted nails. While no tests were made of crates fastened with these nails, there is no doubt that they are superior to the ordinary smooth wire nail, although inferior to the cement-coated nail.

EFFECT OF VARYING SPECIES OF TIMBER USED.

Details of Crates tested.

Nailing.—Two 5D cement-coated nails into the centre and ends of each batten.
Reinforcement.—14 B.W.G. wires fastened around the centre and each end with one ¾ in. staple between battens.

Table 2.

Timber.	Number of Drops required to spill Contents.	Relative Strength to White-pine Crate.
White-pine	330	1·00
Beech	546	1·66
Spruce	101	0·31
Hemlock	98	0·30
Insignis pine	98	0·30

Increasing the holding-power of the nails, however, caused them to shear through the ends of battens, allowing the end to again fail by splitting. Resistance to this type of failure by various woods in common use for cheese-crates is shown in Table 2. The crates manufactured from silver-beech, the wood of greatest density or specific gravity, gave the best results. On the other hand, although the four woods—white-pine, spruce, hemlock, and insignis pine—are of approximately the same density, the serviceability of the white-pine crates was almost three times that of the other crates. This is probably accounted for by the fact that in white-pine there is little difference between the density of the summer wood and spring wood. In the other three species this difference is more marked.

At the same time it must be conceded that the quality of many white-pine crates commonly used is much below that of the specimens

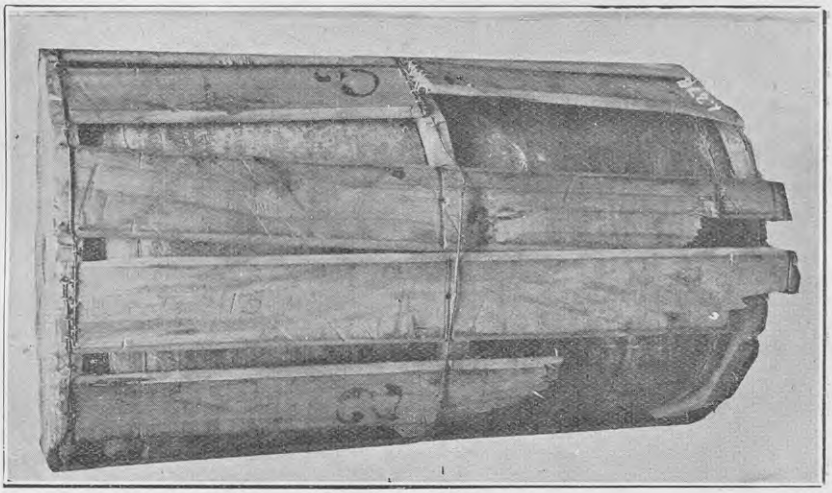


FIG. 9. TYPICAL FAILURE OF INFERIOR GRADE WHITE-PINE CRATE.

Knots and diagonal grain have reduced the strength of the crate by over 50 per cent.

tested. A group of such crates, tested to demonstrate the effect of quality of timber, in particular the effect of knots and diagonal and spiral grain, reduced the number of drops required to cause loss of contents to 128, thus showing a superiority of only 30 per cent. over the crates manufactured from the three other woods.

In appearance the hemlock and spruce crates were superior to the white-pine crates, and especially to the insignis-pine crates. The insignis-pine crate, indeed, was of inferior quality. Improved manufacture would produce a more serviceable package.

EFFECT OF VARYING SIZE OF NAILS USED.

Details of Crates tested.

Timber.—Norway spruce.
Nailing.—Two nails into the centre and ends of each batten.
Reinforcement.—14 B.W.G. wires fastened around the centre and each end with one ¾ in. staple between battens.

Table 3.

Size of Nails.	Type of Nails.	Number of Drops required to spill Contents.	Relative Strength to Crates nailed with 5D Nails.
5D	Cement-coated ..	101	1·00
7D	,, ..	210	2·08
5D	Smooth wire ..	58	1·00
7D	,, ..	119	2·05

Increased holding-power in nails also varies with their size. This is clearly indicated by Table 3, which again shows remarkable but not unexpected consistency in the gain in holding-power with length in both smooth and cement-coated nails of corresponding sizes. Increasing the length of 1⅝ in. nails (by ½ in., or 30 per cent.) to 2⅛ in., according to these tests, increases the strength of spruce crates by over 100 per cent. In hemlock and insignis-pine crates a similar increase in strength would be attained, but in white-pine and beech packages the percentage increase would be smaller owing to battens failing before the nails could develop their full strength.

EFFECT OF REINFORCING CRATES WITH WIRE BINDING NOT IN TENSION.

Details of Crates tested.

Timber.—Norway spruce.
Nailing.—Two 7D c.c. nails into the centre and ends of each batten.
Reinforcement.—14 B.W.G. wire fastened to crate with one ¾ in. staple between battens.

Table 4.

Number of Reinforcements.	Number of Drops required to spill Contents.	Relative Strength to Unreinforced Crate.
None	36	1·00
2	69	1·92
3	210	5·83

Wire bindings applied over battens and fastened by staples driven into the ends and centre between battens absorb a large part of the stresses which would otherwise be borne by the nails. While the wire is placed on by hand without the use of any stretching-machines, the method of attachment results in the binding being placed under considerable tension. The wire is placed around the crate and the ends firmly fixed to a batten. A staple is then driven over the wire between the battens, thus drawing the wire between the battens down so as to touch the ends. Fig. 8 illustrates this, and shows the grooving of the battens where the wire has bitten into them.

The results of the tests set out in Table 4 show that two bindings placed over the ends almost double the strength of the package, while three bindings placed over both the ends and the centre increase the strength of the package six times.

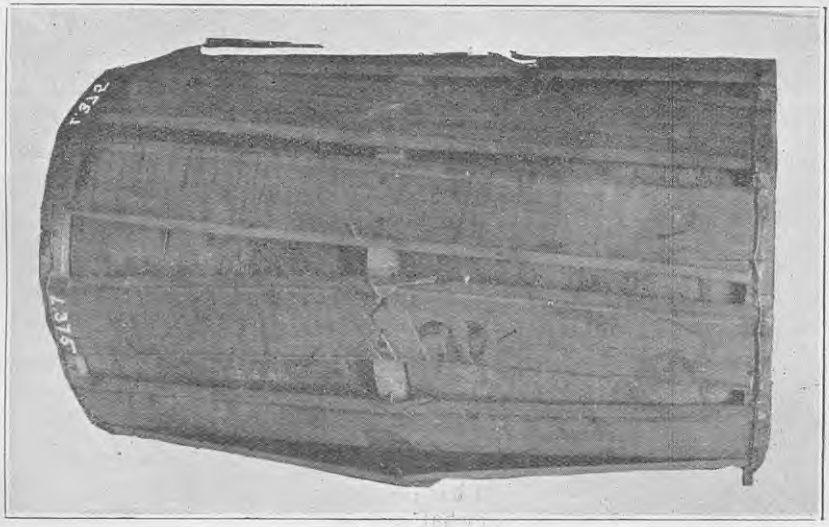


FIG. 10. TYPICAL FAILURE OF TWO-WIRED CRATE.
The unreinforced central battens quickly bulge and break.

The unwired crate failed, by nails pulling through the ends of battens, allowing the ends to split. Applying two wires at the ends delayed this type of failure. The first weakness to develop was the drawing of nails at the centre, since a crate falling diagonally on an edge causes battens to act as slender columns eccentrically loaded at the ends. These, therefore, tend to bulge and break at the centre of their length. Immediately the centre became loose the crate skewed, the ends of battens again pulling through the nails. This is well illustrated in Fig. 10. A third wire applied at the centre effectively eliminated the weakness of the two-wired crate, the final failure occurring by battens breaking across the grain. The efficient stapling of the wire bindings is essential if the full strength of this type of construction is to be developed.

The superiority of the three-wired over the two-wired crate has long been known to the industry in various districts. In some, however,

there has been objection voiced to the third wire. The foregoing tests do not support the objections. An alternative has been proposed in one district to substitute a longer nail in the centre for the short nail together with the wire binding. With smooth wire nails this alternative would give almost as good results, but both constructions are unsatisfactory, as the smooth wire nails pull easily, causing the crate to fail rapidly and also causing damage to the clothes and hands of labourers. In the cement-coated nailed crates the superiority of the three-wired over the two-wired packages is very marked and clearly economical.

EFFECT OF REINFORCING CRATES WITH FLAT METAL NAILED STRAPPING NOT IN TENSION.

Details of Crates tested.

Timber.—New Zealand white-pine.
Nailing.—5D cement-coated nails.
Reinforcement.—½ in. flat metal nailed straps fastened around centre and each end of crate.

Table 5.

Nails per Batten.	Additional Nails holding Strapping to Battens.	Number of Drops required to spill Contents.	Relative Strength to Unreinforced Crate.
Two 5D ..	Unreinforced ..	57	1·00
One 5D ..	Two 5D ..	291	5·11
One 5D ..	One 5D ..	328	5·76
Two 5D ..	One 5D ..	423	7·43

The poor finished appearance of the wire reinforcement, together with the damage caused to the clothes and hands of labourers, warranted the study of promising substitutes. The results of a series of tests upon crates reinforced with flat-nailed strapping are shown in Table 5. The finished appearance of this reinforcement is certainly good, as depicted in Fig. 1. It has the added merit of being more easily applied, but the crate is somewhat more difficult to open for weighing and inspection. The strapping, too, is more likely to tear or break between battens, causing damage to the clothes and hands of labourers, as in the case of wired crates. In nearly all crates in these groups one or more straps broke in this manner.

Efforts were made to secure the flat-nailed strapping in a manner similar to the wire binding—that is, by nails driven into the ends and centre between battens. This method of attachment proved a failure, due to the strap splitting away from the nails while driving, thus causing the strapping to break soon after the commencement of the test. The method of attachment finally developed consisted of applying the flat strapping without tension, merely driving the nails through the strapping and the battens into the ends. Fastening the battens to the ends and centre by one nail and the strapping to the battens by one nail gave a construction equivalent to that of the three-wired crate, in which the battens are attached by two nails and a wire binding applied over the battens. It has the added merit of eliminating the use of over forty staples per crate. The results of the tests, as would be expected, were the same as for the three-wired crates.

The strongest package, using this type of reinforcement, was assembled by using two nails per batten and affixing the strap with an additional nail through the strap into each batten. The extra strength was due solely to the extra nail. On the other hand, more than one nail per batten driven through the strap caused it to break early in the test, due to the reduction in the effective cross-section of the metal.

COMPARISON OF DIFFERENT TYPES OF REINFORCEMENT.

Details of Crates tested.

Timber.—Norway spruce.

Nailing.—Two 5D c.c. nails into centre and ends of each batten.

Reinforcement.—Wire without tension. 14 B.W.G. wires fastened around the centre and each end with one ¾ in. staple between battens.

Strapping without tension : ½ in. flat nailed strapping fixed around the centre and each end with one 5D cement-coated nail per batten.

Strapping with tension : ½ in. by 0·018 in. Acme flat strapping placed around the centre and each end and kept in position with four staples per strap.

Table 6.

Type of Reinforcement.	Number of Drops required to spill Contents.	Relative Strength to Wired Crate.
Wire	101	1·00
Flat nailed strapping ..	129	1·28
Acme strapping	182	1·80

The tension type of nailless flat metal strapping was also studied as a suitable substitute for wire bindings (Table 6). Acme unannealed metal strapping was applied under tension over the nail-heads at the ends and centre, and kept in position by means of staples driven over the strapping into the battens. It proved the most effective type of end and centre reinforcement, crates fastened in this manner being considerably stronger than both the wired and nailed strapped packages. The failure in the three types of crates was substantially the same, the rate at which the various weaknesses developed being retarded in the case of the stronger containers. The ultimate failure was in all cases due to the breaking of one or more wire bindings, nailed strapping, or Acme nailless strapping.

Although applied under tension the nailless strapping requires to be held in position by staples, &c., otherwise the skewing of the crate and the tendency of the strapping between battens to catch and tear upon projections is apt to loosen the reinforcement, allowing it to slip off over the ends. Any size less than that used in the tests would give much poorer results.

Just as the nailed strapped crates were more difficult to open and close for weighing and inspection than the wired crates, so those reinforced with Acme nailless strapping were at a still greater disadvantage in this respect. Whereas the wire binding and nailed strapping may be used again after the opening of the crates, the Acme strapping must be replaced by new strappings.

COMPARISON OF DIFFERENT TYPES OF CRATE-CONSTRUCTION.

Details of Crates tested.

	Standard.	Mat Type.	Cleated Type.
Timber	N.Z. white-pine	Spruce ..	N.Z. white-pine.
Nailing per batten ..	Two 5D c.c. ..	One 7D c.c.	Three 5D c.c.
Number and thickness of battens ..	Twelve $\frac{3}{8}$ in. ..	Sixteen $\frac{1}{4}$ in.	Ten $\frac{3}{8}$ in.
Reinforcement ..	14 B.W.G. wires	Gum hoops	$\frac{1}{2}$ in. by 0·018 in. straps.
Ends	Single piece ..	Single piece	Two piece fastened with cleats.

Table 7.

Type of Crate.	Number of Drops required to spill Contents.	Relative Strength to Standard Crate.
Standard	330	1·00
Cleated one-cheese	835	2·53
Cleated two-cheese	286	0·87
Mat-construction	93	0·28

Reference has already been made to the difficulty of opening and closing standard cheese-crates for weighing and inspection. Four per cent. of all crates are opened and closed, both in New Zealand and abroad, for the purpose of verifying weights, &c. This represents the opening and closing of one crate in every twelve; and since each crate so dealt with occupies a man's time on the average for fifteen minutes the difficulty is a very real one. Improving this feature of crate design will further reduce the original cost of assembly at the factory and enhance the value of the used crate.

Two types of crate thought to offer a solution of the difficulty were tested (Table 7). The mat type shown in Figs. 2 and 11 gave poor

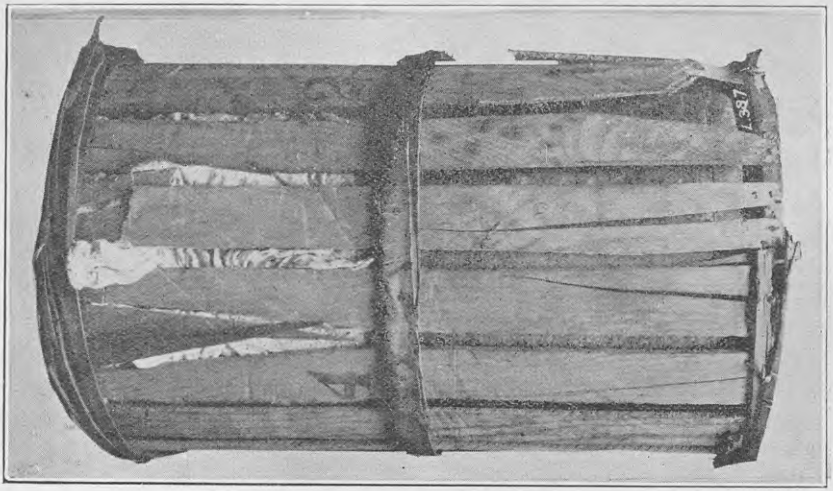


FIG. 11. TYPICAL FAILURE OF A MAT CRATE.

The gum hoops have first split, exposing the thin spruce battens, which then rapidly break.

results. These were not unexpected. The gum wooden hoops reinforcing the ends and centre were of insufficient strength, though they effectively protected the battens before they themselves split to pieces. The substitution of flat metal strapping for the wooden hoops would probably improve the package. It certainly has some promise for the export trade.

The cleated type of crate shown in Figs. 4, 5, and 12 gave results slightly lower than those displayed by the standard wired crate with cement-coated nails. It is, however, easier to assemble, and to open and close for inspection, and has, in addition, a higher salvage value than the wired crate. While it requires less timber for its manufacture, more nails are necessary. This disadvantage, however, is offset by the fact that no staples are used, and that only two Acme flat straps are used in place of the three wire bindings. This type of binding bends the battens in towards the cheese, and to prevent any possibility of their touching the produce the diameter of this crate is increased by $\frac{1}{4}$ in.

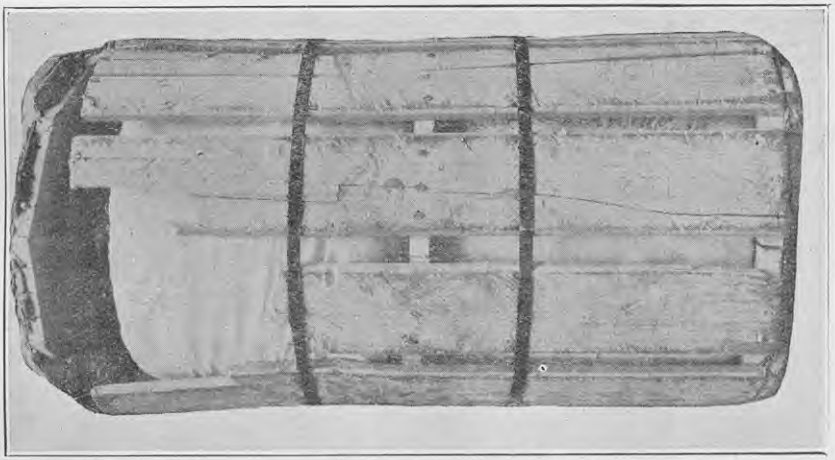


FIG. 12. TYPICAL FAILURE OF A CLEATED TWO-CHEESE CRATE.

The majority of the battens have broken away from one end, allowing the end to almost break away from the crate.

The method of failure was much the same as in the wired crates. It was noticeable, however, that the ends of the cleats absorbed a large portion of the stresses caused by the various drops in the machine. A study of cheese-crates in actual service was made in order to study a similar effect on the wired crates. A number of factories assemble their crates, having the ends of the battens about $\frac{1}{4}$ in. away from the edge of the ends, as shown in Fig. 13 *a*, instead of the usual practice as in Fig. 13 *b*. Accordingly, when a crate falls diagonally on to an edge, the end is often the first member of the crate to take the shock. In such cases there is a tendency for the nails in the end of the batten to compress the wood of the battens towards the centre, as in Fig. 13 a^1. This weakness, however, is not as serious as that which develops in the crate of ordinary construction, in which the end of

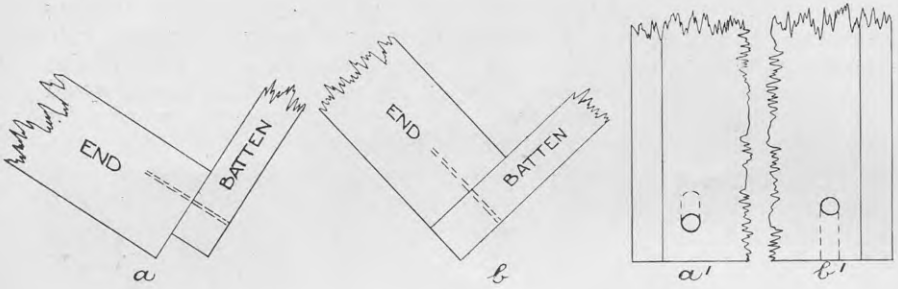


FIG. 13. SHOWING EFFECT OF DIFFERENT METHODS OF ATTACHING BATTENS TO ENDS OF CRATE.

(*a*) End of batten kept away from end of crate; (*b*) end of batten flush with end of crate; (a^1) after diagonal fall on to edge of crate the end is hit first, tending merely to loosen nail in batten; (b^1) after diagonal fall batten hit first, tending to pull nail right through end of batten.

the batten is the first member of the crate to take the shock in a fall diagonally on to an edge. Here the ends tend to pull the nail through the end of the batten, as in Fig. 13 b^1.

Other things being equal, attaching the ends of battens away from the ends would appear to be the better practice. An examination

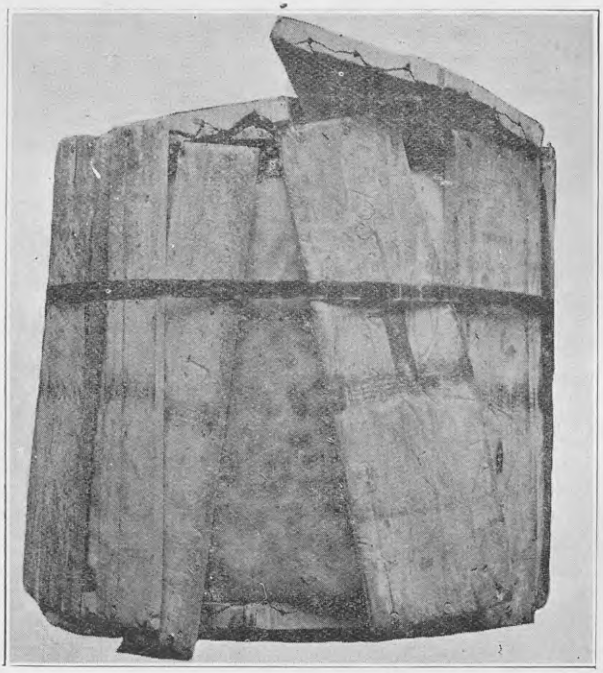


FIG. 14. TYPICAL FAILURE OF A CLEATED SINGLE-CHEESE CRATE.

The cleats and battens have pulled completely from one end, thus exposing the cheese.

of several hundred crates, however, indicated that with a smaller thickness of the end to nail into the nailing was decidedly poorer, there being a greater tendency to split battens and ends.

Some of the field studies of crates in actual service also suggested that the weight of the standard crates holding two cheeses, approximating to 175 lb., was too great for ease of handling. This did not obtain where mechanical handling equipment was in use. A series of tests was accordingly made, using a cleated type of crate holding only one 80 lb. cheese, as in Figs. 6 and 14. This proved to be the most serviceable and balanced crate tested, being approximately two and a half times as strong as the standard wired crate with cement-coated nails. It is admittedly slightly more expensive in comparison with the two-cheese size. This will probably militate against its adoption.

Whether the cleated type of crate is adaptable to export conditions is questionable. Crates awaiting export are at present piled on their ends. With cleated crates greater care would require to be taken in stacking. Piling on their sides, as in shipment by boat, would effectively remove this difficulty. At various ports, too, crates are moved on their ends along gravity conveyers. These would again require greater care in the handling of the cleated crate. The branding of the ends, although presenting some difficulty, is not by any means an insurmountable obstacle to the general adoption of the package.

EFFECT OF VARYING THICKNESS OF BATTENS.

Details of Crates tested.

Size of Nails.—$\frac{1}{4}$ in. and $\frac{3}{8}$ in. battens: 5D cement-coated nails. $\frac{7}{16}$ in. and $\frac{1}{2}$ in. battens: 7D cement-coated nails.

Number of Nails.—Ten-sided crates: Three nails into centre and ends of each batten. Twelve-sided crates: Two nails into centre and ends of each batten.

Reinforcement.—Standard crate: 14 B.W.G. wires fastened to centre and each end with one $\frac{3}{4}$ in. staple between battens. Cleated crate: Two $\frac{1}{2}$ in. Acme straps placed around crate 5 in. each side of centre.

Ends and Centre.—Standard crate: Single piece, $\frac{7}{8}$ in. thick. Cleated crate: Ends two-piece, $\frac{3}{4}$ in. thick, fastened together with two cleats, 2 in. by $\frac{3}{4}$ in., affixed with twelve 5D c.c. nails per cleat; centres fastened together with one dowel.

Table 8.

Thickness of Battens.	Timber.	Style of Crate.	Number of Battens.	Number of Drops required to spill Contents.	Relative Strength to Thin Battens.
$\frac{3}{8}$ in.	White-pine ..	Standard ..	12	330	1·00
$\frac{7}{16}$ in.	,, ..	,, ..	12	513	1·56
$\frac{1}{2}$ in.	,, ..	,, ..	12	623	1·89
$\frac{3}{8}$ in.	,, ..	,, ..	10	280	1·00
$\frac{1}{2}$ in.	,, ..	,, ..	10	545	1·95
$\frac{3}{4}$ in.	,, ..	Cleated ..	12	193	1·00
$\frac{1}{2}$ in.	,, ..	,, ..	12	430	2·22
$\frac{1}{4}$ in.	Beech ..	Standard ..	12	265	1·00
$\frac{3}{8}$ in.	,, ..	,, ..	12	548	2·06

Throughout the foregoing series of tests constant reference has been made to the questionable thickness of battens used. As shown in Table 8 a comprehensive study was made of this feature of crate-construction, forty-five crates of different woods and different types being tested to destruction. The tests indicate that unless battens are supplied to a strict specification, $\frac{7}{16}$ in. material is very preferable to the $\frac{3}{8}$ in. material in common use. This applies only to white-pine, hemlock, spruce, and insignis pine. The silver-beech battens $\frac{3}{8}$ in. thick give a crate stronger than $\frac{7}{16}$ in. white-pine. Increasing the thickness of battens from $\frac{3}{8}$ in. to $\frac{1}{2}$ in., or $33\frac{1}{3}$ per cent., consistently resulted in a 100-per-cent. increase in the strength of the crates.

EFFECT OF ALTERING NUMBER OF BATTENS.

Details of Crates tested.

Timber.—New Zealand white-pine.

Size of Nails.—$\frac{3}{8}$ in. battens: 5D cement-coated nails. $\frac{1}{2}$ in. battens: 7D cement-coated nails.

Number of Nails.—Ten-sided crates: Three nails into centre and ends of each batten. Twelve-sided crates: Two nails into centre and ends of each batten.

Reinforcement.—Standard crate: 14 B.W.G. wires fastened to centre and each end with one $\frac{3}{4}$ in. staple between battens. Cleated crate: Two $\frac{1}{2}$ in. Acme straps placed around crate 5 in. each side of the centre.

Ends and Centres.—Standard crate: Single piece, $\frac{7}{8}$ in. thick. Cleated crate: Ends two-piece, $\frac{3}{4}$ in. thick, fastened together with two 2 in. by $\frac{3}{4}$ in. cleats, affixed with twelve 5D cement-coated nails per cleat; centres fastened together with one dowel.

Table 9.

Style of Crate.	Number of Battens.	Thickness of Battens.	Number of Drops required to spill Contents.	Relative Strength to Twelve-sided Crate.
Standard	12	$\frac{3}{8}$ in.	330	1·00
,, ...	10	$\frac{3}{8}$ in.	280	0·85
,, ...	12	$\frac{1}{2}$ in.	623	1·00
,, ...	10	$\frac{1}{2}$ in.	545	0·87
Cleated	12	$\frac{1}{2}$ in.	430	1·00
,, ...	10	$\frac{1}{2}$ in.	635	1·48

In developing the cleated cheese-crates it was considered that greater strength might be obtained by decreasing the number of battens, thus reducing their tendency to break across the grain. The work was further extended to include the standard wired crates. In all, three sets comprising six different groups of crates were tested. In each set a reduction of battens from twelve to ten was made, the width of the battens in the latter case being increased by an amount sufficient to make the total air-space between battens the same in both the ten- and twelve-sided crates. The diameters of the ends and centres were kept constant in all cases.

The results are shown in Table 9. It was found with the standard wired crate that decreasing the number of battens as stated resulted in a 14-per-cent. decrease in the strength of the crate, due to the more frequent splitting of wider battens. With the cleated-style

crates, however, the opposite result occurred, the reduction in the number of battens resulting in a 48-per-cent. increase in the crate-strength. This was probably due to the method of reinforcement. The Acme straps, which are drawn very tightly around the crate, reduce the splitting tendency of the wide battens. The tendency of the battens to break across the grain, too, is reduced by increasing the width of the battens. A stronger crate is thus developed.

EFFECT OF INCREASING NUMBER OF NAILS.

Details of Crates tested.

Types of Crate. — Standard two-cheese crate and cleated one-cheese crate.

Reinforcement.—Standard type: 14 B.W.G. wires fastened to the centre and each end with one ¾ in. staple between battens. Cleated type: One ½ in. Acme strap placed around centre of crate.

Ends.—Standard type: Single piece, ⅞ in. thick. Cleated type: Two-piece, ⅝ in. thick, fastened together with two 2 in. by ⅝ in. cleats, affixed with twelve 5D cement-coated nails per cleat.

Number of Battens.—Standard type: Twelve. Cleated type: Ten.

Table 10.

Nails per Batten.	Type of Crate.	Timber.	Thickness of Battens.	Number of Drops required to spill Contents.	Relative Strength to Crates with fewer Nails.
One 5D c.c. ..	Standard ..	Norway spruce	¾ in.	96	1·00
Two 5D c.c...	,, ..	,,	⅜ in.	101	1·05
One 7D s.w...	,, ..	,,	¾ in.	56	1·00
Two 7D s.w...	,, ..	,,	⅜ in.	119	2·12
Two 7D c.c...	,, ..	White-pine	½ in.	623	1·00
Three 7D c.c.	,, ..	,,	½ in.	920	1·48
Two 5D c.c...	Cleated ..	,,	¾ in.	270	1·00
Three 5D c.c.	,, ..	,,	¾ in.	835	3·09

During the course of the study various sets of tests were carried out on similarly constructed crates, with varying numbers of nails holding the battens to the centres and ends of the crates (Table 10). In all, comparative figures are available for four sets of tests, comprising in all eight groups of crates. As already indicated, nailing has a decided influence on the strength of cheese-crates.

With one set of spruce crates too small nails were employed, and in consequence the increased strength due to increased nailing was not marked. Using nails of a more suitable size, although of the smooth wire type, a further set of spruce crates developed a 100-per-cent. increase in strength for the use of two nails in place of one. Similarly, a 50-per-cent. increase in the nailing of a white-pine crate resulted in a 48-per-cent. increase in the strength of the crate. The most marked increase occurred in the cleated-type one-cheese crate. With this type a 50-per-cent. increase in nailing resulted in an increase of over 200 per cent. in the strength of the crate. This was due to the lower weight per nail ratio and the more balanced construction of this package.

Conclusions.

The results of the foregoing studies may be summarized as follows :—

(1.) The export crate as at present designed is an unbalanced container.

(2.) The use of cement-coated nails is essential if an economical and balanced package is to be designed.

(3.) A suitable-sized nail should be used for each species of wood—4D for silver-beech, 5D for white-pine, and 6D for insignis pine, hemlock, and spruce.

(4.) Silver-beech, white-pine, spruce, insignis pine, and hemlock rank in this order in suitability for cheese-crates where carrying-qualities are considered.

(5.) Flat strapping and wire binding applied with or without tension are both of great value as a reinforcement for crates.

(6.) Resistance to loss of contents increases with the number of bindings used.

(7.) Tension-applied nailless strapping, flat-nailed strapping, and wire binding rank in this order in strength as crate reinforcements.

(8.) The cleated and mat-construction crates offer possibilities for export service, and further experimental shipments should be forwarded abroad for study and comment.

(9.) Battens, $\frac{3}{8}$ in. thick, of white-pine, insignis pine, hemlock, and spruce are dangerously thin unless supplied under a rigid specification ; otherwise a thickness of $\frac{7}{16}$ in. is recommended. Battens, $\frac{3}{8}$ in. thick, of silver-beech make a very strong crate.

(10.) A crate that could be opened and closed more readily for inspection purposes would be a decided advantage, and it is hoped later to evolve a design embodying this feature. The subject generally is by no means finalized at the present stage.

Recommendations for Standard Crate.

Having consideration to the various factors involved, the Forest Service recommends the use of *one standard type of crate for the export trade.* It can be manufactured from any of the timbers in use—beech, white-pine, insignis pine, hemlock, or spruce. It consists essentially of twelve-sided one-piece ends and centre, $\frac{7}{8}$ in. thick and 15 in. between parallel sides ; battens, $27\frac{1}{2}$ in. long by 3 in. to $3\frac{1}{4}$ in. wide and not less than $\frac{3}{8}$ in. thick if constructed of white-pine, insignis pine, hemlock, or spruce, and not less than $\frac{5}{16}$ in. thick if manufactured of silver-beech ; two cement-coated nails through ends and centres of battens ; and an approved type of metal binding applied around each end and centre. This crate is much stronger than the present standard export package, and, further, is a more attractive container.

A detailed specification for this crate follows :—

SPECIFICATION FOR STANDARD METAL-BOUND CHEESE-CRATE FOR EXPORT.

Section A : General.

(1.) Definition : The crate as herein specified shall be known as the "Standard Metal-bound Cheese-crate—Export Type."

Section B : Timber.

(2.) Woods used : The following timbers shall be admitted under this specification : White-pine (*Podocarpus dacrydioides*), silver-beech (*Nothofagus Menziesii*), insignis pine (*Pinus radiata*), western hemlock (*Tsuga heterophylla*), spruce (*Picea excelsa*), and other timbers approved by the Forest Service.

(3.) Material : (*a.*) The battens and ends shall be well manufactured, and shall be cut true to size. All defects in the timber which materially lessen the strength of the part, or expose contents to damage, or interfere with proper nailing, shall be prohibited. (*b.*) The wood shall be thoroughly seasoned, and shall have a moisture content of not less than 12 per cent. nor more than 18 per cent., based on the weight of the wood after oven-drying to a constant weight.

(4.) Dimensions : (*a.*) Battens shall be 27½ in. long, not less than 3 in. nor more than 3¼ in. wide, and shall be not less than ⅜ in. thick for white-pine, insignis pine, hemlock, and spruce boards, and not less than $\frac{5}{16}$ in. thick for silver-beech boards ; the ends shall be twelve-sided, 15 in. wide between opposite sides, and ⅞ in. thick. (*b.*) The variation in thickness of the boards above or below the thickness specified shall be not more than $\frac{1}{32}$ in., and this variation below the specified thickness shall not extend over more than 10 per cent. of the face of that particular board.

(5. Width of parts : (*a.*) Battens, ends, and centres shall be of single-piece material. (*b.*) Matched and glued or lock-jointed boards shall be regarded as single pieces. No end or centre shall consist of more than three boards so joined.

(6.) Jointing : (*a.*) Matched and glued ends or centres shall in addition be fastened with not less than two galvanized corrugated fasteners, 1 in. by ⅜ in. per joint. (*b.*) The edges of all battens shall be rounded or chamfered along their entire length on one side.

(7.) Surfacing : The outside surface of the battens and tops may be fine-sawn or veneered finish ; otherwise they shall be smooth-planed.

(8.) The grain of the two ends shall be at right angles to one another, and the grain of the centre midway between the two.

Section C : Nailing.

(9.) Nailing schedule : (*a.*) 1⅝ in. cement-coated nails shall be used when driving into white-pine, 1¾ in. cement-coated nails when driving into insignis pine, hemlock, and spruce, and 1⅝ in. cement-coated nails when driving into beech ends. (*b.*) Nails shall be driven flush. (*c.*) Each batten shall be attached to each end and centre by two nails.

Section D : Metal Binding.

(10.) Metal : (*a.*) Flat nailed strapping or stapled wire binding shall be of soft metal, and shall have a maximum tensile strength of approximately 56,000 lb. per square inch. (*b.*) Tension-applied nailless metal binding shall be of hard unannealed metal, and shall have a maximum tensile strength of approximately 84,000 lb. to the square inch. (*c.*) The binding shall be galvanized or otherwise treated to protect against rust.

(11.) The ends of tension-applied nailless bindings shall be fastened in such a manner that the joint shall have a breaking-strength of not less than 75 per cent. of the ultimate strength of the binding.

(12.) Size of binding : The metal binding shall be not less than ½ in. in width by 0·018 in. thickness or of equivalent cross-sectional area.

(13.) Application : (*a.*) Three bindings shall be used per crate, placed around the ends and centre, and covering the nails driven through the battens into the ends and centre. (*b.*) Each nailed strapping shall be fastened to the crate with twelve nails, one nail being driven centrally through each batten. (*c.*) Each wire binding applied without tension shall be fastened to the crate with twelve staples, one staple being driven into the end or centre between all battens. (*d.*) Each tension-applied binding shall be kept in position on the crate with four staples per binding driven into the battens over the binding.

Acknowledgments.

The following organizations have co-operated with the Forest Service in the work here described: Dairy Division, Department of Agriculture—general; School of Engineering, Canterbury University College—crate tests; School of Engineering, Auckland University College—binding tests; Messrs. J. F. Hargreaves and Co. (Limited), Wellington, N.Z., Acme strapping and spruce crates; Messrs. Johnson, Clapman, and Morris (Limited), Wellington, N.Z., and United States Steel Products Company, New York—cement-coated nails; Messrs. J. B. MacEwan and Co., Wellington—hemlock crates; Hawera Co-operative Dairy Company—spruce crates; Messrs. P. Carey and Co., Auckland—mat crates; Mr. B. Hughes, Temuka—insignis-pine crates.

Special acknowledgment is due to the Madison Forest Products Laboratory of the United States Forest Service for its many reports upon box and crate construction. These have enabled the present work to be carried to a conclusion without the laborious investigation of many features of design already studied by the American laboratory.

A large number of the crate tests were carried out by Mr. E. H. A. Englebretch, of the School of Engineering, Canterbury University College. To him special acknowledgment is due for his untiring work in this section of the study.

COMMON AND BOTANICAL NAMES OF TIMBERS MENTIONED IN THIS ARTICLE.

Common Name.	Botanical Name.	Country of Growth.
White-pine ..	*Podocarpus dacrydioides* ..	New Zealand.
Insignis pine ..	*Pinus radiata*	,,
Silver-beech ..	*Nothofagus Menziesii* ..	,,
Norway spruce ..	*Picea excelsa*	Scandinavia.
Sitka spruce ..	*Picea sitchensis* ..	Pacific Coast of North America.
Hemlock	*Tsuga heterophylla* ..	Pacific Coast of North America.
Gum	*Liquidambar styraciflua* ..	North America.

Paper Method of Weed-control.—In tree nurseries of the State Forest Service last year trials were initiated with Pabco-Thermogen paper mulch as a weed-reducer. Results were, on the whole, unsatisfactory (states the annual report of the Service); in most cases the efficacy of the mulch in smothering weeds was lost by the impossibility of fixing the paper so as to adhere closely to the ground. The effect of the mulch on plant-growth varied—in one case seedlings touching the paper appeared to be "burnt," while better plant-growth was observed in some lines treated with mulch. Generally speaking, however, no great difference in growth was found. Soil analysis made showed that no "souring" of the soil was produced by the application of the mulch in the lines.

Pasteurizing Milk for Cheesemaking.—During the dairying season of 1925–26 the quantity of cheese made in factories equipped with pasteurizing plants equalled 76 per cent. of the total output of the Dominion, as against 69 per cent. for the preceding season.

Correction.—In the C.O.R. list published in the *Journal* for November last the mature Jersey cow Woodlands Gipsy, with a record of 651·41 lb. butterfat, was inadvertently entered as tested by J. G. Morgan, Ngawapurua. This should have been S. G. Morgan, Woodville.

TESTING OF PUREBRED DAIRY COWS.

DECEMBER CERTIFICATE-OF-RECORD LIST.

Dairy Division.

THE appended list gives details of performance of cows which received certificates during December, 1926. It will be noted that several specially good records among the several breeds are included, although no changes in class-leaderships have been made.

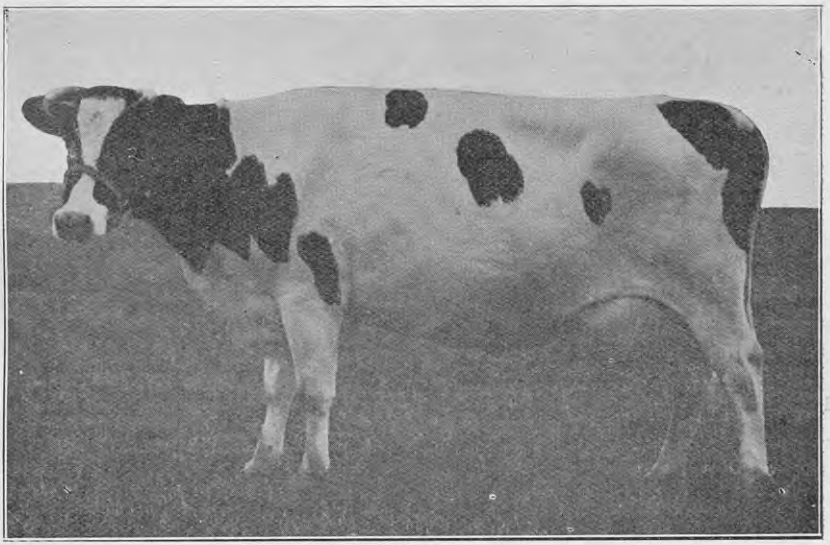
LIST OF RECORDS.

* Cow milked three times daily during whole lactation period. † Milked three times daily during part of period.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
JERSEYS.						
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Croydon Princess May	W. Crosby, Waipuku ..	1 355	240·5	365	9,213·0	575·38
Pencarrow Carnation	R. S. Tuck, Waharoa ..	2 35	244·0	365	11,185·4	541·99
Falconite Pansy* ..	G. E. Yelchich, Waiuku ..	2 64	246·9	365	10,094·2	528·25
Merivale Hope ..	A. R. Gudopp, New Plymouth	2 18	242·3	365	8,460·5	510·62
Lucifera	Mrs. A. Banks and Son, Kiwitea	1 267	240·5	365	9,466·8	492·93
Woodstock Bracelet	Mrs. A. Banks and Son, Kiwitea	1 340	240·5	365	8,833·2	491·28
Silverstream Tui ..	G. B. Hull, Silverstream ..	2 1	240·6	352	8,533·3	485·18
Alfalfa Magnet ..	R. S. Tuck, Waharoa ..	1 351	240·5	365	8,358·15	473·78
Oxford Lily ..	R. S. Tuck, Waharoa ..	1 343	240·5	365	8,668·7	479·26
Woodstock Jenny ..	Mrs. A. Banks and Son, Kiwitea	2 13	241·8	365	9,806·0	461·60
Silverstream Erica ..	G. B. Hull, Silverstream ..	1 343	240·5	364	7,457·2	456·93
Merrie Meade Nocturne	H. C. Grierson, Papatoetoe	2 17	242·2	365	8,910·9	456·13
Glenavon Heroine ..	J. Townsend, Puni ..	2 64	246·9	328	9,547·8	446·84
Coniston Gazelle ..	R. Waterhouse, Papakura	1 225	240·5	365	6,558·2	440·73
Ngahiwi Eminent Treasure	W. J. Freeth, Waitara ..	1 332	240·5	365	7,066·7	435·43
Middlewood Rosary	Kilgour Sisters, Kiwitea ..	1 344	240·5	365	6,752·7	427·64
Woodstock Hopeful	Mrs. A. Banks and Son, Kiwitea	2 22	242·7	365	7,137·9	420·13
Te Aute Thistle ..	W. T. Williams, Pukehou	1 292	240·5	363	6,969·8	418·40
Collingwood Perfection	Hellyer Estate, Dunedin ..	2 65	247·0	302	7,714·6	415·44
Almadale Jewel ..	R. S. Tuck, Waharoa ..	1 363	240·5	365	6,856·3	406·61
Lady Buttercup ..	J. Quinn, Drury ..	1 351	240·5	365	6,736·2	397·91
Ladybird's Pauline ..	R. E. Clements, Dargaville	2 32	243·7	365	5,196·2	371·18
Mountain View Mermaid	A. Hamlin, Tangiteroria ..	2 61	246·6	365	8,131·8	355·42
Goldfield's Nancy ..	W. Muir, Waihi	2 36	243·1	365	5,900·4	332·72
Cloverlea Eunice ..	D. P. F. Malone, Kaponga	2 27	243·2	285	5,838·2	330·26
Merrie Meade La Paloma	H. C. Grierson, Papatoetoe	1 362	240·5	365	6,377·4	322·72
Oaklands Lenora ..	G. W. Ryall, Aria ..	1 322	240·5	282	4,927·1	318·39
Holly Oak Raven Lady	J. R. McDonald, Levin ..	1 332	240·5	303	5,138·8	286·08
Besses Golden Maize Bud	H. Stonex, Bell Block ..	2 72	247·7	223	4,295·7	276·53

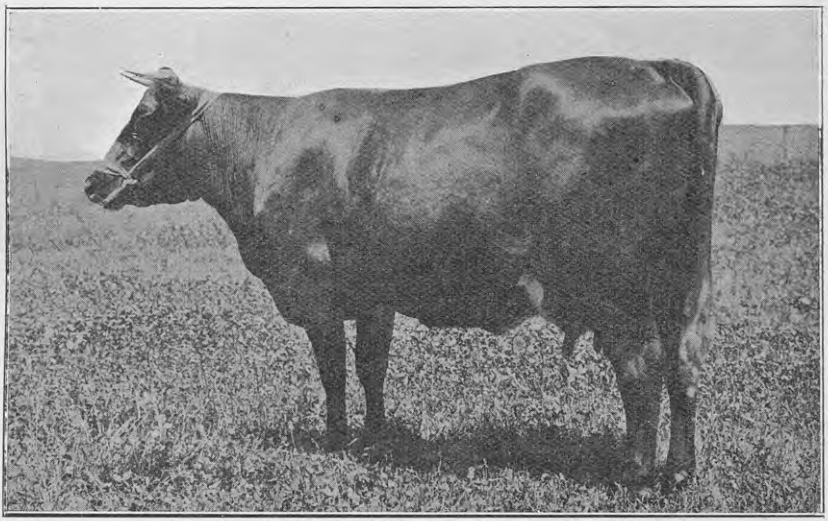
LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS—*continued.*					
Senior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Woodstock Finality ..	Mrs. A. Banks and Son, Kiwitea	2 322	272·7	365	10,380·6	612·57
Holly Oak Primulet ..	Kilgour Sisters, Kiwitea ..	2 221	262·6	365	10,105·8	575·65
Cowslip's Gem ..	W. T. Williams, Pukehou ..	2 332	273·7	359	9,631·3	535·95
Pukatere	F. S. McRae, Palmerston N.	2 169	257·4	365	8,181·6	523·71
Thelma's Joy ..	Kilgour Sisters, Kiwitea ..	2 356	276·1	365	8,360·8	462·62
Oakland's Grizette ..	W. J. Chynoweth, Hamilton	2 357	276·2	227	4,820·2	279·59
Three-year-old.						
Woodstock Féerie ..	A. E. Watkin, Takanini ..	3 298	306·8	365	12,865·3	627·12
Woodstock Suzanne	Mrs. A. Banks and Son, Kiwitea	3 231	300·1	365	10,348·8	546·77
Orange Dale Pearl ..	J. T. Warman, Katikati ..	3 364	313·4	360	8,467·1	468·06
H.M.S. Marvel ..	W. Devine, Palmerston N.	3 85	285·5	329	6,836·3	324·01
Four-year-old.						
Elf's La Primavere ..	John Robb, Westmere ..	4 62	319·7	365	9,583·4	586·77
Conqueror's Bright Star	H. R. Benbow, Ormondville	4 58	319·3	358	8,127·0	469·10
Silverstream Choice Fox	G. B. Hull, Silverstream ..	4 80	321·5	344	9,942·2	452·89
Mature.						
Tikitere	F. S. McRae, Palmerston N.	8 114	350·0	363	12,054·2	746·94
Waipiko Joletta ..	C. G. C. Dermer, Waipiko	6 358	350·0	365	13,537·8	724·21
Rose's Sun Queen ..	John Hale, New Plymouth	7 40	350·0	365	11,870·2	638·37
Flighty Genoa Girl ..	W. Robinson, Patumahoe ..	5 20	350·0	365	13,150·6	623·19
Silver Dot	J. Quinn, Drury ..	10 335	350·0	365	10,355·2	608·71
Fair View Cherry ..	J. Klenner, Kaimata ..	7 255	350·0	365	11,166·8	599·89
Waipiko Cuddle ..	C. G. C. Dermer, Waipiko	5 280	350·0	365	10,503·8	586·93
Miro Meadows Myrtle Leaf	A. A. Ward, Tariki ..	5 282	350·0	365	9,782·5	570·05
Wotton Sandaisy ..	H. J. Lancaster, Glen Oroua	6 121	350·0	365	10,478·6	563·05
Rockview Lady ..	G. R. and H. Hutchinson, Auckland	5 25	350·0	364	10,883·3	561·37
Holly Oak's Lala ..	F. Jennings, Mauriceville	6 102	350·0	319	10,374·1	519·53
Oakvale's Janette ..	W. J. Freeth, Waitara ..	7 307	350·0	365	8,981·7	516·49
Silverdale Victoria ..	H. R. Snell, Ngunguru ..	6 186	350·0	365	8,112·4	430·01
Fox's Golden Pet ..	J. H. Sherrard, Otaua ..	5 6	350·0	344	6,002·6	355·78
	FRIESIANS.					
Junior Two-year-old.						
Na Riwi Mercena* ..	H. W. Reeve, Waitoa ..	2 84	248·9	365	16,945·2	685·50
Ohio Sensation* ..	C. H. Potter, Pukerau ..	1 309	240·5	365	16,560·2	564·84
Melrose Sylvia Echo Lassie*	T. Sheriff, Clandeboye ..	1 331	240·5	365	15,867·7	542·25
Ohapi Korndyke Colantha*	Muff Bros., Orari ..	2 173	257·8	365	12,944·8	407·93
Ohapi Korndyke Queen Posch*	Muff Bros., Orari ..	2 3	240·8	338	11,711·8	404·62
Dominion Chloe Beets	Central Development Farm, Weraroa	1 312	240·5	365	10,356·0	354·54
Senior Three-year-old.						
Ryvington Pontiac Stately†	Mrs. A. M. Hodgson, Tamahere	3 354	312·4	365	13,321·3	481·29



BAINFIELD SYLVIA TOPSY 4TH (MICKELL BROS., TE HORO).

C.O.R. in Friesian senior three-year-old class: 17,540 lb. milk, 804·73 lb. butterfat.



MATANGI RUTH 3RD (RANSTEAD BROS., MATANGI).

C.O.R. in Milking Shorthorn senior three-year-old class: 13,954·6 lb. milk, 688·75 lb. butterfat.

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	MILKING SHORTHORNS.					
Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Pine Farm Jewel 6th	J. Parkinson, Opotiki ..	2 58	246·3	307	9,683·4	359·99
Senior Three-year-old.						
Matangi Ruth 3rd†	Ranstead Bros., Matangi ..	3 333	310·3	365	13,954·6	688·75
Four-year-old.						
Mereside Gem† ..	W. Bowis, Doyleston ..	4 4	313·9	361	10,142·8	402·19
Mature.						
Sunnyside Proude Princess	R. A. Anderson, Invercargill	5 27	350·0	365	12,227·35	495·90
Dominion Jealousy of Ruakura	R. A. Anderson, Invercargill	6 49	350·0	285	8,932·1	354·42
	AYRSHIRES.					
Two-year-old.						
Glengyle Mountain Maid	McAdam Bros., Queenstown	2 23	242·8	365	7,380·2	319·57
Glengyle Mountain Fairy	McAdam Bros., Queenstown	2 46	245·1	365	5,938·2	253·10
Three-year-old.						
Glengyle Mountain Daisy	McAdam Bros., Queenstown	3 10	278·0	333	7,897·7	371·73
Four-year-old.						
Ivanhoe Hindsward Jean	McAdam Bros., Queenstown	4 357	349·2	365	11,137·8	379·25
Mature.						
Greenfields Brown Stately	Webb Bros., Levin ..	5 356	350·0	365	16,110·3	586·28
Greenfields Marion ..	Webb Bros., Levin ..	5 5	350·0	365	13,413·9	515·41
Alice II of Inglewood	Allan Bros., Lower Shotover	13 312	350·0	330	10,301·8	418·56
Ivanhoe Dewdrop ..	McAdam Bros., Queenstown	5 271	350·0	352	10,966·3	402·19
	RED POLLS.					
Two-year-old.						
Dominion Miss Cavell	Central Development Farm, Weraroa	2 54	245·9	365	7,785·6	357·30
	Second-class Certificates.					
	Jerseys.					
Junior Two-year-old.						
Holly Oak Comedy Lass	F. Phillips, Otorohanga ..	1 282	240·5	365	7,440·3	405·63
Tolgarth Pretty Nice	W. T. Williams, Pukehou	1 267	240·5	365	5,844·7	353·17
Senior Two-year-old.						
Kaimata Duchess ..	J. Klenner, Kaimata ..	2 362	276·7	365	9,736·6	472·42
Mature.						
Snow View's Mermaid	A. J. Miller, Uruti ..	6 262	350·0	314	9,206·0	440·87

SEASONAL NOTES.

THE FARM.

TILLAGE OPERATIONS.

THE preparation of land for autumn sowing of grass and for catch-cropping—as dealt with in last month's notes—may be continued during February. When selecting the area to be sown down to grass one should avoid, if possible, land which has just produced a grain crop. This is of particular importance in parts of Canterbury this season, where the ravage of the grass-grub in the wheat crops has been evident. It is best to follow up with grass after some fed-off crop such as rape. Where cereals are to be autumn-sown in grain-growing districts the land selected—either stubble or lea—should be skim-ploughed as early as possible.

The intercultivation of root crops should be continued unless the crop is too far advanced and it is impossible to get through without damage. An extra cultivation often means all the difference between a light yield and a heavy crop of roots. Potatoes will receive their final intercultivation, but if large-growing weeds tend to get away in the crop after this operation is finished it will be advisable to remove them as far as possible by hand. Keep the team busy on summer-fallowed land; it will take all the sunshine available to kill out any twitch.

SOWING OF SECONDARY BURNS.

Should favourable weather conditions prevail during the next few weeks occupiers of unploughable bush land will have a chance to clean areas that have reverted to fern and second growth. Indiscriminate patch-burning is not to be recommended, but if a little money can be spent much can be done in a dry autumn. Where the fern is not too thick, and there is still a fair proportion of grass existing, top-dressing may be all that is required, provided that the grazing can be effectively controlled. Land that has completely reverted, however, must be resown as well as top-dressed.

Bracken fern is not difficult to burn, provided a suitable wind is utilized, but hard fern should only be burnt in a really dry season, otherwise the roots will not be completely destroyed and a ring of fresh growth will spring up. Water-fern is the hardest of all to burn, and is best checked by logging-up, coupled with top-dressing and heavy stocking with cattle. Wineberry is best cut in December and January, and manuka a little earlier.

Heavy sowing is not necessary for successful regrassing—in fact, it is a waste of money to spend much on seed of the better grasses which have already shown that they find the conditions too severe. Cocksfoot in particular is most unsatisfactory for resowing, though a certain number of suppressed plants will survive the fire and show up when the manure takes effect. Rye-grass should be used only to throw early feed. Experience has shown that brown-top and crested dogstail are two of the best species for this work. Danthonia should be included in nearly all cases, also paspalum in localities within

its successful range. Paspalum, however, should not be sown after the first week in March.

A good general mixture would be as follows: Perennial rye-grass, 7 lb.; crested dogstail, 2 lb.; brown-top, 1½ lb.; Danthonia pilosa, 2 lb.; Lotus major, ½ lb.; Colonial white clover, 1 lb.; suckling-clover, ½ lb.; subterranean clover, ½ lb.: total, 15 lb. per acre. On the better classes of land a little Poa pratensis and cocksfoot may be added; in shady situations the brown-top and Lotus major should be increased at the expense of the danthonia and dogstail. The cost of the mixture specified at current prices is about £1 2s. per acre.

Manure should always be applied after the seed if possible, even if for financial reasons the dressing is a light one. Reversion to fern and second growth is a sign of depletion of fertility in the surface soil, and the ash of the burn is insufficient to make good this deficiency. Hence the young grass must be helped if it is to compete successfully with the fern. Super is generally the best for the purpose, though it is as well to add a little lime.

BREAKING IN VIRGIN FERN COUNTRY.

There are—in Auckland Province especially—many thousands of acres of ploughable fern land still awaiting reclamation. The soil of these Auckland areas consists for the most part of a friable loam of a semi-volcanic or pumiceous nature. Where this soil is of a fair depth, as is usually indicated by the vigour of the fern, it can be brought into productivity at a moderate cost, provided that the settler is prepared to use the right methods and to undertake no greater acreage than he can manure regularly.

It is a mistake to attempt the immediate conversion of this land to permanent pasture, either by surface-sowing or by ploughing. It first requires sweetening, fertilizing, and consolidating. This is best done by means of temporary pastures consisting mainly of clover and helped by generous top-dressing. About February the standing fern should be burnt and the land disked thoroughly. Disking is better than ploughing, because it does not bring up raw soil, and it leaves the land fairly solid.

After the harrows have been used to level off the surface, sowing should be done with a mixture approximating to the following: Italian rye-grass, 10 lb.; perennial rye-grass, 8 lb.; cow-grass, 5 lb.; white clover, 1 lb.; English trefoil, ½ lb.; subterranean clover, ½ lb.; soft turnips, ½ lb.: total, 25½ lb. per acre (costing about £1 per acre). If possible the land should be rolled before sowing, otherwise the necessary consolidation may be obtained with sheep. The following manure is suitable for application with the seed: Super, 2 cwt.; bonedust, ½ cwt.; lime, 1 cwt., per acre. Subsequently the land should be top-dressed regularly, preferably with super and lime. The feed so obtained will hardly be first-class dairying pasture, but it will be both early and abundant. As far as possible it should be stocked with heavy cattle in order to obtain as much consolidation as possible.

At the end of two or three years this temporary pasture will begin to open out at the bottom. It should then be ploughed and resown with a permanent mixture after one or possibly two crops of turnips have been taken.

LUCERNE.

February and the early part of March is a good time for cleaning up and renovating lucerne stands, as the fine weather then usually prevailing enables the destruction of grass, weeds, &c. The work is best carried out by means of a cultivator fitted with proper lucerne teeth. If the land has set hard or the field is badly infested with grass it may be necessary to go over it once or twice with disks set almost straight to break the surface and cut the sods, and follow this with the cultivator. If the land is extremely hard it is better to wait until there has been sufficient rain to soften the surface.

Young lucerne crops sown in December should be ready for their first cut about the middle of February. It is very important that this cut be delayed as long as possible, and unless the stand is being smothered with weeds it should be deferred until the new growth is coming away strongly from the crowns. About this time a large proportion of the plants should be showing flowers. Immediately after this cut the area should be given a light cultivation, either with the tine harrows or a very light cultivator, to loosen the surface of the land.

In Marlborough many lucerne and clover stands are cut for seed in February. Material should be thoroughly dry before being stacked—much drier than for hay. In a season like the present one much better seed will be obtained by keeping the stuff in stack for a month or more before shelling than by shelling out of the paddock or immediately after stacking. —*Fields Division.*

THE ORCHARD.

SPRAYING.

THE current period's spraying for the control of codlin-moth is a necessary spray, and should not be omitted by growers. All infected fruits should be gathered and immediately destroyed. Where powdery mildew is in evidence the trees should again be thoroughly sprayed with precipitated sulphur (10 lb. to 12 lb. per 100 gallons). An examination of the trees should be made for red mite and apple-leaf-hopper infection, and where either of these pests is discovered a control spray should be applied to kill the insects before they have an opportunity of laying overwintering eggs. Where black-spot of apple and pear has been troublesome, a close inspection of the fruit and foliage should now be regularly made until the fruit is gathered, in order to detect the infection when it first appears. The first evidence of the disease should be regarded as the danger-signal, and, where conditions permit, the infected varieties should be sprayed immediately to prevent infection or blemish. Brown-rot-infected fruits and mummies should be carefully gathered and destroyed, as the mummies are a source by which brown-rot infection is carried over to subsequent seasons.

Detailed advice as to the sprays to apply will be found in the September *Journal* notes.

SPRAY RESIDUE.

In connection with spraying, prospective shippers will have to consider the matter of spray residue on fruit intended for export. It is very necessary to avoid having an excess of residue on the fruit, and to this end growers are advised to carefully consider the sprays and their ingredients which they intend to apply at the last spraying prior to picking. It is advisable in this respect to omit the spreader, to avoid any excess of lime which it has been the custom to add to any mixture, and to omit Black Leaf 40 from the lime-sulphur and arsenate-of-lead combination. Growers who have had occasion to wipe the residue from their fruit before wrapping will appreciate the benefit to be obtained by eliminating or reducing from late sprays the quantity of certain ingredients which usually cause an objectionable marking or stain.

CULTIVATION.

Cultivation should be continued during the present month in order to destroy weeds and to stir the soil, also to conserve the soil-moisture, as the trees are usually in most need of moisture at this period in the growth of the fruit. In working the ground it is important that the implement used should not go so deeply into the soil as to disturb the fine white root-hairs through which the trees feed, or to expose them to the sun and the atmosphere.

COVER-CROPS.

An important matter in connection with the management of the orchard at this period of the year is the sowing of a cover-crop. In many of our soils it has been demonstrated that the addition of organic matter is very beneficial. Amongst the benefits to be derived from the use of cover-crops are the following: (1) Improvement of the physical condition of the soil and subsoil; (2) addition of organic matter to soil; (3) leguminous crops add nitrogen to the soil; (4) cover-crops in general use up soluble plant-foods, and thus prevent their loss by being washed out by autumn and winter rains; (5) they tend to cause fruit and growth to ripen earlier than is the case where cover-crops are not used; (6) they prevent erosion on steep slopes. The most satisfactory and cheapest method of supplying humus to the soil is by growing such green crops as blue lupins (40 lb. to 50 lb. per acre); oats and vetches (oats 1½ bushels, vetches 1 bushel, per acre); Canadian field-peas (60 lb. per acre); mustard (sown broadcast, 6 lb. to 8 lb. per acre); Cape barley (1 bushel per acre).

In considering the crop to be sown it should be remembered that such leguminous crops as lupins, peas, and vetches supply in addition to organic matter a considerable amount of nitrogen. To obtain the maximum results it is advisable to sow a fertilizer with the crop—say, superphosphate at the rate of 2 cwt. per acre.

BUDDING.

The latter part of January and early February is a good time for doing this work. Select the buds from well-developed shoots of the present season's growth, and from trees which have borne regularly good crops of fruit of the best quality. Where old trees are being reworked buds should be inserted on the outer side of the stock to

be worked, as this will result in a more open head and a better-shaped tree than if worked on the inner side of the shoots. Details as to budding were given in last month's notes.

PICKING.

The picking of the fruit was dealt with in the November *Journal* notes to some extent. In picking all kinds of fruit it is important that it should be perfectly dry, especially if it is intended to store it for some time. Picking should not be commenced in the morning until the dew has left the fruit. The harvesting of the apple and pear crop will now have begun. Apples should be gathered immediately they become ripe—but not fully ripe. When left too long on the trees they are apt after a period of storage to become mealy and lose flavour. The period for which fully ripe fruit may be held for market purposes is very short. If picked too soon the fruit will be poor in quality and flavour, and will wilt and shrivel in storage. Late varieties of apples are usually picked when fully mature and when the deep-green ground colour is assuming a yellowish tone. As these varieties ripen slowly, several months usually elapse before they are eating-ripe.

The proper degree of maturity may be gauged in varous ways, and it is not advisable to rely solely on any one of the following indications of ripeness when determining whether the fruit is ready to pick: (1) The fruits should have the necessary amount of red colour usually associated with the variety, and according to the position of the fruit on the tree; (2) distinct change of ground colour towards light yellow—the hard green colour should have gone; (3) ease with which stem parts from the spur. Some pickers rely mainly on the good brown colour of the seeds as an indication of ripeness, but this way is unreliable for some varieties. Sturmer, for instance, is under certain conditions still immature when the pips are quite brown. Apples should be picked with stems intact.

Pears are somewhat peculiar in their manner of ripening, and to develop the best quality the fruit should be gathered when it is green but matured. If left to become too ripe on the trees some varieties develop gritty granules in the flesh, while others rot at the core and generally do not develop the luscious and finest flavours possessed by fruits gathered from the tree before they are ripe. Pears should also be picked with stems intact.

Quinces should be fully ripe before they are gathered.

Care should be taken not to break off more fruit-spurs than can possibly be avoided, as the spurs are required for the production of subsequent crops. Pickers should be instructed to place the thumb beside the joint between the stem of the fruit and the spur and then bend the fruit sharply towards the thumb; if the fruit is sufficiently mature the stem will readily part from the spur. Fruit damaged through the pulling-out of the stem soon commences to decay. Fruit generally does not ripen evenly on the individual trees, and to obtain the best results three or four pickings should be made. The smaller fruit and that low down on the tree should generally be gathered at the last picking. It is well to remember that there is a considerable variation in the ripening of the different varieties and of the same varieties under different conditions, and to obtain the best results a careful study should be made by growers.

EXPORT OF FRUIT.

It is important and in the best interests of every grower that only the best fruit should be sent away. The fruit should neither be too green nor too ripe. The best time generally to pick for export is when the dark-green ground colour changes towards a light yellow, and when the stem will part from the spur. The fruit should be well graded as to colour, size, and blemish. The wrapping, labelling, and stamping should be neatly done, and the cases packed full and sufficiently tight to prevent looseness developing in the handling and storage. Much damage is occasioned to fruit through very tight packing. Every care should be used to prevent bruising. Throughout all the handlings the fruit receives, everything possible should be done to cause it to open up in such condition that it will more than favourably compare with the fruit of our competitors on the markets of the United Kingdom and elsewhere.

FRUIT FOR IDENTIFICATION.

From time to time specimens of fruit are submitted for naming without any description of the habit or growth of the trees, or any particulars whatever. It is advisable that the specimens should be accompanied by a description of the tree, when the fruit ripens, the name (if any) by which it is locally known, and any other information which would be of assistance in determining the proper name. At least three typical specimens, with stems attached, should be forwarded.

—W. K. Dallas, Orchard Instructor, Dunedin.

Citrus-culture.

Continued cultivation will still be the main work in the citrus grove. With the heavy rainfall experienced this season root-action near the surface will be very pronounced, and unless the land is constantly cultivated the surface soil may become a mass of roots which will be badly parched during the drier season to come. With the surface soil well tilled, however, roots will be maintained at a level where more equable moisture may be expected. Should dry weather set in some mulch will be required. Stable manure is to be preferred, but hay, straw, or any available litter will serve the purpose. Take care not to pile any material round the trunk of the tree, as bark-injury may be caused by such contact.

The rapid growth made this season under very humid conditions will result in wood-growth of a very soft nature and in excess of the amount required to properly build or furnish the tree. Much benefit will be derived from the suppression of undesirable growth, in order that the wood really required may be better matured and more stable.

Humid conditions suitable for the spread of verrucosis and grey scab will necessitate a further spray of bordeaux, 3–4–40, if the advancing crop is to be maintained clean.

—W. H. Rice, Orchard Instructor, Auckland.

POULTRY-KEEPING.

CARE OF THE YOUNG STOCK.

FEBRUARY can generally be regarded as a comparatively easy month on the poultry plant, nevertheless there are several important matters that demand close attention. Perhaps the most important is to see that the pullets are specially cared for, in order that they may produce their maximum egg-yield when high prices rule for this product at a later date. It is a mistake to conclude that because the young birds have passed the brooder stage they can be left to scratch for their living and generally look after themselves. They are now just as apt to get a setback—which will never be caught up—as at any stage of their development.

Only good sound grain foods should be fed—as much as the birds can eat at each meal without waste. Good short plump oats are an excellent food for growing birds, and when available should be included in the ration. It has the effect of keeping them steadily growing, while it tends to prevent the pullets from attaining maturity at too early an age. Green food, such as silver-beet, cabbage, rape, or finely chaffed succulent grass, clover, lucerne, &c., should be fed in abundance, while grit and charcoal should always be in reach of the birds to pick at. Do not fail to keep the drinking-fountains clean and regularly filled. Any neglect in this direction, and especially at this season of the year, will have an injurious effect on the birds.

Keep the quarters clean—the secret of preventing vermin making their appearance—remembering at all times that young stock in particular cannot be satisfactorily developed if compelled to sleep in dirty or lice-infested quarters. Where possible give the growing birds a good range, as confined or hothouse conditions do not tend to promote the development of healthy and robust stock. Of course, reference is now made only to the young pullets and cockerels intended for future breeding purposes. Cockerels intended for the table should have their exercise curtailed, as a free range does not tend towards rapid flesh-formation. Above all things, see that the accommodation is not overtaxed, as crowded stock can never give a good account of themselves. Clean, roomy quarters and a good range, together with liberal feeding, are among the chief essentials in developing young stock.

THE IMPORTANCE OF GRIT.

If fowls are to be maintained in a healthy productive condition it is essential that they be provided with an unlimited supply of grit. It is not generally realized that the lack of grit not only means a reduced egg-yield, but is also a frequent cause of liver troubles, crop disorders, indigestion, and consequent disorganization of the system. The chief function of grit is to assist digestion. It must be remembered that fowls have no teeth to masticate their food. This process is performed in the gizzard by muscular action and a grinding process, the food being ground between the grit swallowed by the bird and the walls of the gizzard. Thus, the harder and sharper the grit the better will it assist the grinding process. No matter how hard and sharp

grit may be, the grinding action of the gizzard will soon have the effect of wearing it down. This indicates that the bird should always have the opportunity of replacing the worn stones by those that are sharp. Some people supply their fowls with round water-worn pebbles as grit, but these are unsuitable for the purpose, unless, of course, they are first put through a grit-mill and broken up. Where fowls have a free range and the ground is of a gravelly nature they will in most cases pick at all the grit they require, but on heavy clay soil, even although they have their liberty, grit should be provided. On the farm where, say, one hundred birds are kept on free range, it is surprising how soon they will consume a drayload of gravel, providing it has been sieved and is of a suitable size for the birds to swallow. In addition to sharp gravel grit, broken sea-shell should be always available for the birds to pick at as an egg-shell-forming material. It is not generally realized that egg-eating and the production of shell-less eggs are frequently caused by the fowls being provided with insufficient lime for the manufacture of shell. It should always be remembered that a hen when laying will eat double the amount of oyster-shell than when not laying.

PROTRUSION OF THE OVIDUCT.

Many complaints have reached me of fowls being affected with protrusion of the oviduct. In one case over twenty birds were lost from this cause in one week. The trouble is usually due to over-feeding with rich foods such as meat, meat-meal, &c. Providing the birds with a large quantity of milk to drink is also often responsible for ovarian disorder. Where the danger lies in this respect is in compelling the laying bird to drink a large quantity of milk merely for the purpose of quenching its thirst. Especially is this the case during hot weather. In addition to the milk, water should always be available, so that the bird is not forced, in order to secure a drink, to take more of the latter than is good for it. Where milk is provided in large quantities to drink, the risk of ovarian troubles and the production of shell-less eggs will be minimized if water is provided in a separate receptacle.

Another trouble, which is often confused with an ovarian disorder, is caused by a hen picking at the oviduct of another bird just when the latter is in the act of expelling an egg. This brings on a severe hæmorrhage, with the result that the other birds in the flock will pick at the bleeding part and often pull out the bowels and oviduct of the victim, causing it a cruel death. Where birds have acquired this vice the only safe course is to darken the nests, or arrange them in such a way that the oviduct of the bird cannot be seen or picked at when in the act of laying. When a bird is on the point of expelling an egg the oviduct protrudes more or less, and presents a highly flesh-coloured appearance. The latter condition no doubt induces the culprit, in its desire for animal food, to pick at and puncture this delicate organ. Careful observation will often locate the culprit, which will be frequently seen walking along the platform in front of the nest boxes waiting for an opportunity to resort to its cannibalistic inclination. It goes without saying that once such a bird is detected it should immediately be got rid of.

—F. C. Brown, Chief Poultry Instructor.

THE APIARY.

EXTRACTING.

EXTRACTING should now be in full swing in all districts of the Dominion. Where operations for any reason have been delayed, care must be taken to see that the bees are not crowded out, or they will commence to loaf, and the ultimate crop will be small. It is a good policy to extract twice during the season; but where the beekeeper prefers to leave the work until the end of the flow a close watch should be kept so as to provide ample room. This, however, can only be done where large numbers of spare combs are kept on hand. It is during the season when honey is coming in freely that the beekeeper realizes that his most valuable asset, next to his bees, is a good stock of extracting-combs. Every effort should be made to get at least twenty spare combs for each hive in the apiary, and with this number always on hand the bees are not likely to be hampered for room.

In the absence of plenty of drawn-out combs the best plan is to keep the extractor going, and thus prevent the bees from blocking the brood-combs. This usually happens unless ample room is provided, and as a result the queens are prevented from laying to their utmost, and the colonies dwindle. At no time during the working season should the work of the queen be hindered. Care must always be taken to see to this important item during the flow. The honey is quite ready for extraction when the combs are three parts capped, but great care must be exercised not to extract unripe honey. Numerous instances have come under my notice where the practice of taking unripe honey has meant a total loss to the beekeeper.

STRAINERS.

It is not uncommon to find exposed for sale honey with which proper care and attention have not been paid to straining at the time of extracting. Nothing deters the sale of extracted honey so much as a layer of wax-particles, dead bees, &c., and it is surprising how few beekeepers take the necessary trouble to see that their product reaches the customer free from impurities. In no case should honey be run direct from the extractor into the containers; it should be properly strained. It is the attention paid to this necessary detail that aids in the sale of the crop, and when honey is properly treated it readily commands a higher price. Fine-gauge wire strainers are usually adopted, but even these are not sufficient to remove the smaller wax-particles. In order to ensure perfect condition the honey should be passed through good fine cheesecloth before being run into the tank. Cheesecloth strainers are excellent, cheap, and easily made, while at the same time they can be readily cleansed. They remove everything but the smallest particles of wax, which should be finally disposed of when the honey is skimmed. This latter process is an important one, and should always be carried out before the honey is put up in marketable form.

TESTING HONEY FOR RIPENESS.

Before tinning off the honey the apiarist should make sure that it is ripe. Fermentation is sometimes quite a serious problem, and yearly large quantities of honey which were thought to be well ripened at extracting-time ferment, more especially when left over till the weather

becomes warm. The bulk of our honey is exported, and a matter of first importance is its condition on arrival at the overseas market. Usually beekeepers experience little difficulty with low-specific-gravity honeys if care is exercised and only well-sealed combs are extracted from. However, to ensure that the honey is up to standard it should be tested with a hydrometer before being run into the tins.

When making the test the contents of the tank should be gently paddled in order that the honey may be of the same consistency throughout. This operation is of importance, as there is always a risk of variation of the specific gravity of the honey at the bottom and top of the tank. If on testing with a Twaddle's No. 4 hydrometer the instrument does not sink below 84 a well-ripened honey is indicated. This is equal to a specific gravity of 1·42, the test being made at a temperature of 60° F. As the temperature of honey in summer rarely sinks so low, the test may be taken at 70° or 80° by adding one point to the hydrometer-reading for each ten degrees of heat over 60°. Thus, if the hydrometer sinks to 82 at a temperature of 80°, it would register 83 if taken at 70°, and 84 if taken at 60°. To arrive at the specific gravity multiply the hydrometer-reading by 0·005. Thus 84 × 0·005 = 0·420; add 1 for the specific gravity of water and it will equal 1·420. This method is only reliable up to a temperature of 90°.

TESTING THICK HONEY.

Sometimes the honey is so dense that the hydrometer will not sink. When such is the case take equal parts by volume (not weight) of honey and water, mix thoroughly, test with a No. 2 Twaddle's hydrometer, and then multiply the result by 2. This will give the same result as if taken with a No. 4 instrument by the direct method. Thus, if the No. 2 instrument sinks into the honey and water to 42, this multiplied by 2 = 84. Perhaps the quickest and simplest method for testing thick honey is to have a deep glass or beaker on which is a mark to contain about 4 oz. of water. Fill up to the mark with water, then pour it into another vessel; now fill up to the mark with liquid honey, add the water previously measured, and mix thoroughly; then place in it the No. 2 hydrometer, note the number to which it sinks, and multiply by 10; place the decimal point before the result, and add 1. Thus, if it registers 43, 43 × 10 = 430; place the decimal point before the 430 = 0·430; to this add 1, which is the specific gravity of water, and the result will be 1·430. —*E. A. Earp, Senior Apiary Instructor.*

HORTICULTURE.

TOBACCO-GROWING.

In the earlier-planted tobacco crops the lower leaves will now be changing colour; the green will be turning to a pale shade, and a slight yellow, mottled appearance is acquired. These are some of the indications of ripeness, and show the time has come for harvesting the crop. A careful judgment is required at this point, as immature leaf has poor colour and flavour when cured, while an overmatured leaf will come out of the cure in a mottled condition and without the necessary elasticity and texture. The aim must be for a cured leaf

of bright even colour, unbroken, with good body, and rather a tough elastic texture. This is usually obtained with the pipe tobaccos grown here by means of the air system of curing, with the help of occasional fires, in some instances, during a spell of humid weather. For the bright-yellow leaf a flue-heated kiln is required. Usually the leaf is cured on its stalk, the plant being cut off at the surface of the ground and the stalk split and threaded on the usual 4 ft. curing-stick. Lack of accommodation sometimes induces growers to crowd the plants on the sticks, which at first is rather an advantage, but later usually results disastrously in slow drying and the development of mildew. Green leaf requires to be handled with care when being taken to the drying-sheds, as it is when in that condition very easily broken or bruised, and in that way seriously damaged.

TOMATO HARVEST AND AFTER-MEASURES.

The harvesting of the glasshouse tomato crop usually closes at about this period. When that time arrives it is advisable to clean up the house promptly, as if this is omitted a heavy crop of fungi and insect pests is usually produced. Both economy and cleanliness demand this prompt attention. The plants are best dug up, freed from the supporting strings, and burnt, as, although vegetation makes an excellent manure, one would by turning it in undoubtedly infect the soil with the diseases present, and so increase the difficulties of another season when that crop is grown. Where white fly or other pests have been present it may even be necessary to fumigate the house with calcium cyanide, or, if fungus diseases have been troublesome, to spray the house and soil with formalin, 1 in 320. A crop of another kind is then sometimes planted, or the land is sown down in a green cover-crop for turning in.

The harvesting of the outside tomato crop will now be at its height. The progress in standard packing in the different districts last season was very commendable, and growers cannot fail to benefit from the adoption of whatever local standards that may be agreed upon. In some instances these took the form of uniform cases, labels, and marks. Such practice cannot fail to increase confidence among buyers and facilitate business. To do otherwise is to continue the confusion and disappointments that are making our markets expensive and ineffectual.

SMALL-FRUITS.

Where Cape gooseberries or passion-fruit are to be grown next season the seeds may be sown now to produce plants for setting out in the spring. Plantations of berry-fruiting plants should be kept in condition by suitable spraying, and where growth is backward a dressing of sulphate of ammonia and sulphate of potash may be applied with advantage in most cases.

THE VEGETABLE GARDEN.

Crops of celery, cabbage, cauliflower, and leeks that are now established will be benefited by an application of fertilizers, also the beds of rhubarb and asparagus.

Seed-beds for the crop of spring cabbage and cauliflower should now be made and sown. A thin sowing will give hard, strong plants which will stand the winter.

HOME-SAVED MANURES.

The large quantities and cost of manures required for the intensive culture of the present day make it desirable to exercise economy in using up all available supplies. Stable manure is now almost unprocurable, and one is inclined to depend entirely on "artificial" manures and green cover-crops; but many growers have other supplies available which it would be economical to make the most of.

Of these sundry supplies fowl-manure is one of the most popular. The present system of keeping poultry under cover makes the collection and storage convenient. The manure is usually kept in a dry state in benzine-tins and ground, or stacked with alternative layers of dry soil under cover. Its high nitrogen content, in addition to good percentages of phosphate and potash, makes it an excellent dressing for feeding growing crops. Some of these houses have a foot of dry soil on the floor, besides straw, for the fowls to dust and scratch in. If this is removed annually during winter, spread on the land and turned in, it makes an effective dressing. In the poultry-house it is replaced with fresh soil, with, no doubt, mutual satisfaction.

Wood-ashes, charcoal, and soot, when obtainable in any quantity, are too valuable to throw away. The wood-ash is rich in lime, soda, and potash, and the soot in sulphate of ammonia; but chemical analysis does not by any means exhaust the list of beneficial qualities of the materials referred to, such as mechanical improvement of the soil and as insecticides. As the qualities of value in these substances are water-soluble they have to be kept in a dry place. Wood-ashes and soot are in high favour as a dressing for land just before sowing it down in onions. Soot is also used for dusting young plants, which it protects from insects while the plants are fed with nitrates.

The high chemical value of sheep-manure makes it an article of commerce in some countries. There it is dried and ground and sold in sacks. It is highly concentrated, although not equal to fowl-manure, than which it is less caustic. In it the three main plant-foods are well proportioned, and it may generally be used freely without doing harm. Where it is readily obtained in quantities, as under the gratings of the wool-shed, it has many advantages over "artificials" that cost more.

Cow-manure has a very low chemical analysis, but organic manures cannot be correctly valued on that basis alone. The grower of cucumbers under glass would probably prefer it to any other, even including those with a higher analysis. Its mild action enables it to be used beneficially on crops which fail to respond to strong manures.

Another resource that is available to many in this country with its long coast-line is seaweed. Its analysis is equal to that of farm-yard manure—in fact, it excels the latter in potash, and is held in high esteem especially for root crops. Where carting can be arranged, this material is well worth consideration.

Such supplies of this kind as may be required should now be accumulated, so that they may be ready for ploughing in during the autumn on such areas as require heavy manuring; also for application to breaks of berry fruits during the winter.

—W. C. Hyde, Horticulturist.

THE NEW DAIRY-PRODUCE REGULATIONS.

MANUFACTURE AND EXPORT.

W. M. SINGLETON, Director of the Dairy Division.

THE old regulations under which the dairy industry has hitherto been guided, so far as export is concerned, were gazetted in 1899. Dr. J. A. Ruddick was then Dairy Commissioner for New Zealand, and was ably assisted in the drafting of the regulations by Mr. R. Evatt, then Chief Clerk of the Agriculture Department; Mr. J. D. Ritchie, then Secretary for Agriculture, also took a close part in the matter generally. Those regulations referred almost entirely to the registration of dairy factories, and to the branding and storing of dairy-produce. The drafting was well done, and the regulations, so far as they went, have, in effect, been carried forward to a considerable extent into the new Dairy-produce General Regulations gazetted on 25th November last.

During the twenty-seven years which have elapsed since the issue of the regulations of 1899 the dairy industry has expanded enormously in New Zealand. The tonnage of butter and cheese exported has increased from 7,608 tons in 1899 to 131,237 tons in 1925. The advent of the farm separator and the milking-machine; the manufacture of milk-powder, casein, milk-sugar, and whey butter; the pasteurization of cream and milk for butter and cheese making; the extension of the grading of cream, and the necessity for ensuring more exact methods of testing for butterfat at some dairy factories; the extension of cold storage for butter, and of cool storage for cheese—these, and other developments, together with the recognized need for more improved methods respecting cleanliness and sanitation at a number of milking-sheds, made it essential that a more specific guide should be issued to assist those connected with the industry.

There is really little embodied in the new regulations immediately affecting dairy companies and suppliers which is not in practice at many of our well equipped and managed dairy factories and dairy farms. From this viewpoint the issue of the regulations is mainly an official endorsement of present good practice. The principal factor which made it wise to issue these regulations at the present juncture was the necessity for some additional definitions and authorities in connection with cream-grading and the testing of milk and cream at dairy factories. The dairying community pressed the Government for legislation respecting these matters, and, having obtained that legislation, regulations were required accordingly. This being the case, together with the fact that the then existing regulations were so old and circumscribed, it was deemed advisable to review the whole position, and include the cream grading and testing for butterfat regulations with such others as would bring the general position up to the present requirements.

Hitherto the Dairy Division has relied very largely on certain provisions of the Dairy Industry Act rather than on regulations under that Act. From that point of view the regulations cannot be stronger

than the Act which they are under, and instead of being accepted as conferring further powers they should be accepted as an interpretation of certain sections of the Act.

It will be generally conceded that in its administration of the Act the Dairy Division has hitherto been moderate. Prosecutions or other arbitrary action on the part of the Division have been conspicuous by their absence. This has been due to the co-operation and good will which the Division has been accorded by those in the dairy industry. It is hoped and expected that the same spirit of co-operation, in conjunction with continued moderation on the part of the Division in administration of the new regulations, will perpetuate the good feeling which has obtained hitherto.

For further publicity and convenient record purposes it has been deemed advisable to publish in the *Journal* the full text of the new regulations (only omitting most of the various appended "forms" referred to therein) as follows:—

REGULATIONS.

Interpretation.

1. (1.) THESE regulations may be cited as "The Dairy-produce General Regulations."

(2.) For the purposes of these regulations, unless the context otherwise requires,—

"Approved" means approved by the Director in writing:

"Cream-grader" means any Cream-grader certificated in accordance with these regulations:

"Director" means the Director of the Dairy Division of the Department of Agriculture:

"Dried milk" means the substance produced when whole milk, skim-milk, butter-milk, or a mixture of cream, whole milk, skim-milk, butter-milk, sugar of milk, or any two or more of these substances, is evaporated or dried:

"Factory" used without the word "dairy" prefixed means a manufacturing dairy used or intended for the manufacturing of cheese, other than a manufacturing dairy registered as a private dairy:

"Grader" used without the word "cream" prefixed means any Dairy-produce Grader appointed under the said Act:

"Inspector" means any Inspector appointed under the said Act:

"Manufacturing dairy" includes any premises of the descriptions enumerated in subclause (1) of clause 7 of these regulations:

"Occupier" of a supplying dairy includes every person having for the time being the management or control thereof:

"Supplying dairy" means any dairy within the meaning of the said Act used in connection with the supply of milk or cream to a manufacturing dairy:

"Whey butter" means butter manufactured from whey cream:

"Whey cream" means cream extracted from whey, and includes any mixture of milk, or cream extracted from milk, with cream extracted from whey:

(3.) These regulations, with the exception of clause 31 hereof, shall not apply to a dairy, or to the butter or cheese manufactured at a dairy, of which the supply of milk and cream is derived from an average number in any month of not more than fifty cows and which is not registered under these regulations: Provided that no butter or cheese is manufactured at such dairy except butter and cheese which is produced entirely from milk or cream derived from cows on that dairy and which is not manufactured for export and is not exported: save that every such dairy in which any dairy-produce is manufactured for sale shall be deemed to be a supplying dairy for the purposes of clauses 14, 15, 16, and 17 of these regulations.

Requirements as to Use of Manufacturing Dairies.

2. Subject to the provisions of subclause (3) of clause 1 hereof, it shall not be lawful for any person to manufacture, receive or deposit for subsequent manufacture, or pack or seal into airtight packages, any dairy-produce, or to mix or blend any butter, except in accordance with these regulations and in a manufacturing dairy duly registered.

3. In particular it shall not be lawful for any person—(*a*) To manufacture butter other than whey butter except in a manufacturing dairy registered as a creamery or private dairy; (*b*) to manufacture cheese except in a manufacturing dairy registered as a factory or private dairy; (*c*) to manufacture whey butter, condensed or preserved milk, casein, dried milk, or sugar of milk except in a manufacturing dairy registered as a whey-butter factory, condensed- or preserved-milk factory, casein-factory, dried-milk factory, or sugar-of-milk factory respectively; (*d*) to pack or seal butter into airtight tins or other airtight packages except in a manufacturing dairy registered as a tinning-house; (*e*) to mix or blend butter into milled butter except in a manufacturing dairy registered as a packing-house: Except that—(i) The separation of butterfat from milk may be carried on (*a*) at any supplying dairy in respect only of the milk produced on that dairy, or (*b*) at any manufacturing dairy registered as a skimming-station; (ii) the preparation for transport to a casein-factory of the curd from milk of any kind may be carried on at a manufacturing dairy registered as a precipitating-station; (iii) milk or cream produced on any supplying dairy may be deposited on such dairy.

4. It shall not be lawful for any person—(*a*) To use a manufacturing dairy registered only as a skimming-station for subjecting dairy-produce to any other process of manufacture than the separation of butterfat from milk; (*b*) to use a manufacturing dairy registered only as a cream-receiving depot for any purpose for which a manufacturing dairy may be used other than for the receipt or deposit of cream for subsequent removal without being subjected to any process of manufacture while at such cream-receiving depot: (*c*) to use a manufacturing dairy registered only as a precipitating-station for subjecting dairy-produce to any other process of manufacture than the preparation for transport to a casein-factory of the curd from milk of any kind.

5. It shall not be lawful for the owner of any manufacturing dairy to receive cream for subsequent removal (without being subjected to any process of manufacture prior to such removal) except in a manufacturing dairy registered as a cream-receiving depot, creamery, factory, or private dairy.

6. Any person intending to build, or to make substantial structural alterations to, a dairy of any of the classes enumerated in paragraph (*a*), (*b*), (*d*), (*e*), (*f*), (*g*), (*h*), (*k*), or (*m*) of subclause (1) of clause 7 hereof shall submit a description and plan of the proposed building or alterations to the Director, and shall not commence the erection of the building or the making of the alterations until the Director has notified him in writing that the Minister has approved of the description and plan. No person erecting any such building or making any such alterations shall make any material departure from the description and plan as approved by the Minister, either before or during the erection or alteration of the building or at any later time, without previous written notice from the Director that the Minister has consented thereto.

Registration of Manufacturing Dairies.

7. (1.) Manufacturing dairies shall be registered as belonging to one or more of the following classes: (*a*) creamery; (*b*) factory; (*c*) private dairy; (*d*) whey-butter factory; (*e*) condensed- or preserved-milk factory; (*f*) casein-factory; (*g*) dried-milk factory; (*h*) sugar-of-milk factory; (*i*) tinning-house; (*j*) packing-house; (*k*) skimming-station; (*l*) cream-receiving depot; (*m*) precipitating-station.

(2.) The same premises may be registered as belonging to more than one of the foregoing classes. Where premises are registered as belonging to more than one class a separate certificate shall be issued in respect of each registration.

8. (1.) No premises shall be registered as a creamery unless, in the opinion and to the satisfaction of the Director, they—(*a*) Are equipped with all the necessary appliances for the manufacturing of butter and for completely controlling the temperature of the produce at each stage of the process; and (*b*) are provided with good drainage and an efficient water-supply.

(2.) No premises shall be registered as a factory unless, in the opinion and to the satisfaction of the Director, they—(*a*) Are equipped with all the necessary appliances for the manufacturing of cheese on the factory system; (*b*) include curing-room accommodation and suitable shelving for at least fourteen days' make of cheese; and (*c*) are provided with good drainage and an efficient water-supply.

(3.) No premises shall be registered as a whey-butter factory unless they are, in the opinion and to the satisfaction of the Director, equipped with machinery for completely controlling temperatures.

(4.) No premises shall be registered as a manufacturing dairy of any class unless, in the opinion and to the satisfaction of the Director, they are sanitary, and in all other respects reasonably suitable for use as a manufacturing dairy of the class in which registration is desired.

(5.) Premises for the manufacture of butter or cheese which are not sufficiently equipped with appliances, drainage, and water-supply to warrant their registration as a creamery or factory may be registered as a private dairy.

9. (1.) The owner of any premises who desires to have them registered as a manufacturing dairy under these regulations shall make application in writing to the Director, in or to the effect of form No. 1 in the Schedule hereto, and shall in such application specify the class or classes of manufacturing dairy to which it is desired that the premises shall be registered as belonging, and shall give particulars of the proposed brand which he wishes to be registered for use on dairy-produce manufactured in the said premises.

(2.) Upon being satisfied that the statements in the application are true and that all the requirements of these regulations are complied with in respect of such premises and brand, the Director shall register the premises as a manufacturing dairy of the class or classes specified in the application, and with a distinctive number, and shall register the brand, and shall issue to the owner a certificate or certificates of registration in the form No. 2 in the Schedule hereto.

(3.) In every case registration of premises shall be deemed to be registration thereof as a manufacturing dairy only of the class or classes specified in the application for registration.

10. (1.) The Director may decline any application for registration on the ground that the proposed brand is identical with any existing brand, or resembles any existing brand so nearly as to cause risk of confusion, or is for any other reason undesirable for use as a brand for dairy-produce.

(2.) On the application in writing of the owner and with the approval of the Director the registration of any brand may be revoked and another brand registered in lieu thereof, and the Director shall thereupon make the necessary alterations in the certificate of registration and in the register.

(3.) On the registration of any premises where the manufacture of butter or cheese is not carried on the Director may, in his discretion, dispense with the registration of a brand.

11. (1.) The Director shall cause a register to be kept of every certificate of registration of any premises and brand from time to time in force, and every cancellation of a certificate shall at once be recorded in the register.

(2.) A copy certified by the Director of any entry in the register shall be *prima facie* evidence of such entry and of the facts appearing therein, and a certificate under the hand of the Director of the absence of an entry in the register shall be *prima facie* evidence of the facts stated in such certificate.

(3.) Every certificate of registration shall continue in force until cancelled under the provisions in that behalf hereinafter contained.

(4.) A certificate of registration issued under any regulations heretofore in force shall enure as if it were a certificate issued hereunder of registration as a manufacturing dairy of such class or classes as, having regard to the purport of such certificate, the Director may decide.

12. (1.) So long as the certificate continues in force, but no longer, the dairy named therein shall be deemed to be a registered manufacturing dairy of the class specified in the certificate, and the owner named therein shall be deemed to be the registered owner of the dairy.

(2.) In the event of the registered owner ceasing to be the owner of the dairy the Director, upon being satisfied as to the facts, may write on the certificate the words "Transferred to [*Full name and address of the new owner*], and transfer recorded, this day of , 19 ," and sign such writing, and shall thereupon record the transfer in his register accordingly, whereupon the new owner shall be deemed to be the registered owner.

13. The certificate may be cancelled by the Director in any of the following events: (*a*) If the registered owner so requests; or (*b*) if the Director is satisfied that the owner has not used his registered premises and brand for a period of not less than six months immediately preceding; or (*c*) if during any period of twelve months the owner has been at least thrice convicted of any offence or offences under the said Act or any regulations made thereunder; or (*d*) if the owner fails or neglects to remedy within the time specified in the notice any defect in the sanitary condition in or about the dairy or its appliances when required by an Inspector so to do by notice in the form No. 3 in the Schedule hereto.

Milking-machines.

14. The owner and occupier of every supplying dairy shall, with respect to every milking-machine used in such supplying dairy, comply with the following provisions; provided that nothing in this clause shall be held to make compulsory the installation of a vacuum-tank or releaser: (*a.*) The releaser and vacuum-tank shall be either in the open air or in an apartment (hereinafter called the releaser-room) other than that used for milking (hereinafter called the milking-shed), and if the releaser-room is under the same roof as the milking-shed there shall be between the releaser-room and the milking-shed a complete and draught-proof partition, or, in the alternative, a passage walled on both sides throughout the width and height of the releaser-room, open to the outer air at both ends, and not less than two feet wide throughout. (*b.*) No internal-combustion or steam engine shall be in the same room as the releaser or cream-separator. (*c.*) An adequate water-supply, and a suitable plant for the boiling of sufficient water for thoroughly cleaning the milking-machine and its appurtenances, shall be installed and maintained near the machine. (*d.*) The body of the vacuum-tank shall be in two parts, or, in the alternative, the diameter of the cover shall be as nearly as possible equal to that of the tank. (*e.*) The releaser and vacuum-rank shall be coupled together by short removable connections. (*f.*) The connections to the vacuum-tank, from the vacuum-pump, releaser, and milking-shed vacuum-pipe respectively, shall be as straight as possible, and, if it is reasonably practicable, shall be independent of each other. (*g.*) The milk-pipe shall be of brass, tinned on the inside, and no iron piping, whether galvanized or not, shall be used in the vacuum or releaser system. (*h.*) The vacuum-pump, vacuum-tank, and releaser shall be so installed and maintained that all lines of pipes shall be as straight as possible. (*i.*) The milk-pipe and vacuum-pipes shall have a sufficient fall, which shall be provided and maintained so as to be as regular as possible, for the purpose of proper drainage.

Care of Milk and Cream.

15. (1.) All separation of cream from milk at any manufacturing dairy or at any supplying dairy shall be done in a room that is well lighted and ventilated, and provided with a substantial floor and drain, both made of concrete or other material impervious to moisture and having a smooth surface capable of being readily cleansed.

(2.) In every supplying dairy in which the separator-room or milk-collecting room is under the same roof with an engine-room there shall be a passage, walled on both sides throughout the width and height of the separator-room or milk-collecting room, open to the outer air at both ends, and not less than two feet wide throughout, between the engine-room and the separator-room or milk-collecting room.

(3.) The owner of every manufacturing dairy shall comply with the requirements of this clause so far as they relate to manufacturing dairies, and the owner and occupier of every supplying dairy shall comply with the requirements of this clause so far as they relate to supplying dairies.

16. (1.) Milk intended for delivery to a manufacturing dairy shall, immediately after milking, be removed from the milking-shed or stockyard, and once at least carefully strained through some apparatus sufficient for the purpose, and then cooled to a temperature of not more than 65 degrees Fahrenheit by being run over a water cooler or by setting the containers in cold water.

(2.) Cream intended for delivery to a manufacturing dairy shall, immediately after having been separated, be cooled to a temperature of not more than 65 degrees Fahrenheit by being run over a water cooler or by setting the containers in cold water.

(3.) The occupier of every supplying dairy shall comply with the requirements of the preceding subclauses of this clause in respect of all such milk and cream produced on the supplying dairy of which he is the occupier.

(4.) (*a.*) All cream intended for delivery to a manufacturing dairy shall from the time when it is separated to the time when it is deposited in such manufacturing dairy be at all times adequately protected from the sun. (*b.*) The occupier of every supplying dairy shall comply with the requirements of this subclause until the delivery of such cream to the owner of the manufacturing dairy or to some person on his behalf. (*c.*) The owner of every manufacturing dairy shall comply with the requirements of this subclause from the time of receipt of such cream by such owner or by any person on his behalf. (*d.*) Every person for the time being having the actual possession or custody of any such cream shall comply with the requirements of this subclause during the period of such possession or custody: Provided always that the liability imposed by this paragraph is without prejudice to the liability of any other person under paragraph (*b*) or paragraph (*c*) of this subclause.

Disinfectants on Teats and Utensils.

17. No occupier of any supplying dairy shall use or allow to be used on the teats of cows in milk or on dairy utensils any poisonous or markedly odorous disinfectants such as coal-tar derivatives.

(To be continued.)

FORTHCOMING AGRICULTURAL SHOWS.

Horowhenua A. and P. Association: Levin, 25th and 26th January, 1927.
Rangitikei A. and P. Association: Taihape, 26th and 27th January.
Helensville A. and P. Association: Helensville, 29th January.
Golden Bay A. and P. Association: Motupipi, 1st February.
Feilding A. and P. Association: Feilding, 1st and 2nd February.
Woodville A. and P. Association: Woodville, 4th and 5th February.
Omaha and Pakiri A. and H. Association: Leigh, 5th February.
Kawakawa A. and P. Association: Kawakawa, 5th February.
Clevedon A. and P. Association: Clevedon, 5th February.
Te Puke A. and P. Association: Te Puke, 9th February.
Dannevirke A. and P. Association: Dannevirke, 9th, 10th, and 11th February.
Pahiatua A. and P. Association: Pahiatua, 12th February.
Rodney Agricultural Society: Warkworth, 12th February.
Masterton A. and P. Association; Solway, 15th and 16th February.
Whakatane A. and P. Association: Whakatane, 16th February.
Te Awamutu A., P., and H. Association: Te Awamutu, 16th February.
Buller A. and P. Association: Westport, 18th and 19th February.
Marton A. and P. Association: Marton, 23rd February.
North Kaipara Agricultural Association: Paparoa, 25th February.
Franklin A. and P. Association: Pukekohe, 25th and 26th February.
Waikato Central Agricultural Association: Cambridge, 2nd and 3rd March
Mongonui County A. and P. Association: Kaitaia, 5th March.
Opotiki A. and P. Association: Opotiki, 8th March.
Morrinsville A., P., and H. Society: Morrinsville, 9th March.
Amuri A. and P. Association: Waiau, 9th March.
Taranaki Metropolitan Agricultural Society: New Plymouth, 9th March.
King country Central A. and P. Association: Te Kuiti, 10th March.
Mayfield A. and P. Association: Mayfield, 19th March.
Rotorua A. and P. Association: Rotorua, 23rd March.
Methven A. and P. Association: Methven, 25th March.
Temuka A. and P. Association: Geraldine, 7th April.
Mackenzie County A. and P. Society: Fairlie, 18th April.

Association secretaries are invited to supply dates and location of their shows for publication in this list.

EXPORT OF APPLES AND PEARS, 1927 SEASON.

1. CONDITIONS OF GOVERNMENT GUARANTEE.

CONDITIONS for the Government guarantee on shipments of apples and pears made from New Zealand during the 1927 export season are as follows:—

1. The guarantee shall be limited to approved varieties and classes of apples and pears packed in compliance with the requirements of "Extra Fancy" and "Fancy" grades.

2. The Government guarantees to the grower a gross market price of 11s. 6d. per case on all cases of such apples and pears exported by him in accordance with the conditions set out herein. (With respect to South American markets the gross price shall be considered to be the c.i.f. price, plus 1s. 6d. per case selling-charges.)

3. The guarantee shall be limited to apples and pears grown and shipped (otherwise than under an f.o.b. contract) by *bona fide* fruitgrowers or fruitgrowers' co-operative societies, through the New Zealand Fruit-export Control Board or other channels approved by the Minister of Agriculture.

4. Any grower who exports any portion of his fruit crop outside the guarantee shall be deemed to have forfeited his right to participate in the guarantee with respect to all fruit exported during the season by him or on his behalf, save that any grower, if he so desires, may ship the whole of his pears outside the guarantee without prejudice to his apple shipments under the guarantee, and *vice versa*.

5. All apples and pears to qualify for the guarantee must be passed by an Inspector of the Department, and must be packed in accordance with the Export Regulations, subject to the modifications and directions set out in the appended statement entitled "Export Regulations."

6. Payment of claims under the guarantee shall be calculated on the basis of the average gross price per case received by the claimant for the whole of the apples and pears approved under the guarantee and exported on his account during the season to all markets, and only the deficiency between the average gross price realized for such fruit and 11s. 6d. shall be payable under the guarantee.

7. Where, however, apples or pears of more than one variety and supplied by more than one grower are exported by a joint packing company or group in its own name, the guarantee shall be calculated separately in respect of the whole of the fruit supplied for export by each grower, on the basis of the pool price received for each variety supplied by him; provided that the joint packing company or group shall have, not later than seven days after the fruit has been shipped from New Zealand, notified to the Director of the Horticulture Division full particulars of each grower's fruit included in each shipment.

8. The Government reserves to itself the right (*a*) to withhold the guarantee from any grower who, in the opinion of the Director of the Horticulture Division, is not satisfactorily grading out, and exporting separately, his "Extra Fancy" and "Fancy" grade fruits; (*b*) to withhold from any grower the guarantee with respect to any variety of "Fancy" grade fruit in the event of the Director of the Horticulture Division being satisfied that such grower is not shipping a reasonable proportion of his "Extra Fancy" grade fruit of that variety; (*c*) to withhold the guarantee from any grower who sells, except for consumption within New Zealand, any portion of his fruit crop without the approval of the Director of the Horticulture Division; (*d*) to limit the quantity of fruit shipped to any particular port should freight rates or market conditions, &c., be deemed unsatisfactory; (*e*) to insist on fruit being precooled prior to shipment if deemed necessary; (*f*) to withhold the privileges of the guarantee from all fruit shipped in vessels the storage facilities of which are held by the Department to be unsatisfactory; (*g*) to withhold the privileges of the guarantee with respect to any market in connection with which the New Zealand Fruit-export Control Board is of the opinion that satisfactory f.o.b. or c.i.f. trade is or can be established; (*h*) to withhold the guarantee with respect to any fruit packed contrary to such instructions as may be issued by the Department of Agriculture, after discussion with the accredited representative

of the Fruit Control Board and the shipping agents of the fruitgrowers concerned, calling for a cessation of packing during any specified period, owing to the lack of shipping facilities or other causes.

9. The Government reserves the right to re-examine and to withdraw any fruit from export in the event of such re-examination indicating that by reason of over-maturity or other cause inimical to the keeping-qualities of the fruit it would be inadvisable to allow such fruit to be exported. All fruit so withdrawn may be disposed of in New Zealand by the owner without reference to the guarantee, or by the Government on behalf of the owner. In the latter event the proceeds will be credited to the owner, and the transaction dealt with generally as though the fruit had been actually exported under the guarantee. But should such re-examination reveal the fact that any line of fruit, through careless or faulty packing, is decidedly below the standard required, it will be deemed not to be covered by the guarantee, and the owner of such fruit may, at the option of the Minister, be held to have forfeited all right to participate in the guarantee for the remainder of the season.

(N.B.—No apples or pears carrying more than one hundredth part of a grain of arsenic per pound shall be approved for export under the guarantee or otherwise.)

2. EXPORT REGULATIONS.

The following regulations shall apply to all fruit—apples and/or pears, as the case may be—intended for export under the Government guarantee, 1927:—

APPLE GRADES AND VARIETIES.

The standard grades shall be as follows:—

"*Extra Fancy*" *Grade.*—Apples of this grade shall be mature, sound, smooth, clean, well formed, hand-picked, true to name, and free from disease, visible bitter-pit, skin-puncture, or skin broken at stem, and other defects. Slightly blemished apples may be included in this grade provided that no individual apple shall have more than 5 per cent. of its surface affected thereby. Apples affected by unnatural russet may also be included in this grade provided that no individual apple shall have more than 5 per cent. of its surface affected thereby. The individual apples of solid red, partial red, and striped varieties shall carry not less than 65 per cent., 40 per cent., and 25 per cent. respectively of good typical colour. The individual apples of yellow or green varieties shall be of good characteristic colour.

"*Fancy*" *Grade.*—Apples of this grade shall be mature, sound, smooth, clean, well formed, hand-picked, true to name, and free from disease, visible bitter-pit, skin-puncture, or skin broken at stem, and other defects. Slightly blemished apples may be included in this grade provided that no individual apple shall have more than 5 per cent. of its surface affected thereby. Apples affected by unnatural russet may also be included in this grade provided that no individual apple shall have more than 10 per cent. of its surface affected thereby. The individual apples of solid red, partial red, and striped varieties shall carry not less than 30 per cent., 15 per cent., and 10 per cent. respectively of good typical colour. The individual apples of yellow or green varieties shall be of good characteristic colour.

The principal requirements of the above grades are as set out below:—

Grade.	Colour.				Maximum Defects.
	Solid Red.	Partial Red.	Striped.	Yellow or Green.	
	Per Cent.	Per Cent.	Per Cent.		
Extra Fancy	65	40	25	Good characteristic colour	5 per cent. blemish; 5 per cent. unnatural russet.
Fancy ..	30	15	10	Good characteristic colour	5 per cent. blemish; 10 per cent. unnatural russet.

The standing of the New Zealand apple trade in England has been detrimentally affected by the large number of varieties shipped each season, many of which represent a few cases only, whilst others are not at all suitable for the market. All those that have been shipped in small quantities, unless specially favoured, will not be again accepted, and therefore do not appear on this season's export list. These include Allington Pippin, Baldwin, Blenheim Orange, Cambridge Pippin, Commerce, Crofton, Duke of Clarence, Golden Russet, Horn, John Sharp, Sharp's Late Red, and Wagner.

Apart from these the list still includes a number of more or less unsuitable varieties, such as Alfriston, Boston Russet, Brownlee's Russet, Golden Pippin, Hoover, London Pippin, Parlin's Beauty, Salome, Shepherd's Perfection, Edward Lippiatt, Pioneer, Premier, Ribston Pippin, Scarlet Pearmain, Stark.

Orchardists who are growing these varieties are strongly advised to work them over with more suitable kinds as early as possible, and in this connection are requested to note that year by year this list will be referred to and notice given that a certain number of the varieties named will not be approved for export after a stated period. In pursuance of this intention notice is now given that those varieties marked * will not be accepted for export after the season of 1929.

APPROVED FOR EXPORT TO EUROPE.

Max. Size.	Variety.	Min. Size.	Max. Size.	Variety.	Min. Size.
	Solid Red Varieties.				
100	Hoover	216	113	Rokewood	216
113	McIntosh Red ..	216	100	Tasma	216
	Partial Red Varieties.				
113	Brighton	216	113	Scarlet Nonpareil ..	234
113	Delicious	216	113	Scarlet Pearmain* ..	216
113	Dougherty	216	113	Shepherd's Perfection..	216
113	Edward Lippiatt* ..	216	113	Shorland Queen ..	216
113	Frimley Beauty ..	216	100	Spitzenberg	216
113	Jonathan	234	113	Stark*	216
113	King David	234	113	Worcester Pearmain ..	216
100	Rome Beauty ..	216	113	Yates	234
113	Salome	216			
	Striped Varieties.				
113	Adams Pearmain ..	216	113	Senator	216
125	Cox's Orange ..	234	113	Simmonds Winter ..	216
100	Premier*	216	113	Statesman	216
125	Ribston Pippin* ..	216	113	Stayman Winesap ..	216
	Yellow or Green Varieties.				
100	Alfriston	198	113	Gravenstein	216
100	Ballarat	180	100	London Pippin ..	198
100	Boston Russet ..	216	100	Lord Wolseley ..	198
113	Brownlee's Russet ..	216	113	McMahon's White ..	216
113	Celo	216	113	Newtown Pippin ..	216
113	Cleopatra	234	100	Parlin's Beauty ..	198
100	Dunn's	198	113	Pioneer*	216
113	Golden Pippin ..	216	113	Sturmer	234
113	Grannie Smith ..	234	113	Willie Sharp.. ..	198

APPROVED FOR EXPORT TO SOUTH AMERICA.

"Extra Fancy" grade apples only shall be approved for these markets.

Max. Size.	Variety.	Min. Size.	Max. Size.	Variety.	Min. Size.
	Solid Red Varieties.				
96	Rokewood	125	72	Tasma	125
	Partial Red Varieties.				
72	Delicious	125	88	Salome	125
80	Dougherty	125	88	Scarlet Nonpareil ..	125
96	Jonathan	125	96	Shorland Queen ..	125
96	King David	125	90	Spitzenberg	125
72	Rome Beauty ..	125	96	Stark*	125
	Striped Varieties.				
80	Premier*	125	80	Stayman Winesap ..	125
96	Statesman	125			
	Yellow or Green Varieties.				
96	Cleopatra	125	72	Dunn's	125

(N.B.—The aforementioned maximum and minimum sizes refer to Canadian case packs; but, as this case when packed with the necessary bulge ($\frac{3}{4}$ in. top and bottom) holds more apples of any given size than the normally packed New Zealand standard case, the maximum and minimum number of apples in reference to the latter case shall be the next lower packing count, as shown on the New Zealand standard-case packing-chart, to those set out above as the maximum and minimum sizes of each variety.)

REGISTERED EXPORT NUMBER.

The registered number issued to all growers under the Local-market Regulations will be declared to be the grower's registered export number also. The registered number of each grower must be branded on each case of fruit exported by him; provided that in the event of any group of growers pooling their fruit for export such group may designate its fruit by using any pool number allotted by the New Zealand Fruit-export Control Board. Likewise any packing organization to which a registered number has been allotted may use such registered number only, provided that in either instance each individual grower's fruit is shown separately on the advice-note for examination, and stacked in separate lots, so that the Inspector may have no difficulty in identifying the particular lot under examination.

Should unavoidable circumstances prevent the adoption of this procedure, resulting in a line comprising a large number of cases being submitted as one line, it must be definitely understood that the examination of same will be solely at the grower's risk, and in the event of any fruit forming a portion of the line being found to be unsatisfactory the whole line will be liable to rejection.

PACKING.

Plain or corrugated strawboard or wood-wool shall be used on top and bottom of cases.

WRAPPING-PAPER.

Apples of the various sizes as set out below shall be wrapped in paper of the size indicated opposite each respectively:—

Sizes 64's to 80's (both inclusive), paper 11 in. by 11 in.
Sizes 88's to 113's (both inclusive), paper 10 in. by 10 in.
Sizes 125's to 198's (both inclusive), paper 9 in. by 9 in.
Sizes 216's to 234's (both inclusive), paper 8 in. by 8 in.

In the event of the size of the paper used being smaller than that specified above for any respective size of apples, such apples shall be double-wrapped by overlapping two papers.

SPECIFICATION OF EXPORT CASE.

CANADIAN STANDARD.

Inside measurements: 10½ in. by 11½ in. by 18 in.

Ends: 10½ in. by 11½ in. by ¾ in., two pieces (each planed on the outer side).

Sides: 10 in. by 19½ in. by 5/16 in., two pieces (one board for each side).

Tops and bottoms: 5½ in. by 19½ in. by 3/16 in., four pieces (two each for top and bottom).

Cleats: 11½ in. by ¾ in. by 5/16 in., four pieces (one across each end both top and bottom).

The Canadian standard case has been substituted for the New Zealand standard case for export purposes, but any grower having timber on hand of the New Zealand standard measurements may use cases constructed of such timber for the 1927 season only. Apart from this provision the specifications of the Canadian export case shall be strictly adhered to.

Local timber recommended for the construction of export cases is white-pine of good quality; but *Pinus insignis*, rimu, and beech timber, if well and evenly cut and used, with flexible white-pine tops and bottoms, will be accepted.

Nailing: Nails used to be not less than 1½ in. long, 14 gauge. Nails to be spaced not more than 3 in. apart, and the outer nails of each board to be not more than 1 in. from the edge of board.

Strapping: All cases to be strapped with a wire or steel band; such strapping to be tightly applied, and to be not more than 1 in. from end of case.

LABELLING AND MARKING.

Each end of each case of fruit intended for export must bear a coloured label of one or other of the designs adopted by the New Zealand Fruit-export Control Board for the purpose of designating "Extra Fancy" and "Fancy" grades.

The marking of cases shall be in accordance with the previous season's requirements.

PEARS.

Varieties approved for export to Europe:—

Max. Size.	Variety.	Min. Size.	Max. Size.	Variety.	Min. Size.
In.		In.	In.		In.
2¾	Josephine de Malines ..	2¼	2¾	Winter Cole	2¼
2¾	P. Barry	2¼	2¾	Winter Nelis	2¼
2¾	Packham's Triumph ..	2¼			

PEAR PACKAGES.

Pears for export shall be packed in wooden trays having an inside measurement of 11½ in. by 18 in., with depth from 2½ in. to 3 in. Each tray to be complete with lid and label. Three trays to be securely wired together, forming one package. Binding-wires to be placed within 1 in. of each end of the package.

In the construction of trays on the basis of sets of three to the package the following is recommended: Bottom of bottom tray and top of top tray to be of two pieces, each 5½ in. by 5/16 in. Tops and bottoms in all other instances to be of two pieces, each 5½ in. by 3/16 in. Middle tray to have cleats across each end both top and bottom, thus requiring four cleats, ¾ in. by 5/16 in. by 11½ in. Constructed in this way any bulge that takes place is inward, owing to the timber being lighter than the outer tops and bottoms. At the same time any such bulge is protected by the cleats, which also keep the trays apart, thus allowing for free ventilation.

Specification of Trays in Sets of Three.

Ends: 11½ in. by 3 in. (or 2½ in.) by ¾ in., six pieces.
Sides: 19½ in. by 2½ in. by 5/16 in., six pieces.
Tops and bottoms: 19½ in. by 5½ in. by 5/16 in., four pieces.
Tops and bottoms: 19½ in. by 5½ in. by 3/16 in., eight pieces.
Cleats: 11½ in. by ¾ in. by 5/16 in., four pieces.

Labels for Trays.

Special labels for use on pear-trays have been prepared, and will be procurable from the New Zealand Fruitgrowers' Federation.

MINIMUM CONSIGNMENT.

Twenty cases of any one variety of either apples or pears shall be the minimum consignment accepted for export.

INVENTIONS OF AGRICULTURAL INTEREST.

APPLICATIONS for patents, published with abridged specifications in the *New Zealand Patent Office Journal* from 18th November to 16th December, include the following of agricultural interest:—

No. 57366: Cream-cooler; E. D. Berry, Palmerston North. No. 57337: Cattle-food-mixing machine; A. J. Palmer, Palmerston North. No. 54627: Cultivator; G. P. Potter, Powranna, Tasmania. No. 54631: Cream and cheese scale; McMillan and Frederic, Ltd., Stratford. No. 57098: Teat-cup; J. H. Bishop and C. W. Nearber, Morrinsville. No. 57312: Steel fence-post; Rylands Bros., Ltd., Newcastle, N.S.W. No. 55153: Mole drain-plough; H. R. Jensen, Whakaronga. No. 56325: Flax-dressing machine; W. R. Aicken, Martinborough. No. 57424: Fence-dropper; S. E. Page, 27 Chancery Lane, London W.C. 2, England. No. 57489: Tractor loading-attachment; H. F. Lessmann, Des Moines, U.S.A.

Copy of full specifications and drawings in respect of any of the above may be obtained from the Registrar of Patents, Wellington, price 1s. All fees must be paid in advance in cash, or paid to the Public Account at a branch of the Bank of New Zealand and the bank receipt sent to the Patent Office; or fees may be remitted by Post Office order or postal note.

CLASSIFICATION OF CATTLE IN NEW ZEALAND.

FOLLOWING are particulars of cattle in the Dominion (including boroughs) for the last two years' enumeration, as compiled by the Census and Statistics Office:—

—	Number on 31st Jan., 1925.	Number on 31st Jan., 1926.
Bulls two years old and over, for stud—		
For beef purposes	12,679	12,908
For dairy purposes	47,141	45,945
Steers two years old and over*	405,768	394,547
Steers and bulls one and under two years old	189,801	169,249
Cows and heifers two years old and over, for dairying—		
In milk	1,178,504	1,181,441
Dry	124,625	122,415
Other cows and heifers two years old and over	518,284	535,273
Heifers one and under two years old	441,510	401,013
Calves (heifer, steer, and bull) under one year old	552,164	589,695
In boroughs, &c.	33,268	†
Totals	3,503,744	3,452,486

* Including bulls not kept for stud purposes. † Included in classified figures above.

WEATHER RECORDS: DECEMBER AND CALENDAR YEAR 1926.

Dominion Meteorological Office.

GENERAL SUMMARY FOR DECEMBER.

RAINFALL during December was above the average over most parts of the Dominion, but strikingly deficient in other districts. The falls were excessive at times in many localities. Thus, while Auckland and other places near had two and a half times their usual fall, Hamilton had less than the usual average for December. The same striking contrast is seen in comparing the total quantities in Poverty Bay and Hawke's Bay, Gisborne having two and a half times its usual average and Napier 60 per cent. above the usual, while other places inland had less than the average. Again, Dunedin had double its usual average quantity, while Invercargill had about half. Rainfall was below the average on the west coast of the South Island and in some parts of the North Island.

Southerly winds and cold changeable conditions prevailed during the first week of the month, owing to the passage of a storm eastward of New Zealand. A barometric pressure of 28·97 in. was reported from the Chatham Islands on the morning of the 3rd, while barometric pressure in New Zealand averaged ¾ in. higher. On the 11th a westerly disturbance passed in the South, and accounted for strong north-west winds. Another westerly disturbance passed in the South on the 20th, and two disturbances were in evidence about Christmastide, one in the North accounting for very heavy downpours. These two disturbances neutralized each other, however, so far as wind was concerned, but together accounted for mild, dull, and wet weather generally.

Conditions were backward on the whole, and haymaking was greatly interfered with in many parts of the country.

RAINFALL FOR DECEMBER AND CALENDAR YEAR 1926 AT REPRESENTATIVE STATIONS.

Station.	December.				Calendar Year.	
	Total Fall.	Number of Wet Days.	Maximum Fall.	Average December Rainfall.	Total Rainfall, 1926.	Average Rainfall.
North Island.						
	Inches.		Inches.	Inches.	Inches.	Inches.
Kataia	1·28	7	0·62	3·28	58·97	50·87
Russell	3·52	8	1·98	2·05	65·22	49·79
Whangarei	3·16	8	0·70	2·49	76·15	60·24
Auckland	6·39	16	2·31	2·84	63·55	44·18
Hamilton	2·87	16	0·64	3·72	58·74	50·36
Kawhia	3·24	12	0·80	3·21	63·92	52·70
New Plymouth ..	4·14	14	1·10	4·33	67·84	60·18
Riversdale, Inglewood ..	7·03	23	1·70	7·43	116·06	104·48
Whangamomona ..	5·73	12	1·43	5·98	91·05	79·50
Tairua	10·86	8	1·44	4·30	74·05	65·82
Tauranga	6·89	13	1·85	3·47	58·14	53·10
Maraehako Station, Opotiki	2·76	14	0·46	2·82	50·84	50·77
Gisborne	5·88	17	1·56	2·16	34·79	46·94
Taupo	1·43	7	0·50	3·66	45·53	45·20
Napier	3·46	13	1·28	2·30	20·89	36·41
Maraekakaho Station, Hastings	5·45	16	1·81	2·21	25·01	34·81
Taihape	2·38	12	0·65	3·42	40·54	40·01
Masterton	4·02	17	0·95	2·80	38·61	38·71
Patea	5·69	11	1·40	3·35	54·62	44·05
Wanganui	2·81	11	0·73	2·63	42·12	36·86
Foxton	3·10	5	1·50	2·54	43·84	31·88
Wellington	3·79	12	0·91	3·29	42·38	48·21

RAINFALL FOR DECEMBER AND CALENDAR YEAR 1926—*continued.*

Station.	December.				Calendar Year.	
	Total Fall.	Number of Wet Days.	Maximum Fall.	Average December Rainfall.	Total Rainfall, 1926.	Average Rainfall.
	South Island.					
	Inches.		Inches.	Inches.	Inches.	Inches.
Westport	5·10	16	1·56	6·60	67·51	78·27
Greymouth	5·61	14	1·15	8·95	89·12	104·13
Hokitika	7·56	13	2·15	10·70	118·72	116·59
Ross	8·44	11	2·51	12·04	140·26	136·86
Arthur's Pass	16·22	13	4·10	12·02	205·16	156·61
Okuru	12·53	12	4·14	11·73	150·37	148·32
Collingwood	12·56	14	3·52	8·01	110·47	99·81
Nelson	4·10	11	1·20	2·69	36·96	37·84
Spring Creek	4·80	13	1·53	1·93	34·22	30·31
Tophouse	6·65	14	2·02	5·00	70·25	60·78
Hanmer Springs ..	3·54	16	0·75	3·26	44·30	40·82
Highfield, Waiau ..	2·65	11	0·48	2·51	28·80	33·38
Gore Bay	3·47	13	0·65	2·12	24·12	31·63
Christchurch	3·55	12	1·39	2·06	23·84	25·30
Timaru	4·02	11	1·30	2·41	23·70	22·78
Lambrook Station, Fairlie	4·13	12	1·41	2·33	26·41	25·09
Benmore Station, Clearburn	2·02	11	0·64	1·77	30·34	24·15
Oamaru	4·69	11	1·62	2·15	29·46	21·82
Queenstown	2·31	10	0·76	2·55	33·67	30·53
Clyde	1·84	10	0·50	1·79	17·72	15·23
Dunedin	7·08	16	1·41	3·48	44·93	36·96
Wendon	2·35	9	0·88	2·95	32·89	30·57
Gore	2·33	13	0·51	3·41	34·42	35·17
Invercargill	2·16	14	0·52	4·26	47·24	45·98
Puysegur Point ..	6·72	14	1·36	6·63	95·90	83·61

—*D. C. Bates, Director.*

Commercial Poultry-farming.—The Chief Poultry Instructor remarks as follows in his annual report for 1925–26: "A gratifying feature at the present time in connection with the industry is the increasing number of large plants established throughout the country, and which are proving profitable undertakings to their owners. A few years ago large commercial plants were few and far between. Now there are many, ranging from 600 to 1,000 bird-capacity, while in some cases plants are carrying upwards of 3,000 laying-birds. The advance made in this connection is almost entirely due to the improved type of laying-bird now available, and the advanced knowledge relative to the breeding, housing, feeding, and general management of poultry."

Grass-grub and Tree Nurseries.—Damage by the grass-grub again occurred in South Island nurseries of the State Forest Service during the 1925–26 season, and efforts were made to prevent attacks and protect tree crops. Experiments were carried out with the aim of arresting the flights of beetles in the vicinity of seedling crops and thus preventing egg-deposition on the area. Screens of plain calico provided with a drowning-trough along the base and of calico covered with an adhesive mixture were placed as barricades to the prevailing direction of flight adjoining badly affected grassland. Negative results, however, were obtained.

Cereals respond well to superphosphate. Root crops require mixtures of slow and rapidly acting phosphate. Green forage crops are benefited by nitrogenous fertilizers in addition to phosphate.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

GREASY HEEL IN HORSES.

"SUBSCRIBER," Ashburton :—

I have a draught gelding with greasy heels, all four legs being affected. The heels have broken out in open sores and there is some discharge. The animal has also gone lame. I have clipped the hair short, and am bathing daily with a strong disinfectant solution. Is this correct? If not, kindly advise me as to treatment. Also, is the trouble infectious?

The Live-stock Division :—

In regard to the treatment you describe, there is a possibility that you are using too strong a solution, and the treatment indicated below would be advisable. In this connection it is well to know that except in very slight cases a cure is extremely difficult to effect. But even if the animal is badly affected the treatment suggested will have the effect of keeping the trouble in check and lessening the objectionable condition. As the disease is primarily constitutional, internal as well as external treatment is necessary. It is therefore advisable to give an occasional dose of physic, such as an aloes ball in a dose of from 4 to 6 drachms, according to the size of the horse. Suitable external treatment is to clip all the hair from the heels and fetlocks and liberally apply the following dressing once daily to affected parts: Zinc sulphate, 2 oz.; Bol Armen, 1½ oz. To this should be added a quart of water, and the mixture well shaken before use. Any chemist will supply this. Care must be taken to keep the horse as much as possible out of wet places, and if the animal is standing in a stable it is essential to keep the floor clean and free from urine and dung. As already stated, the disease is primarily constitutional, and therefore if other animals in the same stable are kept properly groomed and clean there is little likelihood of their becoming affected unless predisposed towards the trouble.

TREATMENT FOR KING-COUNTRY LAND.

J. K. C. BAINES, Feilding :—

On my farm at Piopio, King-country, the grass has begun to show signs of exhaustion. I top-dress annually with basic slag, but the response is very weak. Could you advise me as to what manures are best suited for this light land, and the quantity to use to obtain the best results? I have recently ploughed up 50 acres with the intention of grassing down afresh. Would you kindly specify a good mixture to use, and inform me whether turnips or rape would be best sown first?

The Fields Division :—

Generally speaking, super gives better results on light porous soils than does slag, and for general purposes we would recommend you to use a mixture of two parts super and one part carbonate of lime, at the rate of 4 cwt. per acre. Super alone does well, but you would probably get rather better results with a little lime added. Alternatively, you could apply ½ ton of lime every six or seven years and use super annually. Autumn application is usually best, as it promotes early spring growth. Before resowing the land to grass it would be good practice to take one crop of swedes, then rape, working the surface lightly when the rape is fed off preparatory to sowing grass. Sheep could be used to tread in the seed, as these soils are badly in need of consolidation. If a little bonedust or blood-and-bone were used in the rape-manure it would help the young grass considerably. A suitable mixture for permanent pasture for sheep with a few cattle would be as follows: Italian rye-grass, 3 lb.; perennial rye-grass, 10 lb.; cocksfoot (Akaroa), 12 lb.; crested dogstail, 3 lb.; timothy, 1 lb.; Danthonia pilosa, 1 lb.; cow-grass (colonial), 2½ lb.; white clover (colonial), 1½ lb.; subterranean clover, ¼ lb.;

Lotus major (colonial), ½ lb.: total, 34½ lb. per acre; approximate cost per acre, £1 17s. cash. With judicious top-dressing and careful management this should give you a high-class permanent turf.

FOUL-IN-THE-FOOT.

E. H. L., Mahakipawa :—

Would you please give me some information as to treatment of lameness in a cow? The trouble commenced last summer with an inflamed swelling of the coronet of one forefoot. The wall of the hoof, about an inch down from the coronet, cracked and opened, and eventually the swelling burst, the pus being exuded through the hole in the hoof. It has healed several times, only to burst again.

The Live-stock Division :—

This trouble is commonly known as "foul-in-the-foot," and is caused by micro-organisms gaining entrance through abrasions, wounds, &c. The condition is most often met with in animals that have been standing in mud and filth, but sometimes arises through bruises sustained on hard stony ground. The following treatment is recommended: Examine the sole and between the claws for any wounds, &c.; remove any superfluous horn, especially at the toe; stand the foot in a bucket of warm water to which a little Jeyes and a handful of washing-soda have been added; thoroughly cleanse the foot and then apply a bran poultice, leaving this on overnight. The bathing and poultices should be continued until the discharge ceases. Then apply to the wound a pack of cotton-wool or tow soaked in a weak solution of bluestone, keeping the pack in place with a bandage applied round the hoof-head and between the claws. The animal should be kept in a clean, dry paddock.

MILDEW ON LETTUCE.

A. SEUX, Poroti :—

Will you kindly give me information as to treatment and effective preventive measures for mildew on lettuces?

The Horticulture Division :—

Mildew infection of a lettuce crop is best treated by lifting diseased plants and carefully destroying them. Where heavy cropping is carried out without much rotation, all plant-waste should be burnt to avoid soil-infection. In difficult cases the soil should be given a dressing of lime, and crops immune to this disease should be planted for a season or two.

PROLAPSE OF RECTUM IN YOUNG PIGS.

C. EMERY, Rotokohu :—

About a week after weaning a litter I found two of the little pigs with part of their bowels projecting from behind. I put the parts back, with a stitch to keep them in place, but two weeks after they came out again. About a month after the same thing happened to two more. The food they have had since weaning is skim-milk—nothing else—and their bowels are working very freely. Would you please tell me the cause of this complaint and a cure for it?

The Live-stock Division :—

Prolapse of the rectum is frequently a complication of severe diarrhœa or constipation, particularly when either of these complaints is accompanied by excessive straining. This disease is favoured by weakness, with relaxation or paralysis of the muscle surrounding the anus. Treatment consists of cleaning up the part and replacing it by steady pressure of the hand or finger. Raising the hind quarters slightly and injecting small quantities of water and olive-oil greatly assist. Sometimes replacement has to be repeated. In your case the trouble appears to be due to diarrhœa, and in this connection it is noted that you are feeding solely with skim-milk. Although skim-milk is frequently the only diet given to pigs, it provides insufficient nourishment and should be supplemented by pea-meal, bean-meal, blood-meal, or linseed-meal.