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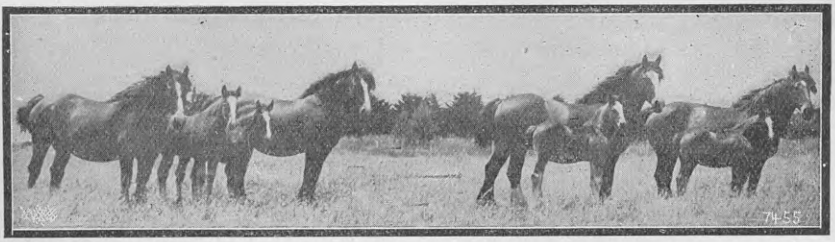
Young Holsteins and Shorthorns at Weraroa.



The

Journal of Agriculture.

WELLINGTON, NEW ZEALAND.

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LIME AND LIMING IN THE SOUTH.

Paper read by Mr. W. D. HUNT, Representative of the Southland Agricultural and Pastoral Society, at the Annual Conference of the New Zealand Council of Agriculture, held at Wellington, July, 1916.

THE district of Southland and the adjoining districts of south Otago have been the pioneers in the use of lime in connection with the agriculture of New Zealand. The first to use lime on an extensive scale in this country was the New Zealand and Australian Land Company, on its Edendale Estate in Southland. The company made a beginning in 1890, during which year it limed about 200 acres. It continued the work until it disposed of the property in 1904, partly by sale and subdivision to settlers, and partly by sale to the Government for closer settlement. During these fourteen years the company limed about 6,000 or 7,000 acres with an average of about 2 tons of burnt lime per acre. The use of lime on an extensive scale has been continued since 1904 by the settlers, and the Edendale and surrounding districts are

now by far and away the best example of successful liming to be found in the Dominion.

The credit for initiating and continuing this work belongs to the late Mr. Thomas Brydone, then superintendent in New Zealand for the Land Company, and Mr. Donald Macdonald, who managed the Edendale Estate during the whole period that the company was using lime upon it. Both these gentlemen had had previous experience in the use of lime in Britain before coming to this country. When the estate was subdivided Mr. Macdonald bought the Edendale homestead and about 1,700 acres of land attached to it, and he still lives there. He has had more experience in the use of lime than any one else in the Dominion, and is as enthusiastic about its use as ever.

The following figures will give an idea of the manner in which the use of lime has increased in Southland and south Otago. The year 1890 can be taken as the date when the commencement was made in a practical way. Ten years later—that is, in 1900—the output of lime from the works in the districts named had grown to approximately 11,000 tons for the year. In 1905 the output was 17,000 tons; in 1910 it was 20,000 tons; and last year, 1915, the limeworks of Southland and south Otago put out 37,000 tons.

The use of lime in agriculture is no new discovery. Its use goes back probably thousands of years. It is too large a subject to deal with comprehensively within the limits of a paper such as this. I shall not attempt to treat the chemical or scientific side of the subject. Any one wishing to study this side of the question can find many books and pamphlets on the subject that deal with it much better than I can. I will confine my remarks chiefly to the experience gained in the use of lime in Southland and south Otago, and, unless otherwise stated, anything I say refers to the use of lime in those districts named, and not elsewhere.

Lime is used in three forms—(1) Shell burnt lime, (2) ground burnt lime, and (3) ground carbonate of lime, or raw lime.

SHELL BURNT LIME.

This was the first method used, and although the others mentioned have been used largely, and at a steadily increasing rate during recent years, there is still probably more shell lime used than either of the other forms, although ground burnt lime will now run it pretty close. All the liming done by the Land Company was with shell lime; in fact, the other two forms have only come into extensive use since the subdivision of the Edendale Estate. Shell lime, as you probably all know, is the burnt lime as it comes

from the kilns. It is in lumps averaging about the size of a tea-cup. The present cost of this lime is 15s. per ton in bulk on trucks, in truck-load lots. The railways carry lime free of cost for distances not exceeding 100 miles, and as every railway-station in Southland and south Otago has a lime-kiln within 100 miles, it means that farmers can buy shell lime at 15s. per ton at their nearest station.

The lime must be carried straight from the trucks to the paddock in which it is to be used. It is applied to the land after the latter is ploughed, generally at the rate of 2 tons per acre. The best method of doing this is to mark the paddock off in lines 8 yards apart. The lines are poled off just as one would do in laying off a paddock for ploughing in lands. A horse drawing a light plough, a log of wood, or anything that will make a good clear mark is driven along the lines. The man carting the lime then takes his dray along these lines, and every 8 yards stops and puts out three shovelfuls of the shell lime in a heap. The shovels used are the short-handled, square-nosed shovels commonly known in the South as lime-shovels. When the carting is finished the paddock will be dotted with heaps of lime 8 yards apart every way. Heaps this distance apart each containing three shovelfuls will equal approximately 2 tons per acre. The lime is then left until it has air-slacked. In this process it increases enormously in bulk and forms into a fine powder. Directly it is in this state it should be spread. The spreading is done with a shovel, and with a little practice and care a man can spread it in this way very evenly over the paddock. If it is desired to use less than 2 tons per acre, as little as 1 ton of shell lime can be used. When using this quantity about a shovel and a half is put in each heap, and then, in order to increase the bulk, three or four shovelfuls of earth should be thrown on each heap. In slacking, the lime will rise right through the soil, and the two will be thoroughly mixed together, and then can be spread. Unless the bulk is increased in this way as small a quantity as 1 ton per acre cannot be spread evenly with a shovel. Even though mixed with soil as stated, a smaller quantity of shell lime cannot be spread evenly. After being spread, the lime should be well worked into the soil by cultivation.

GROUND BURNT LIME.

This is merely the shell lime put into a grinder and ground to a coarse powder. It is put up in sacks, and is railed in truck lots free in the same way as shell lime. It is sold at £1 per ton; the sacks are charged for, and, if returned, are allowed for, generally

at about 2d. each less than the cost price. Including the sacks, therefore, the cost comes to, roughly, £1 2s. per ton. Lime-spreaders are used to spread this lime, and it slacks on the ground. Several useful horse-drawn machines are on the market for this purpose; they can be set to spread from a few hundredweight to about 2 tons per acre; their cost runs to £20 to £25 per machine. Care must be taken to spread ground burnt lime as soon as received, otherwise it will air-slack and burst the bags. Ground burnt lime came on the market at a much later date than shell lime, but its use has increased very much during recent years. It costs more than the shell lime, but it is more convenient to spread, and it can be used in much smaller quantities.

GROUND CARBONATE OF LIME, OR RAW LIME.

This has only come into use comparatively recently. The raw limestone is taken just as it comes from the quarry. It is first broken into small pieces in a jaw crusher or other suitable machine, then dried by artificial means and ground to a fine state of division. The fineness of the grinding is important if quick results are to be obtained. Drying is necessary to enable it to be ground finely, as moist stone cannot be ground efficiently. Ground carbonate of lime is put up in sacks and sown through a lime-spreader in the same way as the ground burnt lime. It is often used, too, in smaller quantities by mixing it with manure and sowing it through the ordinary seed and manure drills. The price charged for carbonate of lime has varied from 16s. to £1 per ton, according to the fineness of the grinding. Bags are charged as extra as with burnt lime, and railage for 100 miles is free. Carbonate of lime came on the market later than burnt lime, and the total quantity of it used is very much below that of either of the two classes of burnt lime. The use of carbonate, however, has been steadily on the increase during the last few years.

RELATIVE VALUES OF BURNT AND CARBONATE OF LIME.

There has been considerable controversy on this question. Carbonate of lime when burnt in a kiln becomes quicklime. In the process of burning it loses 44 per cent. of its weight. When air-slacked and mixed with the soil it changes into carbonate of lime again and regains its former weight. In the ultimate result both are carbonate of lime, and looked at in this way 56 lb. of burnt lime should be the equivalent of 100 lb. of finely ground carbonate. Some years ago a series of experiments were conducted in the United States of America with the two classes of

lime, and in these experiments the lime was used approximately at the equivalents I have named. In every case and from every point of view the carbonate of lime gave the best result. The bulk of our experience in the South bears out these experiments, and it is evident that for some reasons the equivalent in practice is much nearer than 56 to 100. Besides this, the carbonate of lime is much more convenient to use. It can, too, be sown in smaller quantities in drills mixed with manure and be put right alongside the seed. Burnt lime cannot be used in this way. For the reasons stated many people prefer carbonate of lime to burnt lime, even when the costs are equal.

PRICES.

I have stated the price at which the different kinds of lime are being sold in the South. I do not see any prospect of a reduction in the price of burnt lime. The steady rise in the cost of labour is not only increasing the cost of handling the stone, but it is also increasing the cost of the coal necessary to burn it. Railway rates, too, have lately been raised, and this further increases the cost of the coal. I think the tendency is more in the direction of an increase than a decrease in the cost of burnt lime.

Carbonate of lime has not yet been going long enough to say just where the selling-price will settle. The output is, as yet, not very large, and the machinery for dealing with it, under the conditions existing in this country, has not gone very far beyond the experimental stage. The chief difficulty to get over is that of drying. The limestone must be thoroughly dried before it can be ground to a fine state of division. The slightest dampness in the stone will decrease the output and spoil the grinding immediately. In some parts of the United States, I understand, carbonate of lime is sold in bulk on trucks as low as 3s. per ton, but there the conditions are entirely different. The climate where these works are situated is dry, and the limestone can be crushed without any artificial drying. Then, the output is enormous, and the most up-to-date labour-saving appliances can be used. I understand, too, that the production of carbonate of lime is largely a by-product of these works. The main object of the works is either the burning of lime for building purposes, which after burning is casked up and sent all over the United States, or the crushing of lime for use in connection with steel and iron works, and for road and ballast purposes. With all these processes a large quantity of fine material is obtained in the crushing of the rock. This material would in any case have

to be moved out of the way, and doing so would cost money. It can therefore be disposed of at a very low rate. Such conditions do not apply in this country. New Zealand, although a comparatively small country, is so formed that no one spot can command more than a small proportion of it, and the result is that no one limeworks can command a big enough area to get the large output required to enable the most up-to-date labour-saving appliances to be used. Some of the American works crush more lime in a week than the best-situated works in New Zealand are likely to put out in a year.

The ground carbonate of lime in this country is never likely to be a by-product from works whose main output is either burnt lime or crushed rock required for the purposes I have mentioned. The crushing of carbonate of lime for use in agriculture will in this country be the main object of any works erected, and it is to the carbonate of lime and not to any of the other products mentioned that the works must look for expenses and profit. In the South the climate is fairly wet, and the limestone comes out of the quarries in a wet state and takes a lot of drying. The greatest demand for lime is in the winter and spring months, whereas the time of the year when the limestone is driest is the summer and autumn months. Grinding in these months would be cheaper than in the winter and spring, but the storage of the ground material involves extra handling, which would more than do away with any saving. If limestone, after being quarried, is left out in the open for a month or two before grinding it dries to a considerable extent, but not enough to do away with artificial drying altogether. This, moreover, involves a second handling, which more than balances the saving in drying. Our southern limestones when taken from the quarry in winter contain from 15 to 20 per cent. of moisture. To grind efficiently the moisture must be reduced to a proportion not exceeding 3 per cent. This makes it necessary to take about 15 per cent. of moisture out of the stone, which means the removal of about 3 cwt. of water from every ton of rock.

In north Otago and Canterbury climatic conditions are much drier than in Southland and south Otago, and limestone could be ground much cheaper there than with us. The same may apply to a comparatively dry climate like that of Hawke's Bay, but I think it is the wetter parts of New Zealand that are going to require lime most. The lime will have to be ground somewhere near the districts where it will be used. Free railage only extends to 100 miles, and if it is carried farther than this and railage has to be paid the saving in the cost of drying in the drier area is lost. If the demand for carbonate of lime increases

so that works can get a larger output and the machinery and facilities for handling it are improved, I think it probable that prices could be reduced, somewhat from those now being charged.

The outlook for prices generally is that those for burnt lime will not be reduced, and may be increased, while those for carbonate of lime will probably be reduced.

QUALITY OF LIMESTONE-DEPOSITS.

From my experience, it is never safe to judge the quality of deposits by merely taking a few samples out of the face. The actual quality of the body of the rock can never be definitely ascertained until after it has been opened up to a certain extent. I have noticed great difference in the quality of layers in the same quarry. The different layers run horizontally, or at all events originally ran horizontally, but may have dipped in one direction or another through movements of the earth's crust. A layer of first-class stone is sometimes found overlying a layer of inferior quality, and then a first-class layer underneath again. The best way to judge a deposit of limestone before it is opened up is to have bores put down in different places to the depth that the limestone-deposit will probably be worked, and have samples analysed from different levels in the bore. By this means, before the actual work of quarrying begins, a fairly accurate knowledge can be obtained of the class of stone to be met with.

APPLICATION OF LIME.

In the South we generally find that our land wants a dressing of about 2 tons of lime per acre to start with. After that a smaller dressing can be used every few years, but the first dressing requires to be a good one. If 2 tons cannot be put on, smaller quantities are better than none. Even a few hundredweights can give good results. Before liming, the land must be thoroughly drained. It is no use liming land that is not well drained; putting lime on wet land is mere waste of money. The lime, too, must be put on the surface; it always has a tendency to sink. If it is ploughed in to any depth, little good is obtained from it. The best way is to put it on before sowing down in grass, and the longer it can be put on before the grass is sown the better. The best way of all is with a crop of drilled turnips, if this is to be followed by sowing the land with grass. The lime is put on the surface after the land is ploughed for the turnips, and is thoroughly worked in, first by cultivating the land, then by the raised drills for the turnips, and finally by the cultivation and thinning that the turnips receive. After the turnip crop is eaten off the land should be ploughed as

lightly as the plough can be got to run; not more than 3 in. deep at the outside, and less if possible. This is merely turning over the top 3 in. of soil that the lime has been thoroughly mixed through by the cultivation in connection with the turnip crop. If the land is then sown with grass the result is immediate, and the grass comes away very much more quickly than if the land is only limed before sowing the grass.

EFFECTS OF LIMING.

The effect of lime on our South grass-lands, where they have been thoroughly drained, is nothing short of marvellous. It seems to completely alter the nature of the soil. The growth of all the best grasses, and particularly clovers, is promoted to an enormous extent, and the lime either has the effect of directly checking the weeds, couch, and other valueless grasses, or else the effect is indirect through the growth of valuable clovers and grasses being so stimulated that they smother and destroy the more worthless plants. While grain and root crops are greatly benefited by the use of lime before sowing, the greatest benefit is derived by grass, and by the grain and root crops that are grown after the lime-dressed land is broken up again. How long the effect of a dressing of 2 tons to the acre will last I cannot say, but I know that land that has been limed and left down to grass for twenty years has been enormously benefited by it. No land seems to give such good and quick returns from root, grain, or green crops as an old grass-paddock that has been limed previously when it was sown down in grass. Possibly much of the lime itself may have been lost, but the increased growth of grass — particularly clovers — brought about by the application of lime seems to fill the ground with humus, enormously increases its fertility, and thoroughly changes its nature. Lime not only increases the quantity of the grass and clover and subsequent grain and root crops, but it seems to have a great effect on the quality. Stock fattens and thrives very much better and faster on limed land than on land that is unlimed, and the carrying-capacity is largely increased.

LIME AND ARTIFICIAL MANURES.

Lime seems to be of great assistance to artificial manures. Crops and grass respond much better to artificial manures on limed land than on unlimed. The farmers in the South who are the largest users of artificial manures are those who have limed. Nitrogenous manures are not so much wanted on limed land. The growth of clover is largely promoted by lime. Clover collects

nitrogen from the air, and this seems all that is required. Phosphatic manures, on the other hand, give marvellous results on limed land. Many of our South lands would not grow clovers at all until they were limed. As one farmer put it to me, "I never sowed clovers before I limed, because they would not grow; now I never sow them, because they seem to be naturally in the land and come up of their own accord."

The first expenditure in our South lands should be for draining; nothing else is any good until that is attended to. The next expenditure after draining should be for lime, and after lime phosphatic manures can be supplied; but the longer the land can be left in grass after the land has been limed the better, for it is the growth of grass brought about by the lime and humus-content that seems to be the chief cause of the fertility of the land that is limed. I knew a farmer who when sowing a paddock out in grass put 2 tons of lime per acre on half the paddock and an equal money value of phosphatic manure on the other half. There was no comparison between the two sides; the limed half completely beat the manured half. A few years ago I saw a paddock ploughed up and sown in an oat crop without any manure. The paddock had been down in grass for ten years when the crop was sown. Half the paddock had been limed with 2 tons per acre when the grass was sown ten years previously, and the other half had received no lime. The oat crop on the half that had been limed was more than twice as heavy as that on the unlimed portion. The dividing line could be seen straight across the paddock, and there was a difference of quite 15 in. in the height of the two portions of the oats.

Last year I saw a paddock sown in swede turnips. It was ploughed out of land that had been sown in grass for seven years. When sown down with grass half had been limed with about 30 cwt. of lime per acre; the other half had had no lime. The turnip-drills were sown across both limed and unlimed portions, so that each drill was half on the land that had been limed and half on the land that had not been limed. The turnips on the limed portion had to be thinned quite three weeks before the turnips on the unlimed portion. The crop on the limed portion was a splendid one, and a very indifferent one on the unlimed portion.

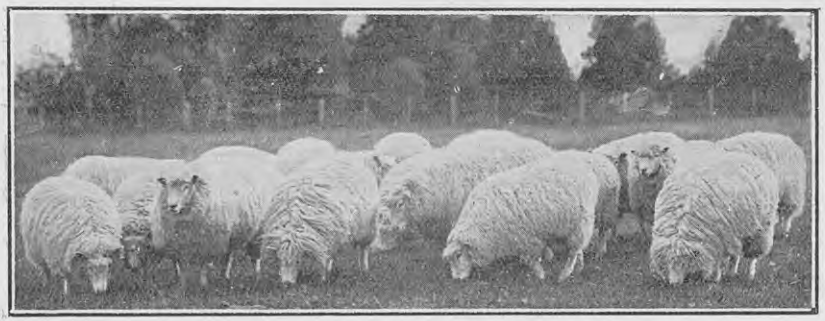
TOP-DRESSING PASTURES.

Lime can be used very effectively in top-dressing grass-lands after they have been sown down, and if in addition to the lime a top-dressing of phosphatic manure is supplied the result is simply

marvellous, and the best of permanent pastures can be obtained on land that previously would not hold grass for a few years. In speaking of these results, it must be understood that the land has first been effectively drained and the suitable grasses are growing in the soil. Top-dressing in the manner stated will enormously stimulate the growth of grasses and clover, but will not create them. In top-dressing with phosphatic manures the lime should always come first, and if the available funds are limited they should all be spent on lime till 2 tons per acre are supplied. If further improvement is wanted, then apply the phosphatic manure.

CONCLUSION.

I said at the outset that I was speaking of conditions as I have found them in Southland and south Otago. Whether these conditions apply to other parts of New Zealand can best be found out by farmers experimenting for themselves. Mr. William Perry, of Penrose, Masterton, tells me that he has now limed about 500 acres with satisfactory results, but he is here to-day, and will, I have no doubt, give you his experience if you ask him. Were I farming in any part of New Zealand I should certainly try lime. I was once travelling through one of the most fertile districts in the North Island; the season was good, and the country looked lovely, and I expressed my admiration to the local resident who was showing me round. "Yes," he replied, "it is a splendid country. The Lord does the work for us here. All you have to do is not to interfere with Him." This statement may be true of some parts of the Dominion, but I know in the South the Lord only helps those who help themselves, and He gives help in double measure to those who lime. From my experience I would try to tempt Him with lime, no matter what part of New Zealand I was farming in.



THE HOUSING OF POULTRY.

A GOOD STANDARD HOUSE AND RUNS.

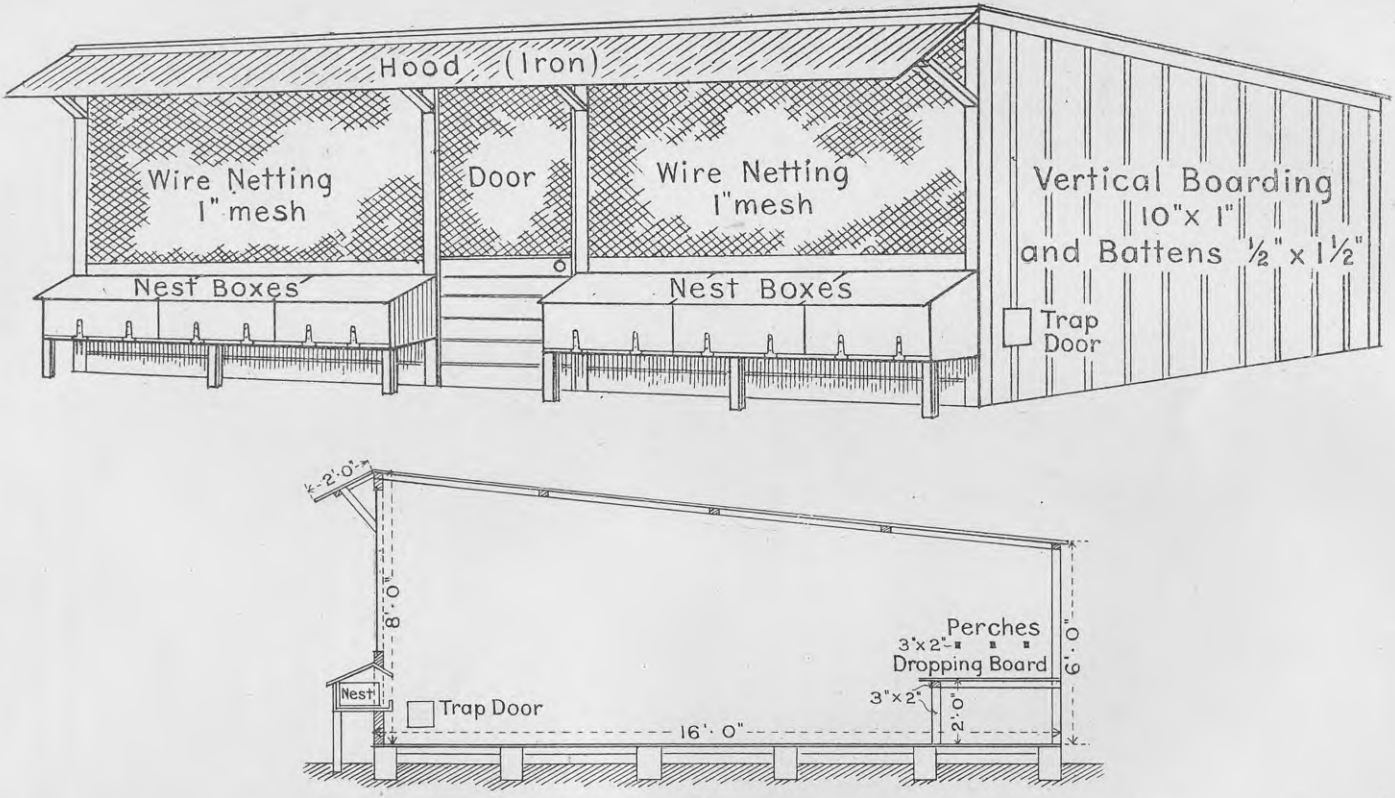
A. E. SALISBURY, Poultry Instructor.

IN order to obtain the maximum return from poultry it is essential that the birds be provided with suitable houses. The importance of the housing factor is not realized as it should be, especially by farmers who keep poultry as a side-line. It is on the farms that the largest profit should be made out of poultry, and yet there is no doubt that a very considerable proportion of the fowls kept by the farmers do not even pay for the food they consume. One of the chief causes is neglect to provide the birds with suitable and sanitary houses. How many thousands of fowls throughout the country are compelled to roost in buildings which are infested with red mites which sap their very life-blood, or are crowded into ill-ventilated or draughty quarters! It says a great deal for the inherent vitality of domestic poultry that serious outbreaks of disease are not more common.

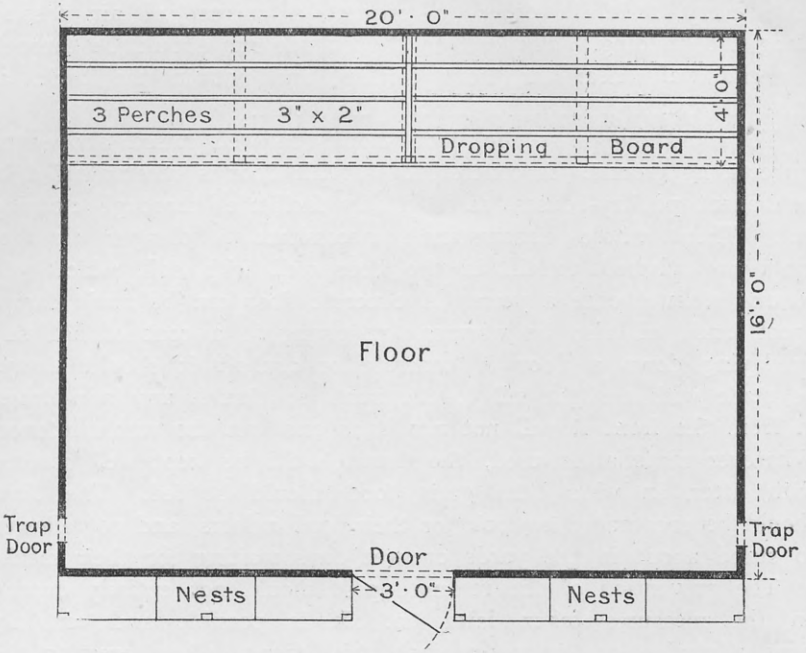
It is quite unnecessary to provide expensive or elaborate buildings for poultry. All unnecessary expense should be avoided, as the returns will have to be debited with interest and depreciation on the outlay of the plant before the net profit is arrived at. In the construction of the poultry-house the first consideration should be the health and comfort of the birds, and the second the minimizing of labour in attending to them. The first object is gained by providing a deep lean-to building with the front partly open. The second advantage is secured by planning the lay-out so as to avoid having to go through the run to enter the house. The birds should be protected against draughts, dampness, and vermin, while being allowed to enjoy the maximum amount of fresh air and sunshine.

In planning a house for a small number of hens the common mistake of making it too shallow from back to front should be avoided. With the front open a good depth is necessary in order to prevent the birds from being too much exposed.

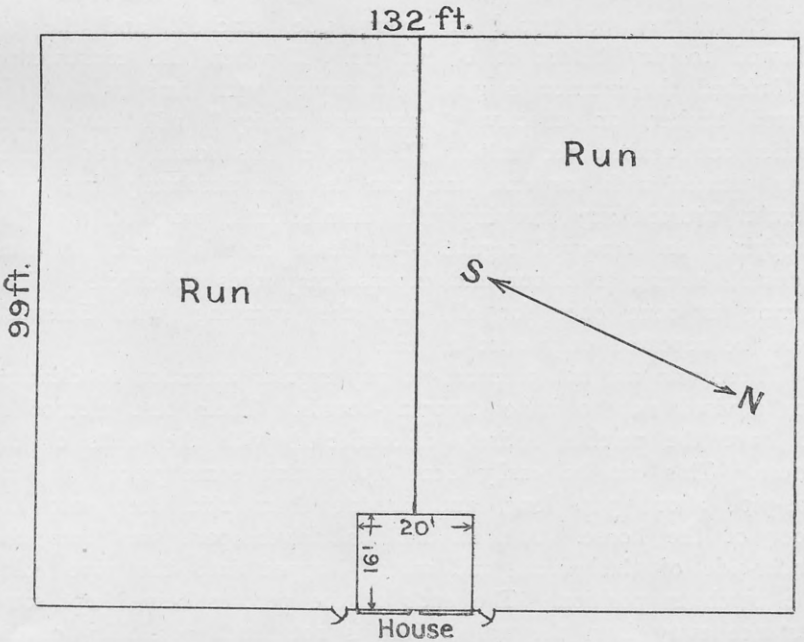
To prevent draughts the back and end walls of the building must have all cracks and crevices closed up. In long houses there should be a partition of some draught-proof material at



GENERAL SKETCH AND CROSS-SECTION OF POULTRY-HOUSE RECOMMENDED FOR 100 ADULT BIRDS.



GROUND-PLAN OF THE POULTRY-HOUSE.



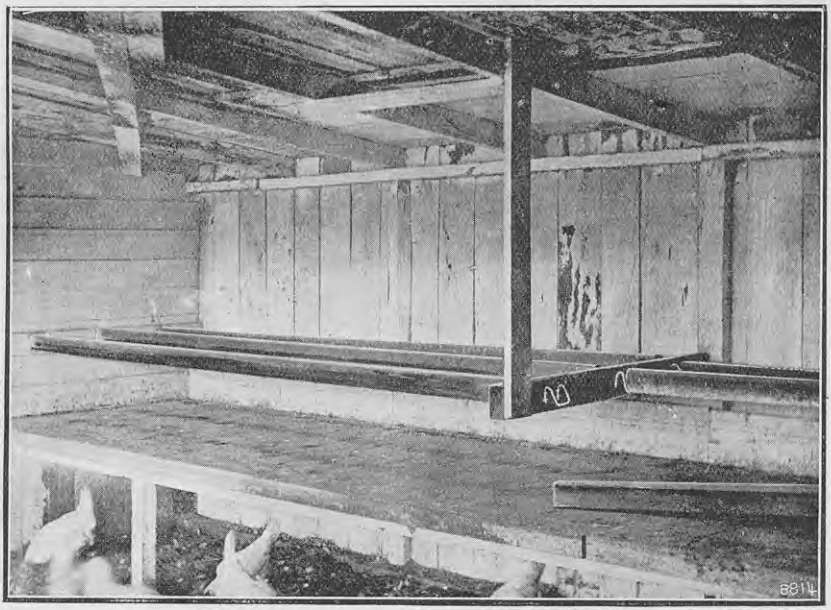
LAY-OUT OF POULTRY HOUSE AND RUNS FOR 100 BIRDS.

least every 20 ft. in order to prevent a current of air passing along the building. The exit to the outside run should be through the end walls near the front corners, and not in the back, as this will create a draught through the house.

To avoid dampness the floor should be well raised above the surrounding ground. A concrete or asphalt floor is recommended in permanent poultry-houses, as it greatly facilitates thorough cleaning out. Those whose circumstances necessitate a cheaper arrangement are advised to fill in the floor well with soil, which will require renewal once a year. A concrete floor can be made damp-proof, and will also be warmer, by giving it a coat of hot tar. In laying down a floor of concrete or asphalt it should always be made with a slight fall to the front, so that if any rain drives in from the front it will not run back and wet the whole interior. Whatever material is used, the floor should be kept well covered with litter, in which the grain food should be fed. The birds should be encouraged to look for their food indoors, and not allowed to stand about in the yards on wet days waiting for their meals.

The prevention of the red-mite pest should not entirely depend on the measures taken later on. It is possible and certainly very advisable to ensure against this enemy when erecting the house. To this end the use of tar is strongly recommended. Supposing timber is the material to be used in constructing the house, it may be tarred on every side, stacked, and the tar allowed to dry before it is cut up. If when the construction is finished the interior is given a spraying with limewash on the tarred timber, an effective "insurance policy" will have been taken out against red mite. The writer has found that houses thus treated with tar and lime can be kept absolutely free from vermin without any spraying with disinfectants, provided that the droppings are removed regularly—at least once a week. A considerable saving of labour and expense may thus be effected. The tarring is done once for all, and the spraying with limewash need be repeated only once a year.

Those who are not prepared to pay regular attention to cleaning are advised not to have dropping-boards. Their best method is to have the perches entirely disconnected with the walls of the house. This can be easily done by getting some pieces of $\frac{1}{2}$ in. gas-pipe about 3 ft. long, and driving them 1 ft. deep into the floor of the house. A 4 in. nail is driven part way into the under-side of the perch, and when dropped into the pipe holds the perch in position. The ends of the perches being kept some distance away from the walls, there is not much possibility of the dreaded red mite getting a hold in the house. A 12 in. by 1 in.



SHOWING ARRANGEMENT OF PERCHES AND DROPPING-BOARD.
Note the wire brackets.

NESTS SEEN FROM INTERIOR OF HOUSE.

board on edge just in front of the outside perch will prevent the litter from getting mixed with the droppings.

A GOOD STANDARD HOUSE.

The accompanying drawings give all necessary measurements and general indications of a style of house recommended for 100 adult birds.

Asbestos slate is found to be the most suitable material for the dropping-board, but being very brittle it requires to be well supported. Three perches of 3 in. by 2 in. scantling (with the 2 in. side up and the corners planed off) are placed 1 ft. above the dropping-board and about 11 in. apart. The perches are hung on brackets made with stout wire, as shown in the photograph. The wire is bent into the shape of a staple, with both points turned round like hooks. This bracket hangs on two staples, and the perch drops into it; it is a simple and effective arrangement for the purpose. Avoid having the perches fixed so that they cannot be removed, or so that they swing to and fro to the discomfort of the birds.

The nests project from the front of the house, and the eggs are gathered from the outside by opening flaps. Kerosene-tins placed on their sides, with three-fourths of each end cut out, are used for the actual laying-boxes. They are raised 1 ft. above the floor to lessen stooping when gathering the eggs. A platform 6 in. wide is placed along the front to enable the hens to enter easily, and a sloping board is fixed just above to make the nest dark and secluded.

The hood over the front of the house prevents the rain from driving in during stormy weather. In exposed localities it will require to extend lower than is shown in the sketch. A common mistake is to have the open part of the front too high, which causes a current of air to strike the birds when at roost. The front should be closed up from the bottom and down from the top, leaving the central part of the wall open. This open portion is covered with 1-in.-mesh wire netting to keep the sparrows out. By locating the house with the front facing the north-east the rays of the early morning sun (being then almost horizontal) will penetrate right to the back of the building where the purifying properties of sunshine are most required.

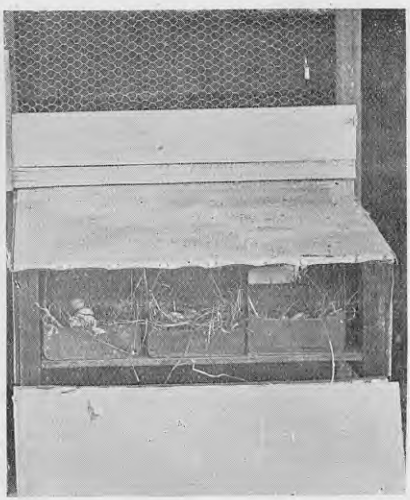
The material to be used in construction must be determined by what is available in the particular locality at the most reasonable price. Boarded walls are shown in the sketch, but corrugated iron has become the most popular material for both walls and roofs, even in climates having great extremes of

heat and cold. Besides being draught-proof and affording no harbour for parasitic life, it is durable and can be readily removed without damage. At the present time, however, owing to war conditions, the price of iron is prohibitive to the average poultry-keeper. Asbestos slate makes a good material for the sides of a house and presents an attractive appearance.

Considering the widely varying climatic conditions which obtain between the north and south of the Dominion, it is impracticable to lay down any hard-and-fast rule as to the amount of house-room required by any given number of poultry. Readers must take their own local conditions into consideration. Generally speaking, a minimum of 3 square feet of floor-space per bird should be allowed for the laying-flock which has access to an outside run. Birds confined to the house entirely should have 4 square feet per head. The breeding-stock during the period they are mated up should be allowed 6 square feet each, in addition to an outside run at least proportionately larger than the ordinary layers require.

THE OUTSIDE RUNS.

On many farms the fowls are allowed full liberty, and consequently become the greatest nuisance on the place. Under these conditions it is impossible for their owners to guarantee the quality and freshness of the eggs. Runs are necessary if the birds are to be kept under control.



NEST-BOXES OPENED FROM EXTERIOR OF HOUSE.

A convenient lay-out of house and runs for 100 hens is shown in the last plan. The importance of having two runs to each house and allowing the birds access to them alternately can scarcely be overestimated. Were this system adopted generally many ailments due to "sick" ground would be unheard-of. The beneficial effects of new ground on the health and productivity of the layer are simply wonderful. How frequently do we see hens (the most ill-treated class of live-stock) confined continuously in yards devoid of vegetation. Year after year

the same small allotment is stocked with fowls. Just alongside is the kitchen-garden, possibly almost as exhausted with continuous cultivation as the poultry-yard is "sick" from continuous stocking. The small outlay required to provide double runs would surely prove a sound investment. Some kind of low dense-growing shrubs should be planted in the runs to provide the shade shelter so essential to the well-being of the birds.

In putting up wire-netting fences it is advisable to use two rolls of the 3 ft. width rather than one of the 6 ft. size, as the former method makes a very much stronger fence, and costs no more. If ordinary fencing-wire is threaded through the mesh at top and bottom, the two edges at middle securely fixed to a central wire, the three wires well strained, and the bottom pegged down, a secure fence will be made which will last for years.

GREEN-BARLEY TROUBLE AMONG CATTLE.

THIS is a complaint sometimes met with in dairy cows and often not recognized by the stockowner. It is brought about through feeding the stock on green barley which is in the stage of ear-forming. It may happen, for instance, that oats and barley are grown separately as green feed for cows. After reaching a certain height the oats are perhaps blown down and have to be used first. The barley when fed is coming into ear, and in a few hours the cows are found to be affected with acute indigestion. The symptoms of the trouble are considerable shrinkage of milk, off feed, animals standing about with arched backs (some hardly able to walk owing to an inflammation of the feet), grinding of the teeth, and sometimes saliva running from the mouth. I have also noticed staggering in some cases. Many animals recover in the course of time by treatment with aperients and stomachics, but others remain in indifferent health for months and are practically useless for that season. I am well aware that some farmers have fed their stock for years on green barley without bad results, but in such cases the green feed has been started when it was young, and the animals have been gradually accustomed to the conditions when the barley eventually came into ear. The majority of cases brought under my notice have been caused through the cows being turned into a paddock adjoining barley for cropping. It is therefore essential that barley should be sown a certain distance from the fence in order to ensure that stock cannot reach it. — *S. Burton, M.R.C.V.S., Veterinarian.*

AGRICULTURAL IMPROVEMENT THROUGH EDUCATION AND EXPERIMENT.

Paper read by Mr. J. BROWN, B.Sc.Ag., N.D.A., Director of the Fields Division, at the Annual Conference of the New Zealand Council of Agriculture, July, 1916.

THE title of my subject as it appears in the agenda paper is somewhat general and indefinite in its import, but my main object, as you may gather, is to review the chief agencies working for the improvement of agriculture, and to offer you my views as to how these agencies may be made more efficient. These agencies are education and experiment, the latter including the work of experimental stations, co-operative trials, demonstration work, and all other special inquiries and investigations arising out of the agricultural needs of the Dominion.

That improvement in agricultural methods and practices must be brought about largely through the operation of these agencies is a fact which hardly needs to be substantiated, and I do not propose to take up your time in doing so, unless a challenge should arise in discussion subsequent to the reading of this paper.

Views, discussions, and proposals concerning agricultural education and the experimental functions of the Department of Agriculture have been brought into prominence in this country time after time for years past, at agricultural conferences, and by individuals interested. A more adequate provision for agricultural instruction has been freely advocated by, amongst others, the late Inspector-General of Schools, Mr. G. Hogben, and the present rural course in district high schools is the result mainly of his work. Recently Mr. Hogben contributed a paper on "Agricultural Education" to the Council of Education, presenting his views on a more adequate scheme for the fostering of the aims of agricultural education. Again, quite recently a report was presented to the House by the Hon. Mr. Hanan, Minister of Education, the trend of which was strongly in favour of a system of education which would minister more effectively to the needs of agriculture and to the mental efficiency of the rising generation of farmers. More recently still, certain members of the Philosophical Institute of Canterbury have published views on the subject of the development of agriculture by methods of scientific research.

The education authorities appear to be agreed that the education of the future in New Zealand must be more and more related to the environment of the pupil and to the affairs of the people, and to concern itself to a far less extent with things that are remote and which do not enter intimately into the lives of the people. Hitherto, and now, the tendency has been, and is, especially in many high schools, to deal almost exclusively with what is foreign to the pupils' daily lives and experiences, or, as the report mentioned says, with pedantic studies and abstractions. Educators have come to realize that if education is to be effective it must deal with the realities which surround and enter into the pupil's existence, or, to put the matter into concrete form, in the rural schools of New Zealand there can be no education worthy of the name which does not use as a means to its ends the soils, the fields, the physical features, the plants, and the animals in the school environment, or which does not concern itself intimately and sympathetically with the social aspirations and business relationships of the people who live in the country.

There is one great practical difficulty in the way of using the real affairs of the people as the source and inspiration of educational effort, and that is that in most cases the teachers themselves have not been educated on these lines, and have difficulty in using the natural phenomena and the real experiences of the country as educating agencies. The school itself has for years been more or less of an exotic growth. It has not been native to the environment. The school and the affairs of the farm, for example, have been far apart. The education which a boy or a girl received at a country school had very little in common with the experiences of the boy or the girl outside of school hours. True, nature-study, elementary agriculture (so called), and domestic science have for some years figured in the curriculum, but I fear that to a great extent these have been book subjects and but little related to farm and home interests and experiences. Matters have certainly improved in recent years; but I cannot help thinking that, while the authorities and the teachers are sincere and earnest in their efforts to get away from the old formal routine methods of education, the thrall of the text-book is still strong upon the great majority. This disability will not vanish until steps are taken to properly train the rural teachers of the future to an intimacy with and appreciation of the facts, affairs, and ideals of country life.

This consideration is fundamental to my subject. No matter how excellent may be the work of experimental stations and other projects for furthering agriculture, their work can be of use

just in proportion to the ability of the farmers as a whole to understand, appreciate, and use their discoveries, and a high degree of such ability can come only through education of the proper kind.

Another point: Not only should the school in its purpose and method be native to its environment—it should be, particularly in the case of the country school, the vital centre of the community which it serves. As it should educate in terms of the actual affairs of the people, it ought to take a leading part in the interests of the people. As an example in point, I should say that any experimental work which is undertaken in the school districts should be as far as possible associated with the local school.

You may infer from what I have said that in agricultural districts the aim should be to have all the education of a kind that might be described as "agricultural," and that is, in truth, what it amounts to, but not in any strict or narrow sense, or what the pedagogue would call purely vocational. Using the facts and experiences of his environment as a means of cultivating his faculties does not necessarily imply a materialistic or technical type of education. The latter must come after the foundations of education have been broadly and liberally established, and the pupil is destined to earn his living in some way which would warrant a specific education combined with a certain amount of definite instruction in agriculture.

How these aims may be achieved is set forth in a scheme of agricultural education for New Zealand prepared by Mr. Hogben and submitted to the General Council of Education on the 30th June, 1915. So far as the future of a rational primary-school education is concerned, there should be no difficulty, provided the education in district high schools and in high schools of the pupils who are to be the teachers of the future is on the right lines. In the district high schools an agricultural course is provided which is perfectly sound in conception provided it is duly and efficiently executed. That something is lacking would seem to be suggested by the context of remit No. 11 on your present order paper.* To a large extent the agricultural science portion of the curriculum is carried out by itinerant agricultural instructors, and this, to my mind, is by no means a satisfactory arrangement. The agricultural teacher should be a member of the staff. There are reasons why this should be so which are hard to explain, but the chief con-

* The remit (from Feilding Agricultural and Pastoral Association) was as follows: "That at each high school there should be a small area of land suitable for farm experimental work, and that a science master should be attached to such school to supervise the agricultural education of the scholars and work in connection with the Department of Agriculture."

sideration is that science studies, including agricultural studies, are not of a nature to permit of satisfactory progress under the itinerant-instructor system. Moreover, it is not instruction that is wanted, but education, and under this requirement the itinerant system is rather apt to break down.

I do not think that the best results can be achieved until each high school has its own teacher of agricultural science, helped out perhaps by the visiting instructors; and the great need underlying the whole organization is a means of educating and training those teachers before they enter upon their work. How this is to be brought about is for the Education authorities to say. It has been suggested that an agricultural college is the solution. Mr. Hogben suggests that instead of going to an agricultural college some of the teachers might go to the experimental farms of the Department of Agriculture if that Department could arrange to receive them. It appears to me to be quite certain that, not for this end alone but on other grounds, a high degree of co-operation should be established between the two Departments. All additions to our knowledge arise out of research and experiment, consequently it is from research and experiment that the teachers of agriculture, in whatever capacity, must draw their knowledge and inspiration. On the other hand, their ability to conduct investigations, experiments, and research postulates a certain kind of education for the experimenters and research men. The two interests are most intimately and inseparably bound together, and only by the closest co-operation can any great achievement be brought about. To sum up the matter in its educational aspects I would state the following points:—

(1.) The Department of Agriculture should strengthen its organization for research, investigation, and experiment by rearranging and co-ordinating the machinery at present at its disposal for that purpose. This the Department is endeavouring to do.

(2.) If practicable and possible, the Department of Agriculture should arrange provision for a certain number of teachers destined for agricultural-science work in district high schools to enable them to associate for a time with its specialists, and to receive instruction and bias towards agricultural science from them.

(3.) For reasons which I shall endeavour to explain later, the Education Department might extend its scholarship provisions to one of the institutions of the Department of Agriculture, in order that young men of adequate education might be available for training thereat, with a view to subsequent employment as field officers of the Agriculture Department, or as agricultural instructors under the Education Department.

With these provisions a satisfactory measure of agricultural education for our present needs might be instituted in New Zealand, except in the case of those pupils who leave the primary school to take up agricultural work direct. It is suggested that in the scheme of education already referred to this defect may be remedied by the institution of afternoon and evening classes at suitable centres, and this appears to me to have everything to recommend it.

These considerations on agricultural education and its progress, as I have said, are fundamental to research and experiment, and it is equally clear to me that education having for its aim the improvement of agriculture, through raising the standard of intelligence of the agricultural population, must be based on the work of agricultural research and investigation throughout the world, but especially within the Dominion. To this task the Department of Agriculture must apply itself with ever-increasing zeal and by every available means. In recent times there has been an ever-growing clamour on the part of the farming community for the services of qualified officers to give advice in connection with cultivation, liming, manuring, cropping, grassing, control of disease, &c., and to carry out experiments and demonstrations, and farmers are inclined to be impatient that more is not done on these lines. Few are aware that to this day the Department has in its service for undertaking this work the merest handful of trained men, and the few officers whose duties lie in the direction indicated are apt to be so engrossed in efforts to comply with demands of every conceivable description, and from the North Cape to the Bluff, that the pursuit of any continuous experimentation or planned research is practically impossible. We have nothing in New Zealand to compare with the fully equipped experimental stations, with their complete complement of trained men and facilities for the uninterrupted pursuit of experiment and research, as is the case in other countries, and this is a state of matters which is not easily remedied. Not only does the Department lack qualified specialists for research, and men of all-round training for the prosecution of local experimental and demonstration work, but of men having the necessary training and at the same time sufficient experience of New Zealand conditions to make their services of value there are very few, and these few generally have more remunerative fields for their abilities.

Local experimental work has been pursued by the Department with the means at its command, and has not been unproductive of good, *pace* the Philosophical Institute of Canterbury, but a better and more complete organization is certainly most desirable, and

just as the initial step towards securing a better system of agricultural education was found to be the preliminary training of the teachers, so in the case of the work of the Department of Agriculture the prime necessity is to provide a system of training for the men to whom the work of the Department might be subsequently entrusted. So far as I can see, there is only one way to bring this about, and that is to limit strictly the administrative and routine duties of the few officers now in the Department's service who are specialists in some particular branch of the Department's work, and to bring them together at one of the experimental stations for the purpose of engaging more definitely in experimental and research work appropriate to the needs of the Dominion as a whole, and at the same time to undertake the training of the men whose subsequent services as officers of the Department would enable an adequate expansion of the work to be undertaken at the experimental stations themselves, and throughout the various districts of the Dominion.

The original subject suggested to me for this Conference was "Methods of Experimentation as pursued in other Countries, and their Application to New Zealand." The methods adopted in other countries, such as Great Britain, France, Canada, and the United States, almost without exception depend upon an organization which has as its basis either an agricultural college or an experimental station, staffed by experts, and associated with that station certain substations in the provinces or counties, smaller experimental areas, and a system of farmers' co-operative experiments, all directed and supervised by the headquarters staff and immediately managed by officers trained at the central institution. Under that system there is the least possible waste of effort, and that is without doubt a type of organization which, considering our present limited supply of trained men, it would be most expedient for New Zealand to follow. Probably you will not agree with me when I assert that before any movement is made to establish more experimental farms steps should be taken to properly equip one of the existing farms for this purpose, and to set the scientific men to work there; but if you will consider the matter seriously and try to divest your minds of local bias you cannot fail to agree that that is the only sensible course to pursue.

In insisting upon the need for an adequately equipped and staffed base station I do not overlook the fact that district work correlated with, but to some extent independent of, the main station is very necessary; indeed, one of the functions of the main station would be the training of men for district work; but in the meantime the experimental work that has hitherto been carried

on throughout New Zealand must not be allowed to lapse. I think, however, that to a large extent it should be redirected, and the change, to my mind, should be in the direction of reducing the co-operative experiments carried out by farmers on their farms in favour of an extension of experimental substations of the type of Ashburton, although perhaps on a smaller scale, and in the establishment of experimental areas, associated with district high schools or elsewhere, in conjunction with local agricultural committees. Time has demonstrated that the attainment of trustworthy results from experimental work involves a sacrifice which not one farmer in a thousand is prepared to make. There must be a close attention to detail, and an exactitude in carrying out the work in all stages, which the private farmer cannot properly undertake. Inevitably there comes a time when it is a question of proper attention to the experiment or a loss in connection with the other crops on the farm. Needless to say, the experiment suffers. Experiments must necessarily be conducted regardless of the profit to be derived from the produce of the experiments, and when that fact is brought home to a farmer his interest in experimental work, as an undertaking by himself, ceases. Certain kinds of trial work, such as variety-testing and trials of manures, when conducted on a reasonable scale, are possible to the private farmer without unduly interfering with his ordinary farm-work, and these experiments should be continued, limiting the number undertaken in any district, and increasing the size of the plots to an extent which would warrant the trouble of separate threshing in the case of cereals, or feeding off the plots individually, and thus obtaining proper records in the case of forage crops.

The local agricultural committees should be in a position to help the Department to carry out such experiments in a feasible way, and although they have not so far had an opportunity of rendering any considerable amount of service in this direction, it is hoped that as matters are now on a better footing in the Department itself progress may be made. The fact that local experimental work in Great Britain has been undertaken mainly on the co-operative principle with success is no criterion for its success here, for the work in the Old Country has been undertaken to a large extent by the "home" or "estate" farms, with all their conveniences and plentiful supply of labour, and by patrons of agriculture, who are similarly well placed for carrying out the work. As I have hinted, it is probable that experimental work, requiring great care and attention to detail, will have to be undertaken at the substations and experimental areas, but as to the exact basis of working these I have no official authority for

pronouncing. In the case of Ashburton the entire conduct and execution of the work is in the hands of the Department, and it is probable that one or two similar stations in the South Island will be established.

I do not think, however, that any considerable extension of experimental substations should be taken in hand until the possibilities in this direction provided by the special institutional farms of the Mental Hospitals and Education Departments have been exhausted. There are at least five of these in the South Island well provided with suitable land and ample labour and equipment, and it would seem as if mutual advantage would accrue to the Departments concerned by co-operative action for the institution of a scheme of strict experimental work on these farms. There is also the question as to whether or not the local authorities might not reasonably be expected to bear a share in the establishment of these district substations, as is done elsewhere.* In the American State of Ohio, for example, what is known as the County Experiment Law authorizes the establishment of county experiment farms, in order to demonstrate the practical application under the local conditions of the result of the investigations of the Ohio Agricultural Experiment Station, and for the purpose of increasing the effectiveness of the agriculture of the various counties of the State. It authorizes the County Commissioners, after certain preliminary procedure, to levy a tax for the purpose, out of which the cost of the experiment farm, its equipment, and the cost of labour is met, to an extent not exceeding £400 annually. The management of all county experiment farms is vested in the Director of the Ohio Experimental Station. The law also requires that a county experiment farm shall contain not less than 80 acres of land.

Any provision that may be made in the direction of establishing experimental substations will not, however, obviate the necessity for other experimental areas, especially in a country like New Zealand, which exhibits such a variety of local conditions. It has been suggested that schemes of experiment on reasonable areas might be operated in association with high schools throughout the Dominion, and provided satisfactory arrangements were made for the cultural work this appears to me to be an excellent idea. As a reasonable working basis I would suggest that the school, supported by the local agricultural committee or other responsible authority, should provide a minimum of 10 acres of land, and

* In the discussion on the paper Sir James Wilson mentioned that County Councils in New Zealand have the power to subsidize and to have a farm under their management. The power, however, has never been exercised.

arrange for the supply of labour, teams, and implements, and that the Department, through its officers, should formulate experimental schemes in consultation with the local authority, provide the seeds and manures, and subsidize the cost by payment of a fixed sum per acre, according to the class of work undertaken, when satisfied that the work has been properly carried out.

The essence of my remarks constitutes a plea for co-operation —co-operation between Departments, and between them and local agricultural bodies — for the furtherance of their joint interests. Departments, much less than individuals, can afford to pursue their own ends and interests exclusively without consideration of the common good. The important thing is to get together and get to work. We can do the work and do it well, and to the complete satisfaction of the needs of the Dominion for years to come, with the opportunities that may be grasped by a little mutual arrangement and understanding, and without resort to any chimerical objective such as a National Institute of Agriculture. Such an institute was proposed recently at a Philosophical Institute of Canterbury meeting. The institute was to be governed by men of scientific standing. With only one or two exceptions the men of scientific standing in agriculture in New Zealand are in the service of the Department of Agriculture, and, so far as I know, when some of the arrangements which I have foreshadowed are brought into operation they will be more than content to remain there.

DRENCHING COWS.

IT is noticeable that many dairymen are not sufficiently careful in administering medicine in the form of a drench to their stock. The proper method is for the operator to pass his left arm over the cow's face and insert his fingers into the mouth in front of the molar teeth. The neck of the bottle should then be placed well into the mouth over the tongue, pouring out slowly so as to give the animal time to swallow. Should the animal cough, the head should immediately be released, as there is a danger of the medicine getting on to the lungs. If the animal is restless, more purchase may be gained by holding the nostril between the finger and thumb, care being taken not to block the passage of air. No drench should be administered when the animal is unconscious or in a semi-conscious state, as in milk-fever.—*S. Burton, M.R.C.V.S., Veterinarian.*

WAX-FOUNDATION MAKING FOR THE APIARY.

F. A. JACOBSEN, Apiary Instructor.

ONE of the live matters now confronting the beekeeper is the art of making wax foundation. The increased cost of this material from the suppliers has made it expedient for many beekeepers to attempt making their own. Failing this, all pure wax should be saved and sent to a reliable foundation-maker to model at a small cost. This latter method is the best for the small beekeeper. Just how many colonies are required to enable a foundation-making plant to be worked successfully and profitably I would not care to say, but would rather leave the answer to individual discretion. However, those who are making, or who contemplate making, wax foundation may find some useful hints in the following description of the process.

PRELIMINARY REFINING OF THE WAX.

It is most essential that all beeswax, preparatory to any manipulations for foundation-making, should be refined and thoroughly cleaned. Wax cakes are usually of all grades and colours. The difference in colour is due largely to the amount of impurities the wax contains. There is no method so satisfactory as treatment with acid to bring it to its pure state and colour. Some claim that by this treatment the wax is made brittle. I can only reply that this has been contrary to my experience.

A highly successful method is as follows: First have in readiness a number of kerosene-tins with the tops cut off, or, better still, buckets. Have a sufficient quantity of boiling water handy to pour a depth of several inches of it into each receptacle. Melt the wax in a large milk-can or other tank, together with a quantity of water, which is boiled after the cakes of wax have been added. Dip the melted wax into the kerosene-tins or buckets containing the boiling water, and add to each about one teaspoonful of commercial sulphuric acid. Stir for a minute or so, and then cover up with sacks to keep warm as long as possible. Slow cooling allows the foreign impurities to settle and prevents cracking. After twenty-four hours lift out the cakes and scrape the impurities from the bottom.

If a good supply of steam is handy a still better method is as follows: Fill a wooden tank or barrel a quarter full of water, and add cakes of wax until nearly full. The water is then boiled until all the wax is melted, after which the sulphuric acid is poured in and the boiling continued until all is thoroughly mixed. The heat is then removed by drawing the steam-pipe out of the barrel or tank, and the impurities are allowed to settle. Cool slowly, and afterwards scrape impurities from bottom of cake. (For other points on the subject see note on "Treatment of wax," by E. A. Earp, in the May issue of the *Journal*, page 402.)

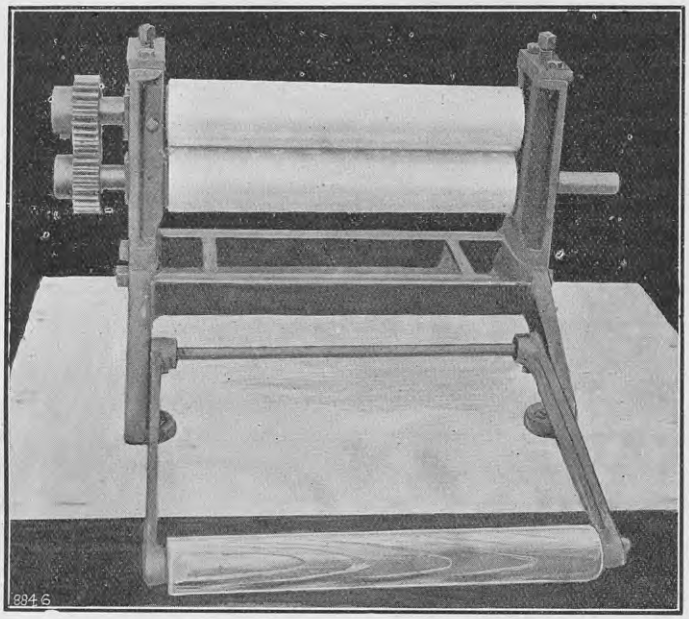


Photo by F. A. Jacobsen.

THE PLAIN ROLLING-MILL.

The quantity of sulphuric acid to be used varies. If the wax is dark enough to make brood-foundation, from 4 to 6 gills of acid is used for each 500 lb. of wax; but if the wax is already of light colour and good quality, so small an amount as 2 to 3 gills will suffice for the same quantity of wax. Readers may be reminded that 5 fluid ounces make 1 gill, and 4 gills equal 1 pint.

FOUNDATION-MAKING.—DIPPING-APPARATUS.

The apparatus required for dipping—the first operation in foundation-making—consists of dipping-boards, melting-tank, dipping-tank, and cooling-water tank. The melting-tank is for the purpose of

melting the refined wax and keeping it liquid. The dipping-tank is the one in which the boards are inserted, and should be 5 in. by 12 in. at the top, and 2 ft. 9 in. long. This tank is usually tapered slightly to the bottom. It should be placed in a large tank of water, which, in order to get the best results, is to be kept at a temperature of 165° to 170° F. The cooling-water tank is for plunging the board after dipping.

At least two dipping-boards are necessary, and one more is an advantage. They should be made out of heart totara or heart white-pine. Only a few boards in each log are suitable for the purpose; these warp neither one way nor the other, and the grain is not liable to fray up and adhere to the wax sheets when they are being peeled off. The size of the boards should be 8½ in. to 9 in. wide, about 2 ft. 6 in. long, and about ⅜ in. thick. Plane them smooth and finish with sandpaper. Before using they should be soaked in brine water for several hours, which serves the double purpose of preventing the wax sticking to the boards and preventing the grain rising in them, with consequent roughening. To make the brine use a teacupful of salt to two or three buckets of water.

THE DIPPING PROCESS.

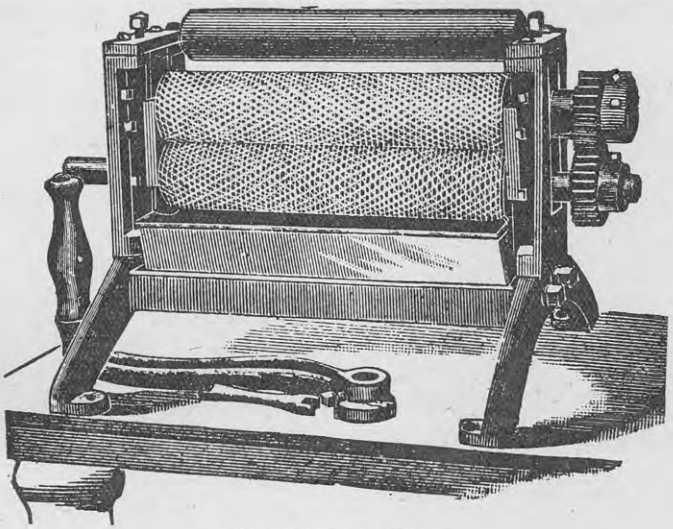
When all is in readiness dip the boards smartly into the dipping-tank, which is filled with wax, to about 2 in. from your fingers at the end, and withdraw smartly. Before dipping again, wait until there are no drips of wax from the board, then repeat as before. For medium brood-foundation dip about a dozen times, and then plunge the board, with wax adhering, into the cooling-water tank, in order to prevent the sheet adhering too firmly to the board. Run a knife round the edge to remove the wax there, and after soaking a minute the wax sheets will peel off. The sheets should be stacked horizontally in a pile. For thin foundation dip only a few times. The best results are obtained when the wax is at a temperature of from 165° to 170° F. If it is too cold there is a thin film on the wax from which you are dipping. Cool wax leaves the surface of the sheets with ripples, and they will be wavy and irregular in thickness. If the wax is too hot they will crack and peel off. It is most important, as will be found by experience, to do the dipping with the wax at the right temperature. Properly made sheets are indispensable for the ensuing work. If the sheets do not peel off the boards readily it is evident the latter have become roughened, and they should be again sandpapered when dry.

The old hand knows the various points that have to be considered, such as the adjustment of the mill, the temperature

of the wax, and the quickness of the plunge of the dipping-board. It may be advantageous at times to reverse the dipping-board and handle the other end, and the water in the cooling-tank must be kept cool by drawing off the warm and adding cold water. More failures in foundation-making may be attributed to faulty dipping of the sheets than to any other cause.

ROLLING THE SHEETS.

The illustration on page 115 shows the plain rollers clearly. The photograph of the workshop interior will also give some idea of how to prepare for rolling. Beyond the mill, the handle of which is being

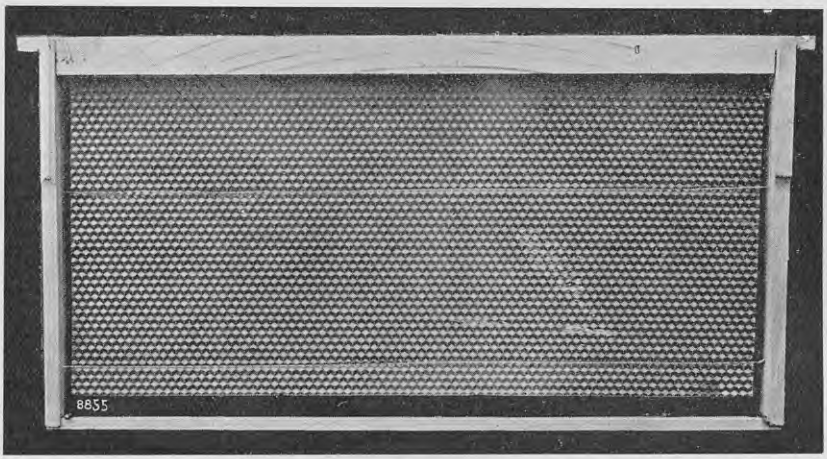


THE EMBOSSING-MILL.

turned, is placed the cooling-tank, which is now used as a heating-vat for the sheets. The top of this tank is level with the base of the rolling-mill for convenience. The size of the tank should be about 12 in. deep, 15 in. wide, and 8 ft. long. The water in this tank in which the sheets are placed is to be kept at a temperature of between 115° and 120° F. Keep the room heated round about 80°, as it has been found by experience that this temperature is best. Although rather hot for comfort, the successful making of the foundation should be the first consideration.

Having mounted and screwed the mill to the bench, some sort of lubricant for the rollers is necessary before proceeding further.

Various mixtures have been advocated, such as a weak solution of lye obtained from an ordinary ash-leach, a solution of slippery-elm bark, ordinary starch paste, or a solution of salt and water. After testing several of these mixtures, however, I certainly favour soap and water. Put a cake of ordinary soap into half a bucket of boiling water, and when melted allow it to cool to under 100° before use. The tray below the rollers, as illustrated, is for holding this solution. The rollers, both top and bottom, should be quite wet with this fluid before use. The sheets as they leave the dipping-boards are usually ragged and thickened at the ends. Instead of trimming each sheet singly, take a pile of them and trim evenly and squarely with a large knife. Put this pile into the

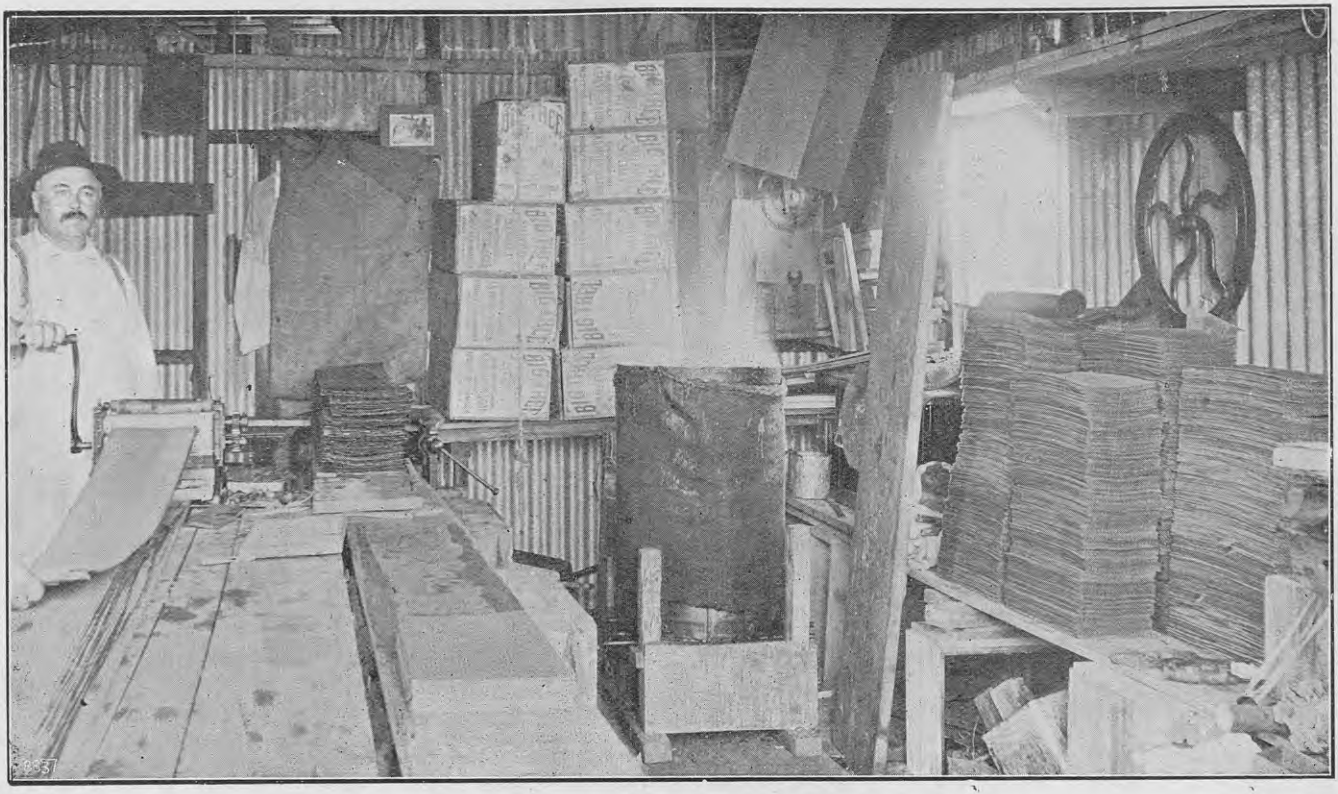


[*F. A. Jacobsen, photo.*

SHEET OF FOUNDATION MOUNTED READY FOR HIVE.

heating-tank and you are now ready for rolling. For this work two persons are necessary—indeed, two carry out the work better all through. It may be found advantageous to stir a little salt into the water.

Dip the end of the sheet in the soap and water, place it between the rollers, and give the handle a half-turn, then lift up the rear wooden roller; the assistant next detaches the end of the sheet from the top roller with a blunt comb or other soft article, and after securing a hold on the sheet with the grippers pulls it from the machine as the handle is turned. It will roll out to a length of about 7 ft. Before putting through each subsequent sheet moisten the top roller with the hand dipped in the soap and water.



A WAX-FOUNDATION-MAKING WORKSHOP.

Showing a sheet going through the embossing-mill, stocks of cut foundation on right, &c. Gas is used for heating.

F. A. Jacobsen, photo.] [*Photo by courtesy of R. J. H. Nicholas, Hawera.*

EMBOSSING THE SHEETS.

After the operation of putting the sheets through the plain rollers, the latter machine is dismounted and the embossing-mill put in its place. The 7 ft. sheets are placed in the heating-tank as before, but pure water is now used, the temperature of which should be between 90° and 100° F. I have found that the sheets work best at this heat. Proceed as with the plain rollers.

CUTTING THE SHEETS.

The quickest method of trimming the long sheets of embossed foundation—these will probably go $7\frac{1}{4}$ ft. to the pound weight in medium brood and about 9 ft. in light brood—is to prepare a smooth board the exact size required for the finished sheet of foundation for placing in the frame. Lay seven or eight long sheets on top of each other, and after placing the board in position cut all round it with a sharp knife, doing as many sheets at once as you can conveniently manage. They cut very much better immediately after leaving the embossing-mill, because the wax is then warm.

CLEANING ROLLERS.

I have known enthusiastic but inexperienced beekeepers endeavour to roll a dry sheet through the mill. They will never attempt it a second time. The wax will cling to both rollers, and the only way to get them to work again is by scalding, or turning a jet of steam on all surfaces for several minutes. The surfaces of both rollers are very soft, and on no account should they be scratched with anything hard. Keep the wax-room free of all small hard materials. A tack embedded in the sheets will ruin the mill, and nothing is so easy as for this to happen.

ADJUSTING ROLLING-MILLS.

When the mill leaves the factory it is evenly adjusted and ready for use. A leaflet giving instructions for the adjustment of the machine is supplied with each. On no account alter the adjustment of the mill without first reading the leaflet and fully comprehending it. When once the rollers get out of alignment it is the most difficult thing for the novice mechanic to right them; indeed, I have known good mechanics advise the purchase of a new machine because they could not adjust the old one properly. When a machine is first in use, if it does not come up to expectations and rolls the sheets with a bow to one side, one may be sure that there is some fault with the dipping. Finally, it is only by patience and experience that the art of foundation-making is satisfactorily mastered.

BLACKLEG AND ITS CONTROL.

C. J. REAKES, D.V.Sc., M.R.C.V.S., Director of the Live-stock Division.

BLACKLEG, often termed "black-quarter" or "quarter-ill," is, practically speaking, a disease of cattle alone, though it is said that sheep and horses have very rarely been known to be affected. No cases among these animals have, however, been met with in this country. The disease, fortunately, is present only in limited areas of New Zealand, but the mere fact of its limited distribution renders it necessary to take all possible precautions to prevent its further spread, and at the same time to keep it under control in the already affected localities. This can be done effectively at but slight cost and with but little inconvenience to farmers, provided they co-operate with and assist the departmental officers in carrying out the necessary measures. The affected areas are—

(1.) The Taranaki District, where the disease has existed for several years, but now, thanks to the yearly inoculation of calves rendered necessary by the operation of the Blackleg Regulations, causes practically no loss. This inoculation has become a part of the annual routine of farmers in the district, and is carried out with little or no inconvenience to them, and at no monetary cost.

(2.) Portions of the Auckland District, where regulations similar to those in force in Taranaki come into full operation during the present season.

NATURE OF THE DISEASE.

Blackleg may be described as a form of blood-poisoning, caused by a specific organism, without whose presence the disease cannot exist. The germs of the disease can retain their vitality in the soil for a long period of time, and it is usually through grazing on land infected with these germs that animals contract the disease. Save in rare instances, only young cattle are susceptible, and it is very unusual to find one under three months or over eighteen months old affected. Further, it is the best-conditioned animals which suffer, particularly those which are making flesh rapidly. Calves while in poor condition are in some way non-susceptible—so much so that direct experimental inoculation with virulent virus may fail to produce any sign of the disease in them. The first symptoms appear in from two to five days after infection has taken place, occasionally earlier.

HOW BLACKLEG WAS INTRODUCED INTO NEW ZEALAND.

There is good reason to believe that the use of non-sterilized imported bone manure in years past is responsible for blackleg gaining a foothold in this country. In Taranaki, so long ago as 1889, isolated cases were found in a small area where this fertilizer had been used, and for several years no cases outside this area were noted. Then the disease began to spread rapidly, and it became necessary to take proper measures to get it under control. These measures have proved remarkably satisfactory and effective. In the Auckland affected areas no doubt the same original cause has operated, and there is reason to believe that isolated cases, not recognized at the time as being blackleg, occurred several years ago in the Waikato. Certainly there is no evidence to show that the disease spread to there from Taranaki — in fact, the distance between the two districts and the time necessarily occupied by cattle travelling between them would practically preclude the possibility of this, seeing that calves infected when leaving Taranaki would be dead long before they could get anywhere near the Waikato. Imported bone manure is no longer able to cause trouble through this disease, as its sterilization before shipment has been compulsory since 1905, and the effectiveness of the sterilizing process is ensured by it being carried out under the direct supervision of Inspectors appointed by the New Zealand Government.

SPREAD OF THE DISEASE.

The principal methods by which the disease is spread may be summarized as follows :—

(1.) Movement of young stock from farm to farm, either through saleyards or direct. Striking instances have lately occurred in the Auckland District, where the disease has been introduced to previously clean farms through the medium of calves bought in the saleyard.

(2.) Failure to properly bury or otherwise completely destroy the carcases of young cattle dead from blackleg. This not only infects the soil where the carcase lies, but allow dogs and hawks, by feeding upon the carcase, to spread the infection. They do not themselves become affected, but they act as carriers.

SYMPTOMS.

The most characteristic symptom is an extensive swelling of one fore or one hind quarter, combined with very definite symptoms of ill health, the animal being dull, feverish, and off feed, with loss of

cud. At times the swelling may appear at other parts of the body than a fore or hind quarter; the neck, breast, loin, or flank may exhibit it. The skin of the swollen part is tense, and on passing the hand over it with a light pressure a peculiar crackling is noted, this being due to the tissues beneath being distended with gas. Before the swelling becomes established lameness is noted, and indications of sickness make their appearance. Death occurs quickly in from two to three days from the appearance of the earliest symptoms, and often even earlier. It may be noted that, if the swollen part were cut into, the tissues under the skin would be found to contain a quantity of dark, soft, brownish-red material, while the muscles beneath are very dark-coloured, in places almost black.

PREVENTIVE MEASURES.

In affected areas any calf showing lameness should be at once isolated and carefully watched. Medicinal treatment, from a curative point of view, is of little or no value, and the one effective measure is prevention. A calf dead from blackleg, or suspected to have died from the disease, should never be skinned, but should with the least possible delay be deeply buried, or burned, with the skin intact. This will lessen the risk of infection of the surrounding soil. At the time of death a little blood, which is very infective, may come away from the nostrils or the anus. A good fire should be burned over the spot where death occurred, and this, if done properly, will ensure safety so far as infection of the soil is concerned.

Apart from these precautionary and preventive measures necessary to be carried out by the farmer, a thoroughly effective means of preventing the occurrence of the disease lies in the inoculation of young cattle with a properly prepared vaccine. This has proved most valuable in Taranaki, and now that it has become necessary to enforce vaccination in the Auckland District there can be no doubt but that it will be equally effective there. The vaccine is prepared at the Wallaceville Veterinary Laboratory, and the work of vaccination is carried out by trained departmental officers, all vaccinated calves being at the same time branded on the neck with the letter "S." This is done entirely free of charge, and all that is asked of the farmer is that he brings his calves to a convenient centre for vaccination. Due notice is always given by advertisement and otherwise, so that as little inconvenience as possible is caused. The hearty co-operation and assistance of farmers in these measures is looked forward to with confidence.

BLACKLEG REGULATIONS.

The following is a summary of the regulations under the Stock Act for the control of blackleg:—

Infected areas are divided into two classes, according to the extent to which they are infected. These are designated by the letters "A" and "B" respectively (the boundaries in the Taranaki and Auckland Districts being duly declared by *Gazette* notice):—

(1.) "Young cattle" means cattle between the ages of fourteen days and eighteen months.

(2.) Removal of any young cattle from an infected area "A" or "B" is prohibited unless such removal is authorized and takes place in accordance with the regulations.

Vaccination of Cattle on certain Lands.

(3.) If the Inspector of Stock is satisfied that blackleg exists on any land wherever situated, or that any land is likely to become infected with blackleg, he may cause the owner to muster all his cattle for inspection and vaccination.

Removal of Young Cattle from an Infected Area "A."

(4.) Any owner desirous of removing from an infected area "A" any young cattle that have not already been vaccinated, or that have been vaccinated more than twenty-one days prior to the date of their proposed removal, must not less than fourteen days and not more than twenty-one days before such removal is intended apply to the Inspector of Stock for the district for a permit to remove the said cattle. Within a reasonable time after the receipt of such application the Inspector will vaccinate such cattle at a time and place as may be arranged. On the expiration of seven days after such vaccination the Inspector may, if satisfied, grant a permit for the removal of the said cattle.

(5.) Any owner desiring to remove from an infected area "A" any young cattle that have been vaccinated within twenty-one days next preceding the date of their proposed removal must apply to the Inspector of Stock for the district for permission to remove such cattle.

(6.) Notwithstanding the foregoing, young cattle may be sent for immediate slaughter to a public abattoir or meat-export slaughterhouse from an infected area "A," subject to the following conditions:—

Every owner must apply to and obtain from the Inspector of Stock for the district a permit to remove such cattle to a specified public abattoir or meat-export slaughterhouse.

No permit will be granted in respect to young cattle from a place on which a case of blackleg has occurred during the six months immediately preceding the date of their proposed removal.

Sale of Young Cattle within an Infected Area "A."

(7.) No young cattle shall be sold or offered for sale in a public saleyard without having first been vaccinated and branded at least seven days previously in the manner provided for in the regulations.

(*a.*) If it is desired to sell in a public saleyard any young cattle that have not been vaccinated, the owner shall make application within the prescribed period to the Inspector of Stock for the district for such vaccination and branding to be carried out.

(*b.*) If any young cattle that have not been vaccinated and branded in accordance with paragraph 7 above are found in any yard or on any land or other places where stock are offered for sale, they shall be deemed to be offered for sale in a public saleyard, and the owner of such young cattle shall be deemed to have committed a breach of these regulations, unless such cattle have been brought into such yard or upon such land by order of the Inspector for the purpose of being vaccinated.

Removal of Young Cattle from an Infected Area "B."

(8.) Owners desirous of removing young cattle from an infected area "B" must within the prescribed period first make application to and obtain from the Inspector of Stock for the district a permit to do so. Before granting such permit the Inspector of Stock may, if he considers it desirable or necessary, vaccinate such young cattle, also all other young cattle on the same farm. (It is anticipated that the action will only be necessary in a small proportion of cases.)

General.

(9.) Permits issued for the removal of young cattle must be produced for perusal on demand.

(10.) Whenever any stock dies or is found dead in an infected area the owner shall, unless otherwise ordered by the Inspector, at once cause the carcase to be destroyed in accordance with the regulations.

(11.) The maximum penalty for a breach of the regulations is £200.

For further information, particulars of boundaries of infected areas, &c., application should be made to the local Inspector of Stock.

SANATORIUM PADDOCKS.

AT shearing-time every sheep is probably handled in a more thorough manner than at any time during the sheepman's year. An excellent opportunity is offered for picking out the sick and weakly and making endeavours either for their cure or disposal. On every farm special paddocks should be provided for this purpose. The area need not be great, but should contain at all seasons of the year good and succulent feed. The following are suitable temporary-pasture crops: Italian rye, prairie, and cow grass; oats and vetches; rape and white mustard; barley and rye-corn—sown as mixtures; soft turnips; barley; Western Wolths, &c. As permanent crops lucerne, also sainfoin, are recommended.

The hill-farmer who has no ploughable ground may also do something to provide himself with "sanatorium paddocks." A good bit of pasture, lying dry, warm and sheltered, and conveniently subdivided, can be utilized. This work is best put in hand at the close of winter. The grass should be hard-grazed by healthy stock, and should then, if possible, be harrowed; but if the country is too broken the harrowing must be dispensed with. A dressing of fine ground limestone should then be given—say, anything from 5 cwt. per acre upwards—together with a somewhat heavy dressing of some form of phosphate suited to the soil. A few blocks of rock salt placed in these paddocks will also help to improve the health of the stock.—*G. de S. Baylis.*

Thirty-five cows of the Ruakura Shorthorn herd have been accepted for registration in the herd-book of the New Zealand Milking Shorthorn Association, Palmerston North. All these cows have been previously tested for milk and butter-fat production, and more than half the number are already registered by the Waikato Dairy Shorthorn Association. The inspection of the Ruakura herd on behalf of the Palmerston North Association was made by Mr. E. Law, of Shannon, who specially commended a number of the animals as excellent types of the milking Shorthorn.

CERTIFICATE-OF-RECORD BULLS.

W. M. SINGLETON, Assistant Director, Dairy Division.

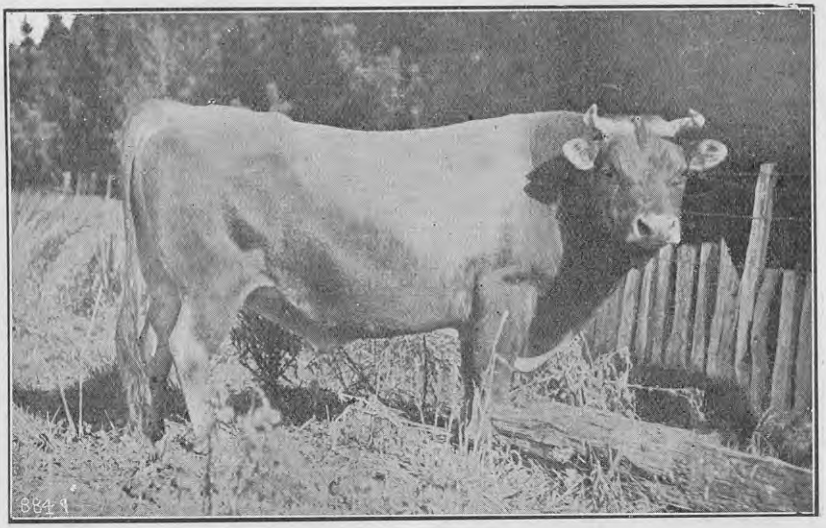
EMINENT'S FONTAINE.

THE subject of this sketch was born in Virginia, United States of America, in 1907. His sire, Eminent, has, according to the 1915 Register of Merit of the American Jersey Cattle Club, some twenty-one daughters with authenticated yearly records, and he is also sire of at least fifteen sons whose daughters have qualified in the authenticated yearly test in the United States.

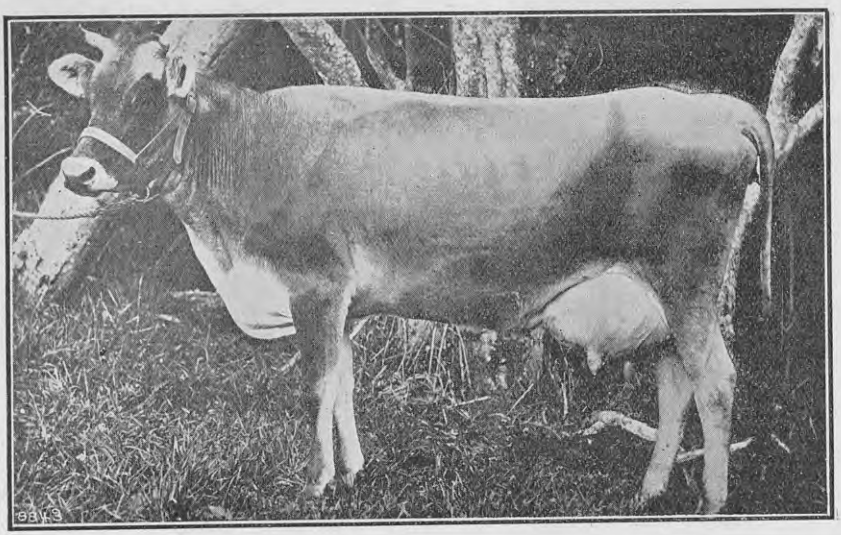
Eminent's Fontaine was imported to New Zealand by Mr. C. G. C. Dermer, of Cheltenham, in 1908, and is still retained at the head of his herd. Eminent's Fontaine has sired twelve certificate-of-record daughters, some of which, considering age and testing conditions, are probably equal in production to those of the best daughters of the other sons of Eminent.

The highest-record daughter of Eminent's Fontaine is Eminent's Maggie, of which an illustration appeared in the July number of the *Journal*. This young cow, commencing as a senior two-year-old, produced in 365 days 11,103 lb. milk, containing 572·13 lb. butter-fat, which more than doubled her certificate requirement. Three daughters, each probably after her second calving, produced over 500 lb. fat. Eminent's Sherry, whose second record was reported also in the last issue of the *Journal*, is one of these. Bred by Mr. C. G. C. Dermer, she was purchased and developed by Mr. F. E. Hellyer, of North-east Harbour, Dunedin. This heifer commenced her first record at the age of 2 years 20 days, and in 365 days produced 424·52 lb. fat. Her following season was started at the age of 3 years 57 days, and during this second lactation period she made the nice record of 554·10 lb. fat, this yield exceeding her standard by 271 lb. Considering the short interval between the completion of her first 365-day period and her second calving, her repeat record is all the more creditable.

Eminent's Girl, bred and tested by Mr. Dermer, produced 515·06 lb. fat during a lactation period started at the age of 3 years 60 days, this being a margin of 232 lb. above the standard requirement. Eminent's Mozelle, also bred and tested by Mr. Dermer, lacked but little to attain the 500 lb. mark, her yield being



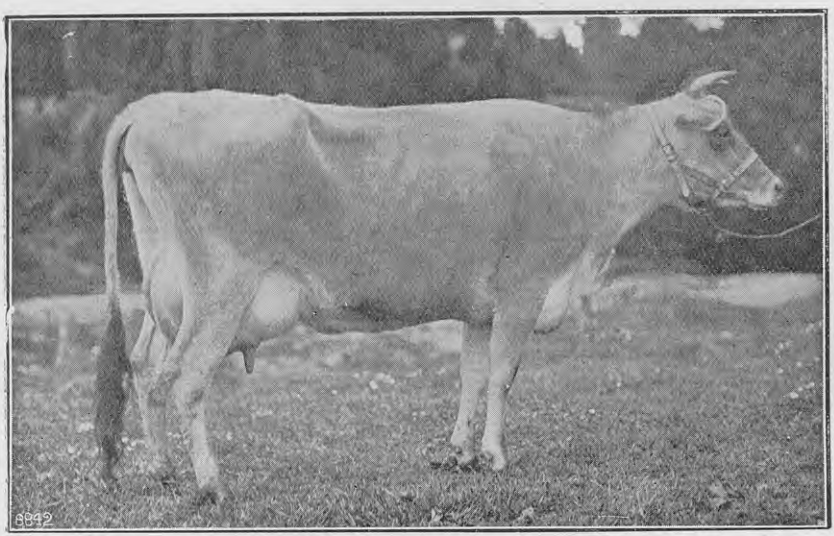
EMINENT'S FONTAINE.



EMINENT'S SHERRY.

494·42 lb. fat in the class for senior three-year-olds. The next highest record daughter of Eminent's Fontaine was tested by Mr. D. H. Kilgour, of Kiwitea. This cow, Famous, as a senior two-year-old produced 446·08 lb. fat, a yield which stamps her as one of the good daughters of the bull in question.

Eminent's d'Norah, in the three-year-old class, has just completed her record with 441·16 lb. fat in 341 days. This young cow was also bred by Mr. Dermer, and was tested by Mr. Hellyer. She makes the twelfth daughter of Eminent's Fontaine to receive



EMINENT'S MOZELLE.

a certificate of record, which now gives this sire more C.O.R. daughters than any other Jersey bull in New Zealand, his nearest competitor being K.C.B., with eleven such daughters.

The pedigree of Eminent's Fontaine shows a considerable concentration of the hereditary factors transmitted by one of the noted bulls of the breed—namely, Golden Fern's Lad. The latter was imported from Jersey Island to the United States, and at the age of nine years was purchased at 441 guineas, and then used for five years in Cooper's "Linden Grove" herd.

Under a Commonwealth of Australia Proclamation, Townsville and Rockhampton, in Queensland, have been declared ports where imported plants may be landed.

A SEED-TESTING KEY.

PROGRESSIVE AVERAGE GERMINATION.

A. H. COCKAYNE, Biologist.

RAPID determination of germinating-capacity is a matter of great importance in the buying of agricultural seeds, and anything in the shape of a "ready reckoner" should be of much assistance to those concerned. In order that the interim reports on seed-samples submitted to the Department for analysis may be the more valuable in determining with a great degree of accuracy the worth as regards germination of a line of seed under test, the writer has had drawn up the set of tables on pages 122 and 123. These tables are compiled from analyses of some ten thousand samples that have been tested in the Biological Laboratory during the past four years, and give the progressive average germination of the main varieties of seed sent in for test.

Each species of seed is divided into four grades: Grade 1 represents first-class commercial lines; Grade 2, lines of good average quality; Grade 3, lines below average quality; and Grade 4, lines of very little worth.

The last column of figures for each grade in the tables is the final average germination capacity of all lines germinating within the range of that grade.

As indicated, the tables are intended to be used in conjunction with my (the Biologist's) interim reports, and an illustration will make their application clear. Supposing, for instance, that the interim report on four perennial rye-grass samples reads as follows:—

Sample No. 1.—86 per cent. average germination in four days.
Sample No. 2.—68 per cent. average germination in four days.
Sample No. 3.—49 per cent. average germination in four days.
Sample No. 4.—26 per cent. average germination in four days.

Then, by reference to the tables it can be safely inferred that the lines Nos. 1, 2, 3, and 4 will give a final germination somewhere near 92 per cent., 77 per cent., 60 per cent., and 34 per cent. respectively. The information thus afforded (together with the purity report) will enable the worth of a line of seed under offer to be rapidly decided.

TABLE SHOWING THE PROGRESSIVE AVERAGE GERMINATION OF THE MOST COMMON AGRICULTURAL SEEDS.

Seed.	Grade.	Average Germination Capacity after Specified Number of Days.											Final Average Germination.
		3 Days.	4 Days.	5 Days.	6 Days.	8 Days.	10 Days.	12 Days.	14 Days.	16 Days.	18 Days.	20 Days.	
		%	%	%	%	%	%	%	%	%	%	%	%
Cocksfoot ..	1. (80–100%) ..	..	26	39	46	68	71	82	83	84	85	86	86
	2. (60–79%) ..	..	14	23	33	53	58	65	70	71	71	73	73
	3. (40–59%) ..	..	12	19	21	35	39	44	47	48	49	52	52
	4. (Under 39%)	..	6	8	10	15	17	19	19	20	21	22	22
Perennial rye-grass	1. (85–100%) ..	67	87	88	89	90	91	91	92	..	..	..	92
	2. (70–84%) ..	53	68	72	72	74	75	76	77	..	..	..	77
	3. (50–69%) ..	39	50	53	55	56	57	58	60	..	..	..	60
	4. (Under 50%)	17	26	27	28	32	33	33	34	..	..	..	34
Italian rye-grass	1. (85–100%) ..	77	..	87	89	91	92	92	93	..	..	..	93
	2. (70–84%) ..	54	..	71	74	77	77	78	78	..	..	..	78
	3. (50–69%) ..	48	..	52	58	59	60	60	62	..	..	..	62
	4. (Under 50%)	20	..	32	33	35	37	37	38	..	..	..	38
Crested dogstail	1. (80–100%) ..	8	34	52	67	85	85	88	88	89	89	92	92
	2. (60–79%) ..	2	13	27	50	53	59	64	66	67	62	70	70
	3. (40–59%) ..	2	6	23	23	37	38	46	49	49	50	55	55
	4. (Under 40%)	2	5	11	11	12	19	19	23	24	27	29	29
Chewings fescue	1. (85–100%) ..	..	..	49	68	77	81	84	88	89	91	92	92
	2. (70–84%) ..	..	..	39	44	63	68	77	77	79	80	80	80
	3. (50–69%) ..	..	..	22	28	38	41	51	57	58	61	62	62
	4. (Under 50%)	..	..	12	25	26	28	28	32	33	33	34	34
Meadow-fescue	1. (85–100)% ..	65	..	87	89	90	91	92	93	94	..	..	94
	2. (70–84%) ..	26	..	77	78	80	81	82	83	83	..	..	83
	3. (50–69%) ..	..	..	52	53	58	60	60	60	61	..	..	61
	4. (Under 50%)	..	..	20	22	25	26	26	29	31	..	..	31
Tall fescue ..	1. (80–100%) ..	..	..	60	71	78	83	83	84	85	85	85	85
	2. (60–79%) ..	..	..	53	68	70	70	70	71	71	72	72	72
	3. (40–59%) ..	..	..	17	36	44	45	47	47	47	48	51	51
	4. (Under 40%)	..	..	15	16	17	17	18	18	19	23	25	25
Sheep's fescue (hard fescue)	1. (Over 60%)..	..	..	30	38	51	59	63	65	70	70	21dys 71	71
	2. (45–60%) ..	..	..	20	26	42	43	51	53	53	54	55	55
	3. (30–44%) ..	..	..	7	15	24	27	34	35	36	36	38	38
	4. (Under 30%)	..	..	6	12	12	16	17	17	19	20	20	20

Seed.	Grade.	Average Germination Capacity after Specified Number of Days.											Final Average Germination.
		4 Days.	6 Days.	7 Days.	8 Days.	10 Days.	12 Days.	14 Days.	16 Days.	18 Days.	22 Days.	24 Days.	
		%	%	%	%	%	%	%	%	%	%	%	%
Meadow-foxtail	1. (Over 50%)..	..	36	26	37	52	54	56	56	57	58	..	58
	2. (35–50%) ..	..	23	27	32	34	36	36	37	40	41	..	41
	3. (20–34%) ..	..	13	19	21	23	24	25	25	26	28	29	29
	4. (Under 20%)	..	8	10	12	13	14	14	14	14	14	15	15
Poa trivialis and *Pnemoralis*	1. (75–100%) ..	32	69	..	75	80	81	82	82	83	20dys 83	22dys 83	83
	2. (60–74%) ..	..	25	..	46	51	54	56	59	60	61	62	62
	3. (45–59%) ..	..	23	..	36	42	45	47	50	53	54	54	54
	4. (Under 45%)	..	16	..	21	22	27	28	28	29	29	29	29
Poa pratensis	1. (75–100%) ..	20	41	..	60	66	68	75	76	77	77	79	79
	2. (60–74%) ..	15	29	..	37	48	55	55	56	63	63	65	65
	3. (45–59%)	8	20	..	31	36	38	45	45	46	49	53	53
	4. (Under 45%)	6	8	..	11	15	21	24	24	27	27	31	31

TABLE SHOWING THE PROGRESSIVE AVERAGE GERMINATION OF THE MOST COMMON AGRICULTURAL SEEDS—*continued.*

Seed.	Grade.	Average Germination Capacity after Specified Number of Days.								Final Average Germination.
		2 Days.	3 Days.	4 Days.	5 Days.	6 Days.	8 Days.	10 Days.	Hard Seeds counted as germinated.	
		%	%	%	%	%	%	%	%	%
Lucerne and English trefoil	1. (85–100%) ..	75	82	85	86	88	88	88	4	92
	2. (75–84%) ..	55	71	72	73	74	75	76	5	81
	3. (60–74%) ..	43	50	54	60	62	62	62	8	70
	4. (Under 60%)	..	..	..	..	..	..	..	..	..
White clover and alsike	1. (90–100%) ..	69	83	84	86	87	88	89	4	93
	2. (75–89%) ..	56	61	70	71	73	77	77	7	84
	3. (60–74%) ..	30	40	56	56	58	61	62	7	69
	4. (Under 60%)	15	29	30	32	33	33	36	4	40
Red clover and cow-grass	1. (90–100%) ..	83	90	90	92	92	92	93	3	96
	2. (75–89%) ..	55	63	74	75	78	79	81	5	86
	3. (60–74%) ..	36	41	50	58	59	60	64	2	66
	4. (Under 60%)	28	30	32	38	40	45	45	2	47

Seed.	Grade.	Average Germination Capacity after Specified Number of Days.									Final Average Germination.
		2 Days.	3 Days.	4 Days.	5 Days.	6 Days.	8 Days.	10 Days.	12 Days.	14 Days.	
		%	%	%	%	%	%	%	%	%	%
Timothy ..	1. (90–100%) ..	41	83	89	..	93	94	95	96	..	96
	2. (75–89%) ..	35	71	72	..	80	83	84	84	..	84
	3. (60–74%) ..	30	60	63	..	63	68	70	70	..	70
	4. (Under 60%)	4	5	7	..	15	16	23	24	..	24
Fiorin (*Agrostis* spp.)	1. (90–100%) ..	..	56	64	..	78	80	83	92	93	93
	2. (75–89%) ..	..	50	62	..	70	79	80	82	85	85
	3. (60–75%) ..	..	..	..	..	..	60	..	..	70	70
	4. (Under 60%)	..	10	14	..	30	33	35	41	42	43
Rape	1. (90–100%) ..	83	92	93	94	95	96	96	..	..	96
	2. (80–89%) ..	..	61	79	79	80	81	86	..	..	86
	3. (65–79%) ..	..	..	63	63	64	65	73	..	..	73
	4. (Under 65%)	..	..	..	..	..	..	..	..	..	..
Swede ..	1. (90–100%) ..	83	84	90	92	93	94	95	..	..	95
	2. (80–89%) ..	58	61	68	72	78	82	85	..	..	85
	3. (65–79%) ..	..	50	54	56	70	73	76	..	..	76
	4. (Under 65%)	..	37	38	42	51	58	59	..	..	59
Turnip ..	1. (90–100%) ..	74	88	92	93	94	94	97	..	..	97
	2. (80–90%) ..	62	70	80	80	81	83	86	..	..	86
	3. (65–80%) ..	47	54	62	67	70	72	75	..	..	75
	4. (Under 65%)..	30	32	36	40	48	50	53	..	..	53

Seed.	Grade. Number of Sprouts per 100 Seed-clusters.	Average Germination (per 100 Seed-clusters) after Specified Number of Days.										Final Average Germination.
		5 Days.	7 Days.	8 Days.	10 Days.	12 Days.	14 Days.	16 Days.	18 Days.	20 Days.	22 Days.	
		Spr'ts	Spr'ts	Spr'ts	Spr'ts	Spr'ts	Spr'ts	Spr'ts	Spr'ts	Spr'ts	Spr'ts	Spr'ts
Mangel and beet	1. (Over 150) ..	120	130	136	143	155	162	170	176	176	178	178
	2. (100–149) ..	72	85	86	91	104	107	115	122	123	124	124
	3. (80–99) ..	43	52	56	69	77	84	86	88	90	92	92
	4. (Under 80) ..	31	36	36	45	46	48	54	59	65	68	68

DAIRY-HERD TESTING.

PROGRESS OF THE KAUPOKONUI ASSOCIATION.

S. McKENZIE, Dairy Instructor, Manaia.

THE Kaupokonui Cow-testing Association (Taranaki) was organized and the work started in the year 1910. The results obtained so far indicate this to be one of the most successful organizations of its kind—success assured by a spirit of enthusiasm among all the members. After two years' work under the general control of the Dairy Division of the Department of Agriculture, the Kaupokonui Co-operative Dairy Company thought so highly of its testing association that it approached the Department to appoint an officer to specially continue the work—salary and expenses to be paid by the company. This was carried out, and has proved satisfactory to all concerned. It is pleasing to note that the neighbouring Joll Co-operative Dairy Company is now running a large association on similar lines, and, judging by recent inquiries, other companies are likely to follow suit.

During the past six years a great deal has been written about the value of cow-testing, but the writer feels confident that the Kaupokonui records quoted below will help to convince many non-testing farmers of the benefits gained by association members in this district who consistently test their herds.

The following figures show the increase in butter-fat gained by members who have tested continually from the season 1910–11 to that of 1915–16 :—

Herd.	1910–11.		1915–16.		Increase per Cow in Six Years.
	Number of Cows.	Herd Average Butter-fat.	Number of Cows.	Herd Average Butter-fat.	
		lb.		lb.	lb.
1	26	183·00	25	305·38	122·38
2	88	229·66	65	348·80	119·24
3	67	230·82	37	371·38	140·56
4	48	219·48	46	261·08	41·60
5	51	205·22	63	272·44	67·22
6	35	217·91	35	281·48	63·57
Herds' average	315	228·76	271	306·94	90·01

THE KAUPOKONUI ASSOCIATION'S TESTING-ROOM.

Increases gained by members who have tested continually from 1911–12 to 1915–16 are as follows:—

Herd.	1911–12.		1915–16.		Increase per Cow in Five Years.
	Number of Cows.	Herd Average Butter-fat.	Number of Cows.	Herd Average Butter-fat.	
		lb.		lb.	lb.
1	55	241·87	43	312·39	70·52
2	37	241·58	36	353·55	111·97
3	29	182·51	26	289·71	107·20
4	12	404·48	15	452·15	47·67
5	37	200·89	37	308·48	107·59
Herds' average	170	234·23	157	317·76	92·65

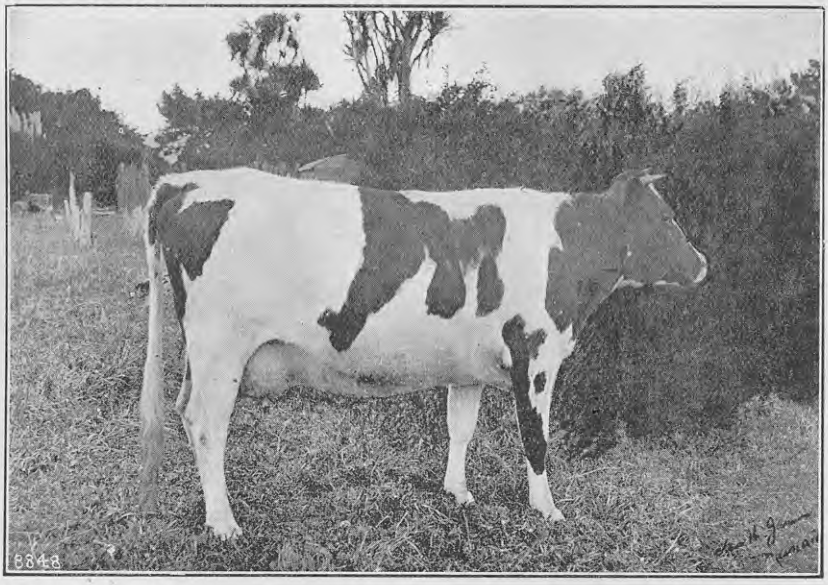
The table which follows shows the increases gained by those members who have tested from 1912–13 to 1915–16:—

Herd.	1912–13.		1915–16.		Increase per Cow in Four Years.
	Number of Cows.	Herd Average Butter-fat.	Number of Cows.	Herd Average Butter-fat.	
		lb.		lb.	lb.
1	20	191·47	18	300·39	108·92
2	49	294·41	47	357·01	62·60
3	46	211·94	46	236·95	25·01
4	9	224·07	14	296·61	72·54
5	82	216·09	78	264·29	48·20
6	58	255·02	50	332·65	77·63
7	34	281·01	29	340·57	59·56
8	31	245·67	31	274·39	28·72
9	6	224·58	6	343·90	119·32
10	48	236·96	43	255·23	18·27
Herds' average	383	241·31	362	292·56	51·04

The records, of which the above are examples, indicate clearly the progress the farmers concerned are making, and have enabled them to use their best judgment in grading their herds up to an increased average yearly production.

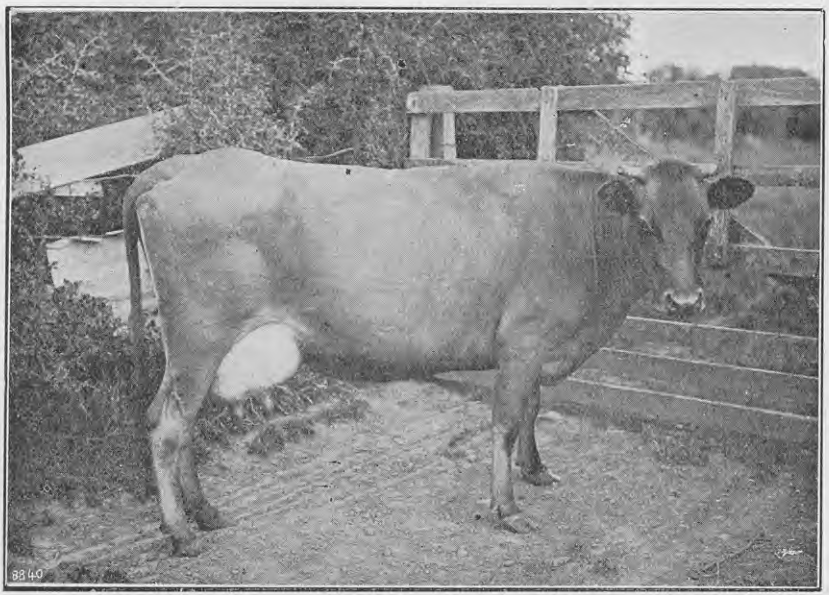
Testing has taught many farmers to milk fewer cows, and has shown them that by paying more attention to the smaller herds and feeding the fewer cows better they were more than compensated for the culls sold. Furthermore, they have learned that the best and cheapest way to improve their dairy stock is by breeding their own cattle and selecting progeny from the profitable members of their herds. The only way to ascertain the animals from which to breed is by the use of the scales and tester.

In the season of 1910–11 at Kaupokonui twenty-four herds, representing 1,454 cows, were under test, their average production



MR. J. IMLAH'S TOPSY DE KOL.

Record in Kaupokonui Testing Association, 493·62 lb. butter-fat in 227 days.



MR. G. A. BERRY'S CREAMY.

Record in Kaupokonui Testing Association, 478·87 lb. butter-fat in 254 days.

being 222·02 lb. butter-fat per cow. For the past season (1915–16) sixty herds were tested, representing 2,343 cows, and these had an average of 283·36 lb. of butter-fat per cow, thus showing the association increase to be 61·34 lb. fat per cow in six years.

Kaupokonui has 229 suppliers, who have milked during the past season 10,212 cows, the average production from these being 224·47 lb. butter-fat. In the 1910–11 season 10,085 cows were milked and averaged 193·14 lb. butter-fat per cow. Thus after six years the company has an increased yield of 31·33 lb. fat per cow, obtained very largely by assistance from its cow-testing association.

NOTES ON PARTURITION.

A. M. PATERSON, M.R.C.V.S., Veterinarian.

WELL-RAISED, properly fed farm animals pass through the ordeal of parturition with very little risk to themselves or loss to their owners if during the operation they are not too hastily interfered with. It is the instinct of a pregnant animal as parturition approaches to seek a quiet corner where she may be alone. Bustle, excitement, and interference at this time may all mean loss.

Dairy cows at calving-time should be kept by themselves in a small paddock near the homestead, where they may be watched; and when the important event begins it should be allowed to proceed without even an attendant being seen or heard. On no account should he break the membranes that first appear, as they and their contained fluid act as a natural distender which makes the free and uninterrupted passage of the offspring easy. Attendants may imagine by breaking the membranes they are making an outlet for the calf, &c., but this is an utterly mistaken notion. When the membranes rupture early of their own accord, or are deliberately torn, then the offspring has to be forced through a contracted avenue, and more than likely some of the members will stick and give rise to considerable trouble, which may end in the loss of a valuable animal and its offspring. What has been said in regard to the cow is applicable to all animals. If it is thought that an animal requires some assistance, it can be given without rupturing the membranes. A little thought is all that is needed to discover how this may be accomplished.

If after calving, lambing, or foaling the afterbirth does not come away immediately there is no cause for anxiety. If it is still retained after a few hours it will be necessary to decide what is

to be done. In the case of the cow, there will be no urgency if the animal is to all appearance well and willing to eat. In fact, the case may be left to nature so long as the cow keeps up her full milk-supply and continues to chew her cud, although the protruding membrane must be kept sweet and clean by frequent washings with a non-poisonous antiseptic. In the case of mares, however, the membrane must be removed within a few hours after foaling. If it is left for more than twenty-four hours the animal may become foundered and die.

If the owner does not know how to proceed with the removal of the membrane himself, he should get the nearest veterinary surgeon to do it for him. If no qualified veterinary surgeon is available, he should seek the assistance of one of those observant, instinctively wise, and handy men to be found in most districts, and whom veterinary lecturers make a point of coaching in just such matters as the one now being discussed. If a farmer has to interfere in any of these operations he should safeguard himself against inoculation by a liberal use of antiseptics, and he should abstain from such operations as castration for at least a few days, otherwise he will run unnecessary risk of losing a considerable percentage of the animals operated on. Coolness, cleanliness, antiseptics, and lubricants are essentials in all parturition cases.

In regard to dairy cows that have had more than three calves, milk-fever should always be guarded against, and this is best done by not allowing heavy milkers to approach calving in too high condition. Prevention of disease has now become the chief aim of all branches of medicine, and, besides being infinitely easier than treating it when it does occur, it is very much more profitable. Milk-fever is an easily preventable disease, and the simple precaution which has been given regarding it, if followed out by dairy-farmers, would secure them much profit where hitherto they have suffered serious loss.

The Black Minorcas topped all the light breeds in egg-production at Ruakura last season, being about 5 per cent. ahead of the White Leghorns, which came second. The Ruakura Black Minorca strain has been specially developed during the last few years.

Eucalyptus Macarthuri, apart from its timber qualities, makes excellent firewood, burning almost like coal. Moreover, it does not crack in the fire, and is thus safer than many woods for the open hearth.

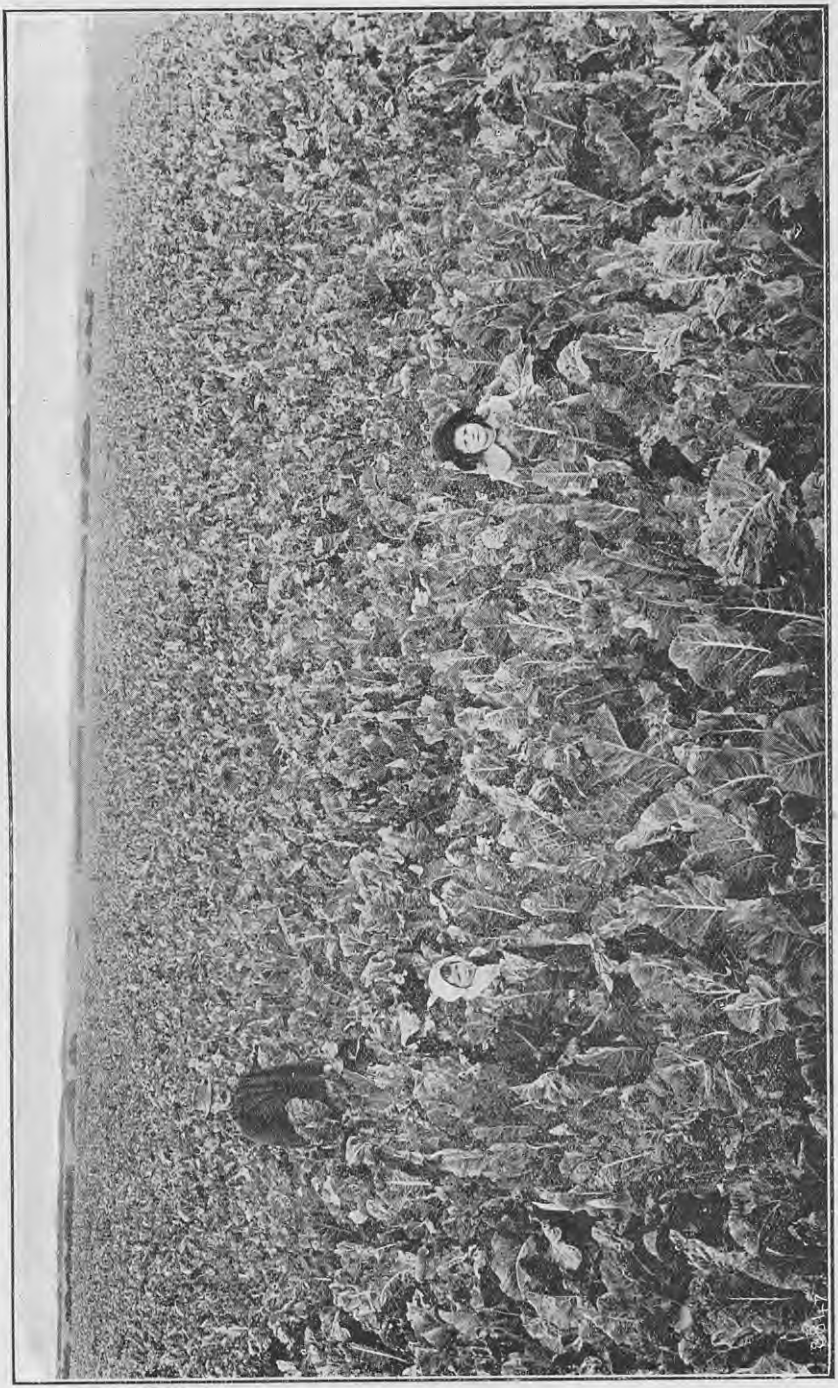
A good early start was made with incubation at the Ruakura poultry plant this season, several vigorous lots of chicks having been hatched early in July. The Poultry Overseer hopes to finish incubating in September.

CAULIFLOWER-GROWING IN CANTERBURY.

THE accompanying photograph shows a fine 10-acre crop of cauliflowers at Willowbridge, South Canterbury, grown in the past season by Mr. W. R. Grant. The field was cropped with potatoes in the previous season, yielding 15 tons to the acre of Up-to-Date. It was then ploughed (with the subsoiler on) to a depth of 10 in.

SOME OF THE WILLOWBRIDGE CAULIFLOWERS.

and left rough for the frost to pulverize the soil. In October and November, 1915, the field was grubbed and tine-harrowed twice each month, then rolled twice and harrowed to keep in the moisture. The land, being of a heavy nature, was very moist with the working when the first lot of plants was ready for planting out from the beds. Transplanting commenced the first week in December and kept on until January. Then broccoli-planting started, and was completed early in February. Owing to the very dry weather the young plants did not start very well, and took a lot of looking after, going over the field and putting in fresh plants where others had died. When the rain came in March no more trouble was experienced, and the plants grew very fast, the soil being warm.



MR. W. R. GRANT'S 10 ACRES OF CAULIFLOWERS AT WILLOWBRIDGE.

The first of the cauliflowers did not come in very well, but after the next rain, which was a good heavy one, they were of first-class quality. No manure was used. Mr. Grant has used manure in past seasons, but has come to the conclusion that on his soil the special application of artificial manure to this crop is of no use. The cutting and bagging of the crop entails a great deal of work. Mr. Grant's largest cut for one week was 183 sacks. The produce is sent south as far as Dunedin and north to Wellington. For the whole season the number of sacks sent away is about three thousand. In one season Mr. Grant sent to a Christchurch firm alone 25 tons of pickling-cauliflowers. — *T. N. Baxter, Fields Inspector, Waimate.*

SOYA-BEAN VARIETY TEST.

NINE varieties of Soya beans received from Purdue University, Indiana, U.S.A., were tested at the Moumahaki Experimental Farm last season. The beans were planted in October in 24 in. rows. Very bad weather followed for more than a month, but towards the end of November better conditions enabled the plants to become erect, and rapid growth followed, successfully checking the growth of weeds. Inoculated soil was not used, and no sign of nodules was observed on any of the varieties. The manure applied per acre was 8 tons farmyard, 4 cwt. Ephos phosphate, ½ cwt. sulphate of potash, and ¼ cwt. sulphate of ammonia. The results of the test are tabulated below :—

Variety.	Date planted.	Weight pulled for Forage, 5th Feb., 1916, in Tons per Acre.	Date pulled for Seed.	Yield in Bushels per Acre (60 lb. bushel).	Average Number of Seeds per Plant.	Approximate Number of Seeds per Pound.	Number of Seeds per Pod.	Length of Straw in Inches.	Colour of Seed.
	1915.		1916.						
1. Mikado ..	Oct. 12	6·28	April 5	28	63	2,360	3	29	Yellow.
2. Auburn ..	,,	13·14	,,	45	122	2,828	3	46	Black.
3. Ito San ..	,,	12·00	,,	38	99	2,680	3	27	Yellow.
4. Tashing ..	,,	12·54	,,	21	59	2,950	2	33	Green.
5. Black Beauty	,,	11·14	,,	24	95	4,130	3	32	Black.
6. Hollybrook	,,	11·14	,,	20	68	3,490	2–3	27	Yellow.
7. Sable ..	,,	13·14	,,	24	122	5,280	2–3	34	Black.
8. Early Brown	,,	14·28	,,	27	65	2,520	3	37	Brown.
9. Morse ..	,,	10·28	,,	14	51	3,710	2	57	Brown.

—*T. W. Lonsdale, Manager, Moumahaki Experimental Farm.*

MANGEL TRIALS AT MOUMAHAKI.

DURING the season 1915–16 a number of varieties of mangels were under trial at the Moumahaki Experimental Farm. The variety trial plots were heavily manured, but the aspect was not all that could be desired. Pine-trees excluded the sun considerably, and no doubt the roots of the trees extracted considerable nutriment from the soil. Following was the manurial treatment, all quantities being per acre: Farmyard manure, 10 tons; Ephos phosphate, 4 cwt.; sulphate of potash, ½ cwt.; sulphate of ammonia, ¼ cwt. The seed was sown on 12th October, 1915, and the crop weights, taken on 24th May, 1916, are as follows:—

	Tons per Acre.
1. Wiboltt's Danish Yellow Long-ovoid Mammoth	63·14
2. Wiboltt's Danish Yellow Short-ovoid Giant	51·14
3. Kelway's Best of All	58·28
4. Kelway's Exhibition Golden Tankard	43·71
5. Kelway's Langport Yellow Globe	67·14
6. Kelway's Crimson King	46·00
7. Cooper's Mangold Sugar-beet	31·14
8. Cooper's Mammoth Long Red	71·14
9. Cooper's Jersey Queen	48·86
10. Cooper's Yellow Globe	44·28
11. Moumahaki seed—Long Red	72·85
12. Moumahaki seed—Sugar Mangel*	48·57
13. Sutton's Golden Tankard	37·14
14. Sutton's Prizewinner Yellow Globe	65·71
15. Sutton's Up-to-Date	42·00
16. Sutton's Jersey Queen	50·57
17. Kelway's Prizewinner	43·42
18. Kelway's Long Red	62·57
19. Sutton's Sugar	46·28
20. Webb's New Lion	57·14

* Grown from seed raised from selection of Sutton's Long Red and Sugar Mangel.

The main field crop was confined to a few varieties, the manurial treatment being also different to the variety trial plots. The main crop followed grass, the land being skim-ploughed during the early part of June, 1915, and left without further treatment until September. It was then ploughed deeply, worked, and dressed with refuse salt, 5 cwt. per acre being applied a month prior to sowing the seed, which was sown on 12th October at the rate of 6 lb. per acre. The plants were singled during the latter part of November and early December; the crop was weighed in the first week in July.

Manurial trials were carried out as follows, the variety in each case being Sutton's Mammoth Long Red:—

1. Superphosphate 4 cwt., sulphate of potash ½ cwt., sulphate of ammonia ¼ cwt., all per acre. Weight of crop (roots only), 72·85 tons per acre.

2. Ephos phosphate 4 cwt., sulphate of potash ½ cwt., sulphate of ammonia ¼ cwt., all per acre. Weight (roots only), 36·28 tons per acre.

3. Ephos phosphate 4 cwt., sulphate of ammonia ½ cwt., sulphate of potash ¼ cwt., nitrate of soda (applied as a top-dressing) 1 cwt., all per acre. Weight (roots only), 67·14 tons per acre.

4. Superphosphate 2 cwt., Ephos phosphate 2 cwt., sulphate of potash ½ cwt., sulphate of ammonia ¼ cwt., all per acre. Weight (roots only), 66·54 tons per acre.

The nitrate of soda in trial No. 3 was applied on a showery day, the date being 21st December. The cost of manure in this plot was 16s. over that of No. 2, but, as shown, the increase in the crop was 30·86 tons per acre. From the trials one would infer that Ephos phosphate is too slow-acting for mangels, but the result of a single test must not be regarded as conclusive.—*T. W. Lonsdale, Manager, Moumahaki Experimental Farm.*

THE FIRST HUMBLE-BEES IN NEW ZEALAND.

MR. I. HOPKINS, formerly Apiarist in the Department, forwards the following note:—

When writing Bulletin No. 46, the "History of the Humble-bee in New Zealand," for the Department of Agriculture I mentioned on page 7 (subject to correction) that some bees which had been imported by a lady were liberated by a resident at Timaru in 1883. I did not know to whom or where to apply for particulars, so left it an open question; but I am now in possession of the facts, which I came across in the American *Beekeepers' Exchange* for June, 1881, when looking through an old volume of that journal for something else. It is a reprint from the *Timaru Herald* of the 7th February, 1881, and its record will make the history complete. The account runs as follows:—

"The two humble-bee queens, the survivors of a shipment of eighteen consigned to Mrs. Belfield, were turned out on Mr. Bristol's farm on Saturday morning. They were strong and healthy, and flew away briskly against the wind. Being liberated amidst clover-fields, there is every chance of their doing well. Some years ago the present Premier of New Zealand attempted the introduction of these useful insects, the last of the creatures dying when within ten days' sail of our coast.

"Not being aware of any successful attempt at their acclimatization being made before, we believe the pair of queens set free on Saturday have the honour of being the first of the kind in the country. The thanks of the farmer are specially due to the lady who, when in London

three years ago, saw Mr. Alfred Neighbour (a somewhat celebrated apiarian at Home) on the subject of sending humble-bees to New Zealand.

"Mr. Neighbour took up the matter *con amore*, and promised, when opportunity offered, to send out a consignment, pointing out the risk attending such a shipment. That gentleman spared neither trouble nor expense in endeavouring to make the venture a success. In the first place, he employed an agent in a district in Scotland where the bees were usually plentiful to mark down the nests in summer, and then, in the early part of the winter, each nest with its queen was carefully dug out and placed separately in a nest of moss in a box for export. Being in a state of torpor when taken from their Scottish home, it was *sine qua non* that they should remain in this state the whole of the voyage to the Antipodes; consequently they were placed in the ice-house of the 'John Elder,' one of the Orient line of steamers. On arrival at Melbourne the box was handed over to the captain of the 'Arawata' to carry on to New Zealand.

"From the appearance of fully one-half of the dead insects there is every reason to believe that they were alive on arrival at the Bluff, but unfortunately a delay in their transit here took place which was fatal to all but two. The telegram to Mr. Belfield telling of their arrival was dated the 31st January, at the same time intimating that the 'Arawata' came in on the 26th. Yet further delay took place, and the interesting strangers did not arrive at Timaru till the 3rd February. Mr. Hislop, late of the Timaru Domain, kindly took charge of the box, and opened it with the result above stated."

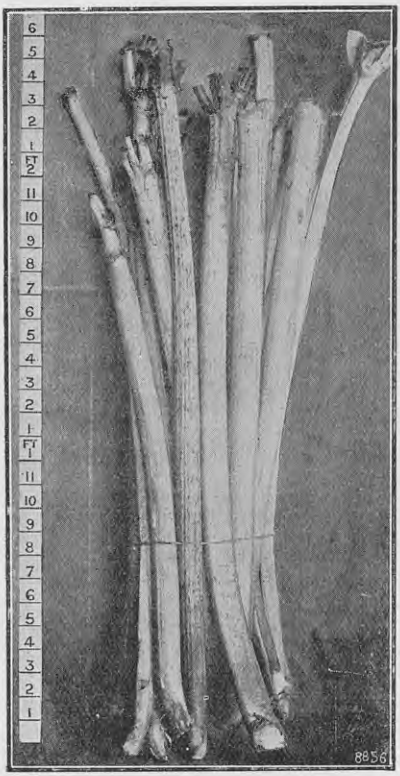
SPRING CULTIVATION.

With autumn and early winter sown crops the question of getting rid of surplus water is generally one of more importance than that of conserving water within the soil. With spring-sown crops the question of conserving mositure in ill-drained soils, as well as in all soils of a porous nature, is one of paramount importance. The proper preparation of the seed-bed by deep cultivation, by fining, and consolidation of the soil thereafter is a primary factor in helping to keep the soil moist. The Cambridge roller is an indispensable implement in such operations, but there are still numerous farms where such things as Cambridge rollers have been heard of but never possessed or utilized. The Cambridge roller is not an implement in everyday use upon a small farm, neither is it a very expensive article, and consequently three or four adjacent farmers might easily share one between them. A roller of medium weight with an extra-strong frame is the most useful kind of implement for a small farm, as it may be used as a light roller, and can be weighted by placing bags of earth upon the frame to any reasonable weight desired.

Failing a roller perhaps the next best thing, and also a most inexpensive article, is the rubbing or fining board. It resembles a sledge with close decking, but with the boards nailed slightly slantways instead of at right angles to the runners, and overlapping as in weatherboarding. This sledge-like implement is turned upside down, weighted with a bag of earth if necessary, and pulled by two horses. It will fine down a ploughed field upon which the harrows or disks have ceased to accomplish satisfactory work, and it also performs a considerable amount of levelling, while making a firm and compact seed-bed. It probably is better adapted for use upon clays and loams than upon very light loams or sand; but even on sands it may be made to perform fairly good work by placing most of the weight towards the centre or back rather than near the front.—*G. de S. Baylis, Fields Supervisor.*

WINTER RHUBARB.

THE rhubarb-stalks depicted in the photograph are fair samples of the produce of the bed at Arataki Horticultural Station, from which they were taken. The roots have never been disturbed. Seed was sown in November, 1913, the seedlings thinned to about 2 ft. and left to grow. The plants have produced abundantly for two winters and two springs. They are never pulled bare, and are not pulled at all during the summer months. Manuring has been very light. The variety is Topp's Winter, from seed selected from the best plants grown previously with equal success by the same grower at the Weraroa Experimental Farm. As will be seen by the rule in the photo, the stalks shown are between 2 ft. and 2 ft. 6 in. in height.—*W. H. Taylor, Manager, Arataki Horticultural Station.*



THE MARTON EXPERIMENTAL PLOTS.

THE following report on operations at the small experimental area near Marton Junction worked by the Department is furnished by Mr. G. de S. Baylis, Fields Supervisor :—

The Marton plots up to the close of 1914 had been chiefly used as propagating and preliminary rough trial plots for various cereals recently introduced into the country. Consignments of a bushel or so were sown and tested, and such varieties as seemed likely to be useful or suitable to any particular district were distributed from the stocks grown, through the channel of the co-operative experiment, to farmers in various parts of the country. In this way Federation, John Brown, Jonathan, Taragon, and Yandilla King wheats, all of which varieties are now well known in certain districts of the North Island, were originally introduced to this country.

Numerous other varieties of wheats from Australia, such as Comeback, Bobs, and Powers Fife, were also tested, as well as Canadian Fifes, both red and white varieties, Imperial Amber, and Turkey Red, all being varieties imported from Canada ; Grenadier and Pearl wheats imported from Sweden ; and numerous other cereals from England and elsewhere. Among Swedish importations, the White Ligowo oat—now thoroughly well established in the Wairarapa, where it has given excellent results—also Hannchen barley, have been markedly successful in certain districts, and, like the wheats, were first grown in this country at the Marton plots, from whence seed was distributed to farmers.

The soil immediately around Marton Junction is of poor quality and of shallow depth, being immediately imposed upon a stiff yellow clay. The position is exposed and very wind-swept. This fact, together with the lack of drainage, renders the period of growth a very short one on account of the low soil-temperature, since the spring growth starts late, and droughty conditions usually make their appearance on the advent of summer. On such a soil and under such conditions it is normally only possible to successfully grow such crops as wheat, oats, &c., which make much of their growth in late autumn and early spring, and complete their growth before hot summer weather and droughty conditions set in.

In order to correct the natural errors in this soil, and thereby to render it fitted for the production of satisfactory crops other than cereals, it appeared to be necessary to drain the land thoroughly, to lime it to correct acidity, to improve its texture, and to plough in green material to increase the humus-content and increase the porosity of the surface soil itself. By such means it was intended to render the soil sweeter, better drained, warmer, sooner workable after rain, less subject to drought, and consequently give it possession of a longer growing season, which would alone result in enabling it to grow satisfactory crops of many kinds which make their maximum growth

between the late spring and early autumn. It was also considered that by such treatment less injury would be done to the soil when feeding off swedes or suchlike crops in the winter season, and that the stock would benefit by the dryer and warmer soil conditions prevailing.

A scheme was consequently drawn up whereby all the land with the exception of a small area was subdrained by the mole plough at intervals of 7 ft. Pipe connections and outlets were put in when necessary. The cost of this work was approximately £3 per acre. After the land had been drained it was divided into four areas, as follows :—

Area A consisted of $5\frac{4}{11}$ acres, plots 1 to 9 inclusive. Ground limestone at the rate of 1 ton per acre was applied to all acre plots, the balance consisting of strips of $\frac{1}{11}$ acre each dividing the acre plots from one another. These were treated in various ways for observation purposes.

Area B consisted of $5\frac{4}{11}$ acres, plots 10 to 19 inclusive. Ground limestone at 1 ton per acre was applied to all plots large and small. Upon this area a light crop of green oats was ploughed under in the early spring of 1915.

Area C consisted of $5\frac{4}{11}$ acres, plots 20 to 29 inclusive. Ground limestone, 1 ton per acre, was given to all plots. Green oats were ploughed under in early spring of 1915. All plots were also subsoiled to an extra depth of about 4 in.

Area "Triangle" consisted of a small area undrained and not recently limed.

In all cases in the areas A, B, C, the trial plots are the acre plots. The divisional plots between each acre plot—viz., $\frac{1}{11}$ acre strip—are treated in different manner for observation purposes only.

Last season the whole area was sown in kales and rape, which were fed off with sheep. The plots to be green-manured were subsequently ploughed and sown in oats, and the area without green manure was also ploughed. The green manure was turned under in the early spring.

According to the scheme arranged it was proposed to work this land for a period under a regular rotation, with a view to improving its fertility and ultimately rendering it more productive and suitable for the satisfactory growth of many other varieties of crops in addition to cereals. The rotation was as follows: Red clover two years, then wheat, turnips, or a similar crop, followed by oats or a similar crop. The land was to be sown down to grass with the clover crop following if it was desired to then put it out of cultivation for a period.

Green's Ruakura oat was the oat used for the season, and grew well. The boisterous winds and rains in the early part of the season, however, played great havoc with the crop, and some of the plots were badly laid. Hence records of yields are unreliable, since some crops were more difficult to cut than others. The chaff actually cut and bagged, however, off $1\frac{2}{11}$ acres on area C (drained, limed, green-manured, and subsoiled) was at the rate of 4·27 tons per acre. Area B (drained, limed, green-manured), which on account of rough weather was badly laid, only yielded at the rate of 1·66 tons per acre. Area A (drained and limed) yielded 3·047 tons per acre.

In the oat plots the amount of seed and manure sown in each case was as near as the drill used would put same out—viz., 127 lb. oats

and 170 lb. of manure mixture per acre, of equal parts slag, dried blood, and bonemeal.

In passing it may be remarked that I believe this is the first year in which potash has been omitted from the mixture used for cereals at the Marton plots; and although a little rust is usually noticeable on varieties subject to same, this season even varieties like the Ruakura oat, which at Marton is usually practically free from rust, rusted considerably. Owing, fortunately, to habit of this variety of maturing early its period of greatest development had passed before the rust made its appearance, and consequently the yield was not affected to any considerable extent. The oats were sown on 15th September.

John Brown wheat, a variety originally imported by the Department from Australia, grown at Marton plots and from there distributed to farmers, was the variety purchased from one of the New Zealand growers and sown for the season. The seeding was 160 lb. per acre, and manure 150 lb. per acre. The manure mixture was equal parts slag, bonemeal, and dried blood. The actual weights threshed were as follows: Area C (drained, limed, green-manured, and subsoiled) yielded 39 bushels 35 lb. per acre. This sample off the mill gave, roughly, 56 lb. of first quality for every bushel of total yield. Area B (drained, limed, and green-manured) yielded 33 bushels 8 lb. per acre. This sample gave, roughly, 54 lb. of first quality per bushel of yield. Area A (drained and limed) yielded 35 bushels 36 lb. per acre, and gave about 56 lb. of firsts for every bushel of yield.

Owing, unfortunately, to a breakdown in the gearing of the drill when these plots were being sown, areas C and B had to be resown, and consequently for record purposes they cannot be compared with A, which had the advantage of being sown earlier, with the seed lying convenient to the fertilizer. Areas C and B were resown without further manure nearly a month later.

As regards the clover, according to the scheme two acre plots in each area were to be sown with this crop. It was, however, found necessary to fallow plot 11 for a time to clear it from weeds. The clover on plot 21 was also ploughed up to utilize the land for another leguminous crop. Thus practically only 1 acre of clover in each area was left for comparative purposes.

Owing to climatic conditions at the time of the first cut it was not possible to stack the produce of each plot separately, but the total weight of the first cut when pressed was found to be within a fraction of the total weight of the second cut. The interim notes taken place the relative yields of the plots in the same order as in the second cut. It will therefore be permissible to place the weight of the first cut approximately at the same as the second cut. On this basis the yields were as follows:—

Area C (drained, limed, and subsoiled), plot 23: second cut, 42 cwt. 1 qr. 7 lb., baled by machine; first cut, 42 cwt. 1 qr. 7 lb. (approximate): total, 84 cwt. 2 qr. 14 lb.

Area B, plot 13: second cut, 27 cwt. 2 qr. 2 lb., baled by machine; first cut, 27 cwt. 2 qr. 2 lb. (approximate): total, 55 cwt. 0 qr. 4 lb.

Area A, plot 3: second cut, 26 cwt. 2 qr. 18 lb., baled by machine; first cut, 26 cwt. 2 qr. 18 lb. (approximate): total, 53 cwt. 1 qr. 8 lb.

The clover plots were sown on 22nd October, 1914, and were hard grazed in the autumn following when the sheep were eating off the kale, as the kale was not fenced off from the clover plots. The grazing and treading given to the clover was consequently heavy, and it suffered severely, at one time looking as if it might not make a satisfactory recovery. The seeding was 20 lb. per acre. The manure used per acre was 84 lb. basic slag, 84 lb. superphosphate, and 42 lb. sulphate of potash. This was a mixture which in a box test with Marton soil gave very satisfactory results, and for that reason was the one I selected for use.

On 14th January some observations were made on the subsoiled plot 23, and it was found in many places that a good top soil of dark colour existed to a depth of fully 11 in., and that the clay subsoil was loosened for about 2 in. below that; also that the clover-roots had penetrated still considerably farther than that into the clay below the subsoiled area. The average depth of the top soil on this plot used to be about 8 in.

On the same date, on plot 13, which had received the same treatment as plot 23 without subsoiling, the average depth of true top soil appeared to be about 8 in., with pure clay subsoil underneath. This had been penetrated to a moderate depth only by the clover-roots. On plot 3, also not subsoiled, the depth of the dark top soil was about 8 in.

It would appear, therefore, that the process of subsoiling has considerably assisted in deepening the top soil proper, and that in such a process a deep-rooting leguminous plant, such as cow-grass, is likely to accomplish far more subsoil tillage than shallow-rooting crops such as oats, barleys, &c. This evidence as to the increase in depth of true top soil on the subsoiled plot, No. 23, explains doubtless in a great measure the increased productiveness of plot 23 over the other clover plots in areas B and A, which were not subsoiled.

For the other plots in the rotation chou moellier was selected instead of swedes. At time of writing these have not yet been fed off, and will be reported upon later. All stubble plots in the rotation were sown in Italian rye-grass for grazing off during the winter season.

WORK FOR THE COMING MONTH.

THE ORCHARD.

J. A. CAMPBELL, Assistant Director, Horticulture Division.

THE earlier part of September can, where necessary, be devoted to the completion of certain orchard-work which through unavoidable circumstances may have been impossible to attend to earlier in the dormant season, such as the application of winter sprays and the pruning of pip-fruits. Even the pruning of stone-fruits, although the trees are in bloom, may be continued where necessary. But to adopt this plan unnecessarily is a great mistake; not only does it create many unnecessary problems, such as "My trees are bursting into bloom: is it too late to spray with oil?" or "Should I spray with Bordeaux first and oil afterwards?" and so on. The advance of the season brings with it more than sufficient seasonable work to keep the average ochardist fully occupied, and much of the future welfare of the orchard depends upon the manner in which the work at this period is carried out, particularly that in connection with the control of black-spot and other fungus diseases.

The principal work for the month will include—Cultivation; the application of a fungicide for the control of peach leaf-curl, and fungus diseases affecting the English plum (where this work has not been completed during the previous month); the application of a fungicide for the control of black-spot and powdery mildew in respect to those pip-fruits sufficiently advanced for the purpose; the second oil spray for the control of woolly aphis (where not done during the previous month); and grafting and planting.

CULTIVATION.

It must be remembered that spring ploughing is the last and most important instalment of this form of cultivation for the season, therefore the work should be thoroughly done. September, as a rule, provides the best conditions for the work—depending, of course, on locality and climate conditions. Ploughing should not be done while the soil is wet and claggy, nor should it be deferred until the soil becomes more or less baked and hard through the

heat of the sun. The object aimed at in ploughing the orchard is to thoroughly break up and aerate the soil, and to provide the best possible conditions for the roots. For this purpose a more or less light skimming of the surface is useless. The soil must be worked as deeply as possible without, of course, undue injury to the roots. Even this is a matter which is often given more consideration than is really necessary. There are many instances where a little less consideration for the roots and a little more for effective work would result in considerably more benefit to the tree. Provide the proper soil conditions and the roots, in moderation of course, can be pretty well left to take care of themselves.

Before commencing to plough gather up all prunings, &c. Ploughing should not always be done the one way; cross-ploughing should be carried out in cases where autumn ploughing has been done. In any case open up between the rows of trees and finish up by throwing the furrow away from the trees. This can easily be levelled off by the proper manipulation of the disk cultivator. Work as close up to the trees as can be done without injury, in order to reduce subsequent hand-work.

After ploughing, the soil should be worked down to a fine tilth and uniformly consolidated. No cavities or air-holes are to be found in a well-cultivated soil. The soil-particles, although not packed hard, should lie in close contact. In this way the requisite amount of warmth, air, and moisture is more satisfactorily provided and the conservation of moisture most readily maintained. Such implements as the disk cultivator, Cambridge roller, clod-crusher, harrows, &c., are used according to the nature of the soil for breaking down after ploughing. How soon after ploughing this work should commence also depends on the nature of the soil. With some soils, such as those of a clayey nature, this is an important point, and one that requires watching very closely. If commenced too soon the soil will be found to be stiff and puggy, and if left too long it will bake in the sun and become absolutely impossible to work down satisfactorily in any way. With lighter and freer soils the question is much less important, but under any conditions successful cultivation includes working the soil down to a fine tilth.

SPRAYING.

Peach Leaf-curl. — Spraying for this disease should be done during the month of August, but although the majority of peaches bloom during that month there are quite a number of varieties that do not properly bloom until September. With these spraying can now be done, and in any case it is better to spray, even

though the trees are in full bloom, than not to spray at all. For this purpose use 8-6-40 Bordeaux mixture, or lime-sulphur 1–15 to 1–20. For plum-rust, bladder-plum, &c., spray as for the peach.

Black-spot.—This well-known fungus disease is accountable each season, directly and indirectly, for a very large quantity of damaged and blemished fruit—directly by the damage done to the fruit by the disease itself, and indirectly by the scorching of the spray on the fruit and foliage in the attempt to check the spread of the disease. Of the two the spray-damage is probably greater than that caused by the disease. This of course does not mean that spraying should be discontinued, for if such were the case the damage done by the disease would in a short time be very much greater than the two combined. The object to be aimed at is to control the disease and at the same time reduce the amount of spray-damage to a minimum. With this in view it is advisable to reduce as far as possible the necessity of summer spraying; but when such is required select a formula best calculated to check the disease with the least amount of damage to the fruit and foliage.

Actual outbreaks of black-spot can best be guarded against by thorough spraying with stronger fungicidal sprays earlier in the season, the most satisfactory time being after the buds burst and are showing colour, or when the most advanced are in full bloom. This state of bud-development, so far as a number of varieties of apples and pears are concerned, can be expected during the latter part of the month. Watch for this and spray thoroughly, and you will to a great extent provide against attacks of black-spot. The sprays recommened for this purpose are—

Pears: 6-4-50 Bordeaux mixture, or lime-sulphur 1–15.

Apples: 6-4-50 Bordeaux mixture, or lime-sulphur 1–25 to 1–30.

Powdery Mildew of the Apple.—Bad attacks of this disease seriously affect the health of a tree, particularly those of more or less weak constitution, such as the Jonathan. Some varieties are less subject to attack than others, but very few are altogether immune. Lime-sulphur has proved to be by far the best remedy in general use for this disease. The spray should be applied early, just as the leaves are forming, and should be repeated at intervals throughout the season. An affected tree should be well cut back at the winter pruning to stimulate growth, and all affected parts overlooked at this pruning should be removed after growth commences, when they will be readily discerned owing to the white powdery appearance of the foliage.

The strength of spray at this period is lime-sulphur 1–25 to 1–30. The spray may be used considerably weaker and still be effective, but when applied at the strength stated it also acts as a control for black-spot.

GRAFTING.

Unsuitable varieties of fruit-trees can by means of grafting be readily changed to varieties more suited to the requirements of the grower. Grafting can be applied to all classes of fruit-trees, but it is generally confined to pip-fruits. The work can be commenced during this month, or after the sap begins to move and the bark lifts freely from the wood. The process is simple, and has previously been described in the *Journal*. (See September, 1915.)

PLANTING.

Planting can still be gone on with, particularly in respect of pip-fruits. Early-blooming fruits, such as peaches, are better planted in August if the soil conditions are favourable, otherwise it is better to hold them over until the soil is warmer. Before planting all young trees should be dipped in oil emulsion, if this has not already been done at the nursery. The introduction of the regulations governing the sale of nursery stock, which have just come into operation, should in future do away with the necessity of the orchardist having to dip the trees himself before planting. However, until the regulations are in proper working-order dipping before planting will be a wise precaution to take.

THE POULTRY-RUN.

F. C. BROWN, Chief Poultry Instructor.

THE HATCHING-PERIOD.

THERE should now be no delay in getting the bulk of the chickens required for the season hatched out, especially those of the heavier breeds, which should be in the brooder by September at the latest. In fact, it will generally be found that even with the lighter breeds the chicks brought out at the end of September or early in October are the most profitable. It should not be forgotten that the right season for hatching chickens extends over a very short period of the year. When they are brought out too soon—say, early in July—there is a great risk of their going into moult just when high-priced eggs are expected. On the other hand, if the hatching is delayed until November or December the chickens seldom or

never grow to the desired size, and consequently lay small-sized eggs. Apart from this, it will generally be found that the late birds are more subject to disease than those hatched at an earlier period.

Where the natural mother has to be depended upon for hatching purposes I realize the difficulty in securing the desired number of broodies when they are most required, for the broody propensity is being bred out of the majority of the utility stock more and more each year. Rather than delay the hatching operations on this account the only safe course is to resort to artificial methods, either by purchasing an incubator or by securing day-old chicks. The day-old-chick method of rapidly establishing a flock has much to recommend it, provided the chicks purchased come from approved and selected laying-stock. Especially does this apply when the chicks are forwarded in a fireless brooder in which they can be reared to a safe age.

The novice who is making his first attempt this season to work an incubator would be well advised to follow closely the book of instructions supplied by the maker. I realize that it would be very useful to many of my readers to lay down the general principles to be observed in managing an incubator; but, unfortunately, there are so many styles of incubators in use and methods of working them that any definite instructions given in these columns could not be applied generally. Correspondents when asking for information regarding the troubles they encounter in the work of artificial incubation should, therefore, always give the name of the particular machine they are using.

THE SITTING-HEN AND THE YOUNG BROOD.

When the chicks are to be hatched and reared in nature's way care must be taken to set the hen away from the fowlhouse, in order to guard against vermin as well as to prevent the hen from being disturbed by other fowls. A good plan is to set the hen in a watertight coop with a run attached, where the chickens may remain so long as the hen requires to brood them. The nest should be made on the ground; in fact, natural conditions should be provided as near as possible. Nothing but a little hay should come between the eggs and the earth, and if there is some moisture in the earth so much the better. The common trouble of dead-in-the-shell, where the natural mother is being used, is invariably due to the want of moisture. It is always a good plan towards the pipping-stage to lift the hay, or whatever nesting-material is used, and slightly moisten the earth. This will greatly assist the

chicks in cutting their way out of prison. When shaping the nest the earth should be hollowed out in the centre, or, in other words, made saucer-shaped, so that the eggs cannot roll away and the hen may have full control over them. It must be remembered, of course, that the hen turns the eggs several times a day; the nest must therefore be made sufficiently flat on the bottom to enable the turning process to be properly carried out. When the nest is too deep and narrow the eggs are apt to roll on top of each other and become broken. Eggs for hatching should be as fresh as possible. The number of eggs to put under a hen depends on the size of the eggs and also on the size of the hen. Generally speaking, twelve to thirteen are in most cases as many as can be satisfactorily covered.

Do not let the lice drive the sitting-hen from her nest. Give her a good dusting with insect-powder. Care must be taken not to dust the hen just before the hatching-period or when the chicks are very young, as the powder may get into the chicks' eyes and cause blindness.

On no account interfere with the hen when the chicks are hatching. She can manage best by herself. After the hatch is over there is no hurry to feed the chicks for at least twenty-four hours. The egg-shells must be removed and the nest made comfortable, while anything that may cause an accident, such as a deep water-tin, should be taken out of the way. Both the hen and the chicks should be enclosed for the first few days, then an arrangement should be made enabling the chickens to run in and out of the coop while the hen is kept enclosed. On no account allow a hen with a young brood a free range.

Sitting-hens should be given grain food only, whole wheat for preference. Any green food, mash, or meat is apt to cause scouring, which may injure the hatching-qualities of the eggs. For the first two days chicks may be given coarse oatmeal. After the third day a little broken wheat should be added by degrees. From the sixth day the following mixture may be supplied: Crushed wheat 4 parts, crushed hulled oats 4 parts, maize 1 part. From the first, clean water, grit, and charcoal should be always before the birds and fed separately. Green food, such as finely cut grass, lettuce, lucerne, clover, water-cress, &c., must be fed daily. When the chicks are a fortnight old a little boiled meat that has been passed through a mincing-machine will make a valuable addition to the ration. Where only a small number of chicks are to be reared and there is no mill available to grind the grains, I would recommend the use of one of the popular prepared chicken-feeding mixtures that are on the market.

EGG PRODUCTION AND SUPPLY.

Now that the work of hatching and rearing is in full swing, it is well to emphasize that if our poultrymen are to keep the New Zealand market to themselves they will have to raise much greater numbers of stock than has been the case in the past, in order that the supply of eggs during the winter months may be equal to the demand at a reasonable price to the consumer. It should be remembered that the higher the price of local eggs during the scarce season of the year the greater is the inducement for China, America, and other egg-exporting countries to cater for and establish a market in this country. Each year sees an increase in the number of eggs brought in to supply local requirements. When it is considered that for the six months ending 30th June last there have been imported into New Zealand desiccated whites and liquid yolks estimated to equal 294,000 dozen eggs, together with 50,000 dozen in the shell, or a total of something like 344,000 dozen, it will readily be seen how far the demand is from being satisfied with the locally produced egg. The local market requires a larger supply of eggs in the autumn and winter months, and unless the demand can be met by New Zealand producers it will be impossible to keep out the foreign article. It need not be inferred that cheap fresh eggs should be produced in the winter months, but rather that the summer surplus should be preserved or placed in proper cool storage for winter use for the business of the confectioner and others. By means of organization among producers and a proper system of preserving there would be brought about a more uniform retail price for eggs throughout the year, thereby encouraging greater consumption. The winter prices would be reduced, but the summer prices would be increased, and such an increase in the price of the abundant summer eggs that would be a great factor not only in inducing people to take up poultry-keeping, but also in making the business the profitable undertaking it should be for those engaged in it.

THINGS TO REMEMBER.

Cleanliness and regular time of feeding are two great essentials in chicken-rearing.

Always guard against overcrowding. It is a poor policy to produce more chickens than the plant is capable of carrying.

There are no chicks that do so well as those reared on fresh clean ground.

There is no gain by getting a good hatch of chicks and allowing the rats to take them. Have the brooder-house and chicken-coops ratproof.

THE APIARY.

E. A. EARP, Apiary Instructor.

BREEDING.

NORMALLY, at this season of the year there are usually large patches of brood in the hives. A further examination may be carried out where the beekeeper was in doubt last month as to the hive being queenless or not. The absence of brood at this season will denote a poor queen or that the hive is queenless. In either case it is advisable to unite with another hive. This should be done immediately, as a queenless hive stands in great danger of being robbed by other bees in the apiary. A ready method of uniting is by placing the weak colony over a strong one on the stand of the latter, with a sheet of newspaper between the two hive-bodies. They may be examined after a couple of days to see if things are going well, and if the paper is not bitten through it should be torn in several places. In another day or two the united colonies will be working peaceably. In the case of the weaker colony it is wise to kill the queen before uniting. At this examination the beekeeper must keep a strict watch for symptoms of disease. If foul-brood is discovered in a mild form the colony should be marked for treatment later in the season. Should, however, the colony be badly affected it is advisable to sulphur the bees and destroy the combs. Care should be taken to remove the hive to a place of safety until it can be properly cleansed.

APIARY REGISTER.

As mentioned in a previous note, a register for keeping records of individual hives will be found of great assistance. Where a number of colonies are kept such records are invaluable, as they enable work to be carried out expeditiously, and act as a guide to the beekeeper in laying out plans for the forthcoming season.

OVERHAULING THE HIVES.

In August a great deal of the preliminary seasonal work of the apiary may be done. Each hive should receive a good coat of paint. This will help to preserve the timber, besides giving the hives a neat appearance. The bottom boards should be scraped clean. During the winter months there is usually an accumulation of cappings, pollen, and dead bees, and if left this becomes a harbour for woodlice, which are very objectionable. A simple plan is to provide a spare bottom board. Lift the hive on to

the spare one, scrape the old board and replace the hive. Remove all top boxes, as advised last month, and make the bees snug and warm for brood-rearing. Remove all weeds and long grass from round the hive. Long grass keeps the hives and bottom-boards damp and acts as a habour for insects.

CLEANSING HIVES AND FRAMES.

Do not fail to cleanse all hives and frames that have been in contact with diseased colonies. This work may be undertaken now and the hives and frames prepared for future use. Where there is only a small number of frames to be cleansed it is hardly worth while to attempt to save them. However, if much material has to be treated the saving effected will more than pay the beekeeper for his time and labour. There are several methods for treating hives and material, but perhaps the simplest and most effective is by the use of boiling water and caustic soda. Many beekeepers recommend the use of a painters' blow-lamp, but this tool is not always handy, and, besides the charring of the hives, is an advertisement for all time that they once contained diseased bees.

The most suitable vessel for cleaning frames is an ordinary washing-boiler. To every 8 gallons of water add 1 lb. of caustic soda, and allow to boil. The frames may be tied in bundles of six and immersed in the liquid. The caustic soda attacks the propolis and wax, and this immediately floats on top of the water. Three to five minutes' immersion will serve to cleanse each bundle of frames. Skim the refuse from the top of the water frequently, and as the solution weakens add more soda. Stack the frames in supers and place in the sun to dry. The hive-bodies and bottom boards may be cleansed by means of a swab. Immerse the swab in the boiling water and carefully wash the inside of the hives. Care must be taken when using caustic soda, as it is liable to burn the hands.

ARRANGEMENT OF THE HIVES.

There is no set system of arranging hives, and they may be placed according to the preference of the beekeeper. The entrances should all face the north if possible, but on no account face them south or in a westerly direction if this can be avoided, as the cold driving winds from these quarters militate against successful brood-rearing. It is important that the hives be so placed that the beekeeper need not pass in front of the entrances when carrying on operations. Do not place the hives close together

in long rows, as there is a danger of the queens entering the wrong hives and being destroyed; moreover, the plan will militate against successful manipulation, as the closely adjacent colonies will be disturbed whenever one is opened.

A good arrangement of the hives is to set them out in pairs with at least 3 ft. between each two pairs. This affords the beekeeper plenty of operating room. The two hives comprising the pair may stand within a few inches of each other, leaving clearance for the roofs. The space between each two rows should be at least 6 ft., but more can be given if space is not a consideration. In order to preserve the bottom boards the hives should be raised a few inches off the ground. Concrete blocks or old bricks make excellent supports for the hive. Each hive should have a slight cant, so that the entrance is about 1 in. lower than the back of the hive. This will prevent water from collecting on the bottom boards.

USE OF FOUNDATION.

Section 6 of the Apiaries Act provides that "In any case in which it is found by an Inspector that the bee-combs in any hive cannot without cutting be separately and readily removed from the hive for examination, he may direct the beekeeper to transfer the bees to an approved hive within a specified time." This makes it very clear to the beekeeper that he must exercise some care to get the bees to draw down straight combs. It often happens that bees are put into hives fitted with frames which contain no foundation. Having done this the beekeeper is satisfied that he has complied with the Act, but such is not the case. It invariably happens that the bees cross-draw the combs, and the hive is in the same condition as if the bees had been put into a common box. The bees build the combs to suit themselves, and instead of drawing them straight down, as in well-built frames, they fill the hives from side to side with irregular pieces of comb and render the manipulation of the frames an absolute impossibility without breaking them to pieces.

By the use of foundation beekeepers can obviate this trouble and induce the bees to draw down straight combs; thus examination for disease can proceed without hindrance. By the introduction of comb foundation a great step was made in modern apiculture, and perhaps, next to the invention of the frame hive, it marked the most important development in beekeeping. The judicious use of comb foundation gives the apiarist complete control over brood-rearing, and this factor is perhaps as important

as that of good straight combs. It usually happens that if bees are provided with strips of foundation, or put into common boxes, they build a large quantity of drone-comb, which will be subsequently utilized for breeding drones; thus one of the principal objects of the use of foundation is defeated. The presence of a few drones in the hive is imperative, as they are required for impregnating the young queens; but in practice it is usually found that the bees will contrive to breed a sufficient number for that purpose although full use be made of foundation.

Drones, as beekeepers know to their sorrow, are non-producers, and it is generally conceded that they do no work in the hive, but, on the other hand, consume large quantities of food gathered by the workers, and their presence in large numbers will militate against profitable beekeeping. Traps may be used for the purpose of catching the drones, but this method is not in general use, save perhaps by beekeepers who make a practice of rearing queens, and then they are applied for the purpose of trapping drones from undesirable queens. In practice it is by far the best policy to use full sheets of foundation, but in any case the beekeeper who neglects its use altogether will be up against the problem of having to transfer his bees at a later date.

ROBBING.

Keep a strict watch for robbing. This is most likely to occur when feeding has to be undertaken, and once started it is about the hardest matter to cure. Feed only in the evening, so that the excitement created by the supply of warm syrup will have died down before morning. Keep the entrances to all hives contracted, and see that there are no cracks through which a robber could possibly enter. Perhaps the main cause of robbing, however, is the presence in the apiary of queenless or weak colonies. If the bees once discover a queenless hive there will be no peace until the source of trouble is removed. The inmates of such a hive will not defend their stores as bees in a normal condition will, and unless the colony is united with another it will tend to demoralize the rest of the apiary, until none but strong colonies will be safe from the depredations of the robbers.

Where a weak colony is in danger of being attacked, and where the beekeeper is satisfied that it is worth saving—that is, if he considers the queen good enough to build up a strong colony by the time the main honey-flow sets in—his best plan is to pile wet grass on the alighting-board and well up above the entrance, keeping the grass wet for a day or two, and painting any cracks

in the hive with kerosene or carbolic solution. This treatment will soon settle the robbers and restore peace in the bee-yard. However, the best thing to do with weak colonies is to unite them without delay with stronger hives. Like most other troubles, though, prevention is the best thing when dealing with robbers. Do not spill any syrup near the hive, do not leave any combs lying about, and do not have any weak colonies, and you will not be troubled with robbing.

THE FARM GARDEN.

W. H. TAYLOR, Manager, Arataki Horticultural Station.

VEGETABLE-CULTURE.

As a matter of course, peas are sown twice during the month. When selecting varieties it is well to consider what means are available. Tall peas are the finest in pod and frequently in flavour, but it is not wise to grow them unless tall sticks can be provided. If no sticks are available, or only short ones, it will be most profitable to grow medium-height varieties. I have found it necessary to omit names of varieties. These notes are for all the Dominion, and seed-lists differ. It is best for growers to make their own selection.

About the middle of September is the best time to sow leeks if these are intended for winter use — their proper place. If required earlier, sow at once. The seed is sown in a drill, and the plants put out later on. The method of planting will be described in due course.

The first broccoli-seed should be sown in mid-September. This time is appropriate for sowing all that may be wanted for the season, including early, mid-season, and late varieties. If sown at this time and given proper attention they may be expected to give their best, and the various kinds will succeed each other. It is, however, not absolutely necessary to sow all the kinds mentioned; sowings may be continued till early in November, and this course is often necessary where sufficient land may not be available for planting all the kinds. The plants would require to go out by Christmas, whereas the later-sown might be planted up to the end of January. The resulting heads would not be likely to be so good as those planted earlier.

Brussels-sprouts seed should also be sown about the middle of the month. These sprouts require a long time to grow, and are never a success if planted late. As they are, in the opinion

of most people, the best of all winter vegetables, it is worth while to give them a good chance. In the colder parts of the Dominion, and also in hilly places where the hours of sunshine are not many, savoy-seed should also be sown; but in warm parts and places subject to many hours of sunshine daily it is too early. Savoys are not worth eating until they have felt the influence of cold weather; as an early crop they are a failure.

Sowing cauliflowers should not be neglected. Select a giant kind like Metropole or Veitch's Autumn Giant, and the heads will be ready at Easter-time, just as peas and French beans are about past. Turnips may be sown at intervals of about eight weeks, sowing at each time just sufficient for use during that period. During summer-time turnips quickly become tough and unfit for use. Carrots may be sown; if, however, an early sowing was made the main crop need not be put in yet. Parsnips also may be sown if required early, but if they are desired for winter use only do not sow yet, as they may become overgrown. Plant Jerusalem artichokes.

Lettuce is now best sown in lines; sow thinly, thin out surplus plants, and leave the others to grow. Radishes should be sown in small quantity every second or third week. I would advise a trial of a new variety, Icicle, which I find very satisfactory.

Sow tomato-seed at once. It is best not to raise these seeds in heat; an ordinary greenhouse or frame is sufficient. The young plants run up leggy very quickly if in heat, and are then difficult to manage. A mild hotbed is, however, a great help when the young plants are pricked off.

Pumpkins, marrows, hardy cucumbers, and melons of various sorts may be sown in boxes if desired. In an ordinary way it is not advisable; the seed comes very freely if put in the open ground early in November.

Capsicum and chilli seed may be sown in a greenhouse. The plants are pricked off as soon as they are large enough to handle, and are finally planted out. These vegetables only succeed in the open in the hottest parts of the Dominion. They may, however, be grown in most parts if the plants are lifted before there is danger from frost, placed in pots, and finished off in a greenhouse.

SMALL FRUITS.

Planting all bush fruit will, of course, be finished and established plantations put in order. Where artificial manure is to be given it should be applied at once. For gooseberries mix together 2 parts nitrate of soda, 1 part superphosphate, and 1 part sulphate of iron, and apply 1 lb. of the mixture to 3 square

yards of soil. The same will do for currants. Raspberries should have an addition of 1 part kainit, and the same will do for strawberries. Stable manure should have been applied earlier where possible. It would now be most beneficial as a mulch.

In some parts strawberries may still be planted; it does them no harm to plant when the blossoms are expanded. Late planting is best on stiff soil, as it enables the cultivator to work later on the soil, and it is consequently in better condition for young plants to root in.

Plant out Cape gooseberries. Cut off the top of last year's plants. They should be breaking from the base of the plants, and these shoots will make the plants. They are usually more fruitful the second year than the first.

THE FLOWER-GARDEN.

The flower-garden, equally with other parts of the garden, requires manure, and if it is trenched in deeply no amount that is likely to be given will do any harm: in most cases it will do good. It may, however, do a great deal of harm if rich manure is dug into the surface soil in an indiscriminate manner. Azaleas and rhododendrons are not averse to manure, but it should be given as a mulch. The roots of these plants are very fine, and are not to be disturbed with impunity, nor should rich manure come in immediate contact with them. When plants of any kind are put out care should be taken that only clean soil comes in contact with the roots. Plants rarely can make roots in strong manure. There are exceptions, certainly; but it is best to make no exceptions and plant all alike in clean soil. Manure may be given as a mulch in certain cases where strong feeding is essential; and, as before mentioned, if the manure is low down in the ground it will harm nothing, partly because only strong roots will reach it, and also because much of its strength will have been lost before the roots reach it. Cold loamy soil is better than manure for camellias until they become well established in the ground. It is a mistake to suppose that because a plant is not flourishing it requires manure. More often it is good soil that is wanted and good cultivation.

This is a good time to plant carnations—the best time, in fact. The position where they are to be grown should be open to the sun. They never succeed in snug corners; plenty of fresh air and sunlight is wanted. The soil should be deeply dug, and manure worked in deeply, so that the roots may not reach it until the plants become strong. The soil should be of a firm but free nature; road-sand is a good thing to add to light or stiff soils. A little superphosphate or basic slag and bonedust

may be mixed with the top spit—say, 2 oz. of the first or second mentioned, and the same of bonedust, per square yard. Before planting and while the surface soil is dry tread it firmly down, so firmly that it may be walked on without the boot sinking in the least. Then plant the young plants very firmly, letting the ball of earth down low enough to allow the lower pair of leaves to rest on the surface. Remove footmarks when planting is finished, so that rain may freely enter the soil. After-attention will mainly be to keep the surface loose and free of weeds.

Feeding with liquid manure, or even mulching, is rarely necessary unless extra large flowers are desired. These are obtained by feeding and severely thinning the blossoms, neither of which operation is to be recommended for general utility purposes. Fed plants become gross and subject to disease and insect pests, and for the pleasure of most flower-lovers a considerable number of good flowers is better than a small number of phenomenal size. There are in any case varieties that produce naturally flowers large enough for any purpose. The plant grown without heavy feeding is usually the most thrifty.

In most places, except where late frosts occur, hardy flower-seeds may be sown in the open ground, annuals being more particularly referred to. This class of flowers is not sufficiently grown. Every one with garden space should sow as many as room can be found for. There are many very beautiful flowers to be had at a trifling cost, and many of them will drop seed and reappear, enabling the obtaining of fresh kinds at little cost, while still retaining such as are desired of those already grown.

Half-hardy subjects such as asters, &c., may be either sown in boxes or kept till early in November and then sown in the open ground, a mode of procedure that enables those who have no glass structure to get as good a show as those who have that advantage—unless, indeed, the very best use were made of it.

Dahlias should be attended to, as they will be starting growth. Divide the old tubers into pieces containing at least one bud and bed them n a nice piece of soil in a sheltered spot.

Gladioli should be planted—that is, the large-flowered autumn-flowering kinds. They like deep loamy soil, not overrich but not poor; a naturally good soil is best. Plant the bulbs so that they are quite 6 in. befow the surface.

The various types of herbaceous iris may be planted. The chief race is the Japanese. These require really good soil: they will not thrive in poor or dry soil. The margins of a stream are best to their liking, where the roots can find unlimited water but with their heads fully exposed to sunlight.

ANSWERS TO CORRESPONDENTS.

IN every instance a question to which an answer is desired in these columns must be accompanied by the full name and the postal address of the inquirer, not necessarily for publication, but as a guarantee of good faith. The question should be written on one side of the paper only.

PEAS FOR SHEEP-FATTENING.

W. FORRESTER, Raraka, Waikari :—

Please let me know the best method to adopt for fattening sheep on peas. When should the peas be sown, and how long before they would be fit to turn the sheep on ?

The Fields Division :—

The peas should be sown so as to come through the ground when all danger of frost has practically passed—in your district probably about the middle of September. You will doubtless know best when this period sets in. When the crop is partially in flower you could put on the sheep. The land should be well worked up before sowing the peas. They should be sown at the rate of 2½ to 3 bushels per acre (60 lb. to the bushel). The Field Partridge and the Egyptian pea are excellent field varieties. You have not described your soil, hence it is difficult to advise definitely *re* manuring, but from general knowledge of the country we would advise your using 2 cwt. basic superphosphate and ½ cwt. blood-and-bone manure per acre. The peas, of course, are sown broadcast, either by hand, or with a broadcast seed-sower, or with an ordinary drill with coulters removed.

SOWING HEDGE SEEDS.

ALEX. SERVICE, Avondale :—

Could you give any information as to the best time and way to sow hedge seeds, as pines, Pittosporum, boxthorn, and barberry ? Will passion-plants grow from slips, or are they best from seed ?

The Horticulture Division :—

Sow in the spring in the open ground. With a spade take out very shallow drills. Hold the spade very near the ground : this makes a wide and shallow drill. Scatter the seed evenly in the drill. Cover by lifting soil and spreading it over the seed. Beat the soil slightly with the back of the spade to firm it over the seed.

Passion-vines are readily raised from cuttings of young wood, but also grow from seed.

REMEDY FOR WORMS IN HORSE.

GEORGE BUCKLAND, Leigh :—

What is best to give a horse for worms ?

The Live-stock Division :—

Give the animal, first thing in the morning, on an empty stomach, the following drench : Turpentine, 1 ounce ; linseed-oil, 1 pint. If necessary, repeat in four or five days' time.

BEEKEEPING IN OUTSKIRTS OF WELLINGTON.

W. D. H., Ngaio :—

Would beekeeping be practicable in windy districts, such as the outskirts of Wellington ? I have a number of trees the fruit of which does not set well, owing, I think, to non-pollination by bees, which are very rarely seen in my locality. It is said that they get blown away from the hives and perish. Is nectar from gorse detrimental to the flavour of honey ?

The Horticulture Division :—

It is quite practicable to keep bees at Ngaio ; in fact, several small apiaries are located there, although the honey produced is small in quantity. To keep a hive or two to pollinate your fruit-blossoms would, in our opinion, be highly successful, notwithstanding the fierce winds. Very little nectar is gathered from gorse, this plant supplying a large amount of pollen. The nectar is good quality.

BLOOD-SCOUR IN CALVES.

BEN JACKSON, Te Pahu, Waikato :—

What is the best remedy or prevention for blood-scour in calves ?

The Live-stock Division :—

The complaint you mention is probably due to a small worm in the fourth stomach, causing parasitic gastritis. It is similar to a complaint found in hoggets and lambs, dealt with in Bulletin No. 3, which has been forwarded to you. The treatment should be exactly the same for calves as lambs, except that the lysol should be 1 to 1½ tablespoonfuls according to size of calf and in a corresponding increase of milk.

SWAMP FEED.

"SWAMP," Mangapehi :—

I have drained a peat swamp, but find the depth of peet makes ploughing and other team operations impossible. Is there anything I could surface-sow in, say, the spring which would entice cattle over the swamp and so crush down the peat and make ploughing, &c., a practicable proposition ?

The Fields Division :—

If the swamp is poorly consolidated you could confine your sowing to Yorkshire fog and *Lotus major*, at the rate of about 14 lb. fog and 1 lb. *Lotus major* per acre. If, however, the swamp has been somewhat consolidated you could sow on the best portions grasses such as Western Wolths or Italian rye, and cow-grass and alsike by way of clovers. Red-top is a grass that might thrive, as should meadow-foxtail later on when the swamp has settled considerably.

CURRANT-BORER.—MANURE FOR MUSHROOM-BED.

"INQUIRER," Otaki :—

Please state the best treatment to prevent borer in black currants ; also whether cow-manure can be used instead of horse-manure when growing mushrooms in a shed.

The Horticulture Division :—

The borer usually enters the currant-bush, as well as other trees, through a dead snag or stub. Once the grub has gained an entrance it is difficult to remove. To prevent the affection keep the bush free of dead twigs and snags. In removing wood, cut clean and avoid stubs. In the case of an affected tree, encourage the tree to stool and make new growth ; work out the old and affected wood as quickly as possible.

Cow-manure is too cold to take the place of horse-manure in the preparation of a mushroom-bed, but a proportion of cow-manure is considered an improvement, particularly when well-rotted stable manure or other material calculated to correct the temperature is added.

PIG BREEDS FOR LONG FLITCHES.

"SOLANUM," Wairau Valley :—

The May number of the *Journal* gave a recipe for curing bacon, which I have just followed with splendid results, and I will now be much obliged if you will kindly inform me which is the best breed of pig to give long flitches ?

The Live-stock Division :—

Either the large Yorkshire, the Tamworth, or a first cross from these is recommended to best meet your requirements for long flitches.

PHOSPHATIC "GUANOS."

JOHN A. LAWSON, Otorohanga :—

Could you inform me if any of the various guanos sold in New Zealand are phosphatic guanos, and, if so, which ones ? Also, what is about the length of time required for the phosphoric acid in rock guano to become available for plant-food with our average rainfall ?

The Fields Division :—

All the so-called "guanos" sold in New Zealand are phosphatic. The length of time for the phosphoric acid of a Pacific island (rock) "guano" to become available in your locality will depend upon the soil. In a drained-swamp soil the phosphoric acid will become available moderately readily—in about six weeks to two months; while on average soils the time would be in the neighbourhood of two to three months.

PINUS RADIATA TIMBER.

"MONTROY," Fairlie :—

I would be glad of your opinion as to whether *Pinus radiata* timber would be suitable for use in a concrete house for floor and ceiling joists, studs, &c., and what would be the probable life of such timber so employed ?

The Horticulture Division :—

Pinus radiata, under special conditions, is a very durable timber. The main condition is perfect protection against moisture. For all the purposes you mention, with the exception perhaps of floor-joists, it should last quite as long as rimu or many other building-timbers. It would be more risky to use it for floor-joists unless the floor is well raised from the ground, and is otherwise likely to be dry.

TEETH TROUBLE IN HORSE.

GEORGE ROBERTS, Ida Valley :—

I have a draught gelding, five years old, and he always throws his chaff out of his mouth. I had his teeth filed down last year, but it made no difference whatever. Could you give me any advice as to what to do ?

The Live-stock Division :—

We should advise you to leave the horse alone for a time, or else to get a qualified veterinary surgeon to examine the back teeth. A horse at the age stated does *not* require to have his teeth rasped. Probably the trouble is due to a milk-tooth which has not been shed.

BEACH SHELLS FOR LIMING.

P. S., Whangaparaoa :—

My section is for the most part clay gum land, and I suppose it would greatly benefit with a liberal dressing of lime. I had contemplated making a kiln and burning shell from our beach, but later I have been advised to apply the fine shell as it is. As lime comes rather expensive delivered here, I would like to know if I

applied a heavy dressing of fine shell how it would compare with a dressing of ground carbonate of lime. How much shell would I need to apply to equal a 2-ton dressing of carbonate of lime? Is burnt shell as strong as ordinary burnt rock lime?

The Fields Division :—

As shells contain a very high percentage of carbonate of lime, when burnt they produce as high a percentage of calcium oxide (burnt lime) as the burnt rock of high grade. So, also, when ground to a powder there is equally as much powdered carbonate of lime as when rock of high grade is crushed. Thus 2 tons of carbonate of lime produced from high-grade rock is equivalent to 2 tons of ground shells. As to whether or not the fine shell you intend to use from the beach is serviceable for liming land depends upon its fineness. If the shell is as fine as the coarse sand itself it would be serviceable; otherwise it would become soluble very slowly, and hence would not be suitable, except perhaps under very sour soil conditions.

RAISING CUPRESSUS MACROCARPA, ETC., FROM SEED.

"SUBSCRIBER," Dannevirke :—

Will you kindly inform me as to the correct method of starting *macrocarpa* seed, also regarding care of young seedlings, as I find that a large proportion of them disappear after starting?

The Horticulture Division :—

The seed-cones of *Cupressus macrocarpa, Pinus insignis*, &c., may be gathered at any season, and, if spread out on a sheet during bright sunshine and kept free from damp, most of the cones will open sufficiently to release the seeds in the space of a few weeks. The ground intended for seed-beds should be deeply dug and worked to a fine tilth. Fine netting is needed to prevent birds picking off the seedlings as they germinate, and the beds should be covered with scrim where there is a strong sun. The seed should be sown in the early spring, and does not require soaking in hot water to hasten germination. As to the depth the seed should be planted, a safe guide is to cover seed to a depth of about double its diameter.

CASTRATING COLTS.

"INQUIRER," Waimate :—

Is it necessary in castrating colts to open the inner skin or covering of the testicle before severing with the emasculator?

The Live-stock Division :—

The usual way, in ordinary operations, is simply to expose the testicle, place the emasculator on, and then remove. There is no need to cut the inner skin, though there would be no harm at all in doing this.

MOVING A HEDGE.

"INTERESTED," Oturoa :—

I have some *Cupressus Lawsoniana* trees and elaeagnus and barberry hedging which have been planted three years and are growing strong. I now find it necessary to remove them and plant elsewhere. Would you advise me to "wrench" the trees, and if so, how, and at what period of the year?

The Horticulture Division :—

Plants comprising a three-year-old hedge of *Cupressus Lawsoniana* should be "wrenched" before shifting, otherwise they would probably die. Wrenching is done in the early autumn, and is most successful when followed shortly by the autumn rains. The work consists of cutting the roots on all sides of the plant with a sharp spade and partially lifting. Although not so necessary, the same process had better be carried out in respect to your elaeagnus and barberry. If time will not allow of this, cut the plants hard back when shifting.

THE ORCHARD-TAX ACT.

FOR the information of fruitgrowers and others the full text of the Orchard-tax Act passed during the session just closed is printed below. Special attention is drawn to the provision whereby the tax first operates as on the 30th September of this year. Arrangements regarding receipt of the tax are now being made, and information on that matter will be published in due course. The Act is as follows:—

An Act to provide Moneys to aid in the Development of the Fruitgrowing Industry.
[*7th August, 1916.*

BE IT ENACTED by the General Assembly of New Zealand in Parliament assembled, and by the authority of the same, as follows:—

1. This Act may be cited as the Orchard-tax Act, 1916.

2. For the purposes of this Act—
"Occupier" means the occupier within the meaning of the Rating Act, 1908:
"Orchard" means any land used for the growing of fruit-trees and the production of fruit for sale, and includes any such land notwithstanding that the fruit-trees thereon may not have come into bearing.

3. (1.) There shall be payable by the occupier of every orchard as on the thirtieth day of September in each year a tax, hereinafter referred to as an orchard-tax.

(2.) The orchard-tax imposed by this Act shall be calculated at the rate of one shilling for every acre or part of an acre comprised in the orchard in respect of which the tax is payable:

Provided that in no case shall the tax payable in respect of any orchard be less than two shillings and sixpence for any year.

(3.) The tax imposed by this Act shall be payable on the first day of November in each year, and shall be paid to such person or persons as may be authorized by the Minister of Agriculture to receive the same.

(4.) If any tax imposed by this Act remains unpaid at the expiration of twenty-one days after the due date thereof, there shall be added thereto by way of additional tax an amount equal to ten per centum thereof.

(5.) All unpaid tax shall be recoverable in any Court of competent jurisdiction as a debt due to the Crown.

4. All moneys received under this Act shall be paid into the Consolidated Fund; and the Minister of Finance may, on the recommendation of the Minister of Agriculture and without further appropriation than this Act, pay over the amount of such tax, or such part thereof as he thinks fit, to the New Zealand Fruitgrowers' Federation (Limited).

5. All moneys paid to the New Zealand Fruitgrowers' Federation (Limited) under the authority of the last preceding section shall be expended for such purposes, in the furtherance of the interests of the fruitgrowers of New Zealand, as may be approved in accordance with regulations under this Act.

6. For the purposes of this Act the Governor may, by Order in Council, make such regulations as he thinks fit—

(*a.*) Prescribing the purposes for which moneys paid to the New Zealand Fruitgrowers' Federation (Limited) under this Act may be expended;

(*b.*) Prescribing the form of accounts to be kept, and of returns to be furnished, by the New Zealand Fruitgrowers' Federation (Limited) in respect of moneys paid to it under this Act;

(*c.*) Prescribe the method of settling any disputes that may arise with respect to the area of any orchard or of the amount of tax to be paid by the occupier thereof for the purposes of this Act; and

(*d.*) Prescribing such other matters as he thinks necessary for the effective administration of this Act.

7. This Act shall remain in force until the thirty-first day of December, nineteen hundred and twenty-one, and no longer.

COMMERCIAL INTELLIGENCE.

LONDON WOOL-SALES.

FOLLOWING is the High Commissioner's cabled report, dated 28th July, 1916, regarding the closing of the fifth series of London wool-sales:—

The wool-sales closed with a firm market for superior wools, but irregular for other qualities. Home buyers are cautious on account of the British Government's purchase of the Home clip, and owing to the great uncertainty regarding future action. Estimated closing values are: Fine crossbreds, 1s. 8d. to 1s. 10½d.; medium crossbreds, 1s. 4d. to 1s. 7d.; coarse crossbreds, 1s. 2d. to 1s. 5d.; superior merino, 1s. 9d. to 2s.; medium merino, 1s. 5d. to 1s. 8½d.; inferior merino, 1s. 2d. to 1s. 4½d. 94,000 bales were held over.

IMPORTATION OF HOPS TO UNITED KINGDOM.

IT is notified that although the recent prohibition (as a war exigency) of the importation of hops to the United Kingdom applies to all hops, special licenses will be issued by the Board of Trade, London, for the importation of specific quantities, as occasion requires, of hops which are the produce of the British Dominions. In the case of New Zealand, on issue of a license the exporter should forward to the consignee an invoice for such hops bearing a certificate in the following form:—

This is to certify that the hops specified in this invoice are the produce of New Zealand.

Date:..... .....

(Official stamp.) Collector of Customs,
Port of.....

TRADE INQUIRIES.

Canned Goods.—Messrs. Mann and Cook, of 27 St. Mary Axe, London E.C., desire to get into touch with packers or canners in New Zealand who would be prepared to export canned goods to Europe, and who are not already represented in London. They refer particularly to the Italian market, where they have their own office and where their Italian manager informs them there is a good field for development.

Produce Agency.—Messrs. E. E. Smith and Co. (Limited), general produce merchants, brokers, and commission agents, of 28 Martin's Lane, Cannon Street, London E.C., advise that they are open to act as agents for the sale of New Zealand produce.

DAIRY COMPANIES AND RELATED MANUFACTURES.

FOLLOWING is the text of section 19 of the War Legislation Amendment Act, entitled "Companies Amendment," passed during the recent session of Parliament, with special reference to the rennet position:—

"Notwithstanding anything in the Companies Act, 1908, or in the memorandum or articles of association of any company having for its object or for one of its objects the manufacture of butter or of cheese, it shall be lawful for such company, without complying with the provisions of the Companies Act, 1908, relating to the alteration of the memorandum or articles of association of companies—(*a*) To carry on the business of the manufacture of rennet, casein, sugar of milk, or butter-boxes, or the manufacture of any other article or product connected with or required for the dairy industry; or (*b*) to purchase shares in, or to otherwise assist, any other company lawfully engaged in the business of the manufacture of any such article or product as aforesaid."

LONDON MARKET VALUES.

COMPARATIVE STATEMENT COMPILED FROM THE HIGH COMMISSIONER'S CABLES FOR THE PAST THREE MONTHS.

London Date.	Wool. Bradford Quotations for Tops. 36's.	40's.	44's.	50's.	56's.	60's.	Mutton. Canterbury.	Mutton. North Island.	Lamb. Canterbury.	Lamb. Other than Canterbury.	Beef. New Zealand Hinds.	Beef. New Zealand Fores.	Butter. Danish.	Butter. New Zealand.	Cheese. New Zealand White.	Cheese. New Zealand Coloured.	Cheese. Canadian.	Hemp (Spot). New Zealand Good-fair.	Hemp (Spot). New Zealand Fair.	Hemp (Spot). Manila Fair (New Grade).	Hemp (Forward Shipment). New Zealand Good-fair.	Hemp (Forward Shipment). New Zealand Fair.	Hemp (Forward Shipment). Manila Fair (New Grade).	Wheat. N.Z. Short-berried.	Wheat. N.Z. Long-berried.	Oats. N.Z. Sparrowbills.	Oats. N.Z. Danish.
1916.							d.	d.	d.	d.	d.	d.															
May 13	..	..	..	..	..	..	8⅛	8½	9	9	..	..	172/0	165/0	113/0	113/0	115/0	50/0/0	48/0/0	56/0/0	49/0/0	47/0/0	55/0/0	..	..	..	..
,, 20	..	..	..	..	..	..	8⅝	8⅝	9½	9½	..	..	172/0	169/0	114/6	113/6	115/9	49/10/0	47/10/0	55/0/0	48/0/0	46/0/0	54/0/0	..	..	..	..
,, 27	..	..	..	..	..	..	*8⅝	..	*8½	..	8	7¼	172/0	169/0	113/0	112/0	116/0	49/10/0	47/10/0	53/10/0	48/0/0	46/0/0	53/0/0	..	..	..	..
June 3	..	..	..	..	..	..	*8⅝	..	*9½	..	..	..	174/0	169/0	108/0	105/0	105/0	49/10/0	47/10/0	53/10/0	48/0/0	46/0/0	53/0/0	..	..	..	..
,, 10	..	..	..	..	..	..	*8⅝	..	*9½	..	7¾	6¾	176/0	170/0	110/0	106/0	105/0	49/10/0	47/10/0	53/0/0	48/0/0	46/0/0	51/0/0	..	..	..	..
,, 18	..	..	..	..	..	..	*8⅝	..	*9½	..	8	7½	175/0	169/0	109/0	105/0	105/0	48/10/0	47/0/0	50/5/0	47/10/0	46/0/0	48/10/0	..	..	..	..
,, 24	..	..	..	..	..	..	*8⅝	..	*9½	..	7⅛	7	176/0	169/0	104/0	101/6	100/0	48/10/0	47/0/0	50/0/0	47/10/0	46/0/0	48/0/0	..	..	..	..
July 1	..	..	..	..	..	..	*8⅝	..	*9½	..	7	6½	176/0	169/0	99/0	98/0	96/0	48/10/0	47/0/0	51/0/0	47/10/0	46/0/0	49/0/0	..	..	..	..
,, 8	..	..	..	..	..	..	*8⅝	..	*9½	..	6	5½	173/0	169/0	96/0	95/0	93/0	48/10/0	47/0/0	52/0/0	48/0/0	46/0/0	50/10/0	..	..	..	..
,, 15	..	..	..	..	..	..	*8⅝	..	*9½	..	6	5½	172/0	167/0	85/0	85/0	86/0	48/10/0	47/0/0	52/0/0	48/0/0	46/0/0	50/10/0	..	..	..	..
,, 22	..	..	..	..	..	..	*8⅝	..	*9½	..	..	..	173/0	167/0	89/0	89/0	89/0	48/10/0	47/0/0	51/0/0	47/10/0	45/10/0	49/0/0	..	..	..	..
,, 29	..	..	..	..	..	..	*8⅝	..	*9½	..	5⅝	5⅛	176/0	169/0	91/0	88/0	90/0	48/10/0	47/0/0	51/10/0	47/10/0	45/10/0	49/0/0	..	..	..	..
Aug. 5	..	..	..	..	..	..	*8⅝	..	*9½	..	5½	4½	184/0	174/0	92/6	93/0	93/0	49/0/0	47/0/0	51/10/0	48/10/0	46/10/0	51/0/0	..	..	..	..
,, 12	..	..	..	..	..	..	*8⅝	..	*9½	..	5¾	4¾	195/0	176/0	96/6	94/6	95/0	49/0/0	46/10/0	51/10/0	48/10/0	46/0/0	..	..	..	..	..

* Specified as "New Zealand."

NOTE.—All the above beef quotations are specified as "N.Z. bull-beef." In cable of 5th August "N.Z. cow-beef" was quoted—hinds, 5 5/16d.; fores, 4¾d.

NEW ZEALAND EXPORTS TO BRITAIN.

COMPILED FROM MANIFESTS OF VESSELS SAILED DURING RESPECTIVE MONTHS OF CURRENT AND PRECEDING SEASONS.

Month.		Mutton, Carcases.	Lamb, Carcases.	Beef, Quarters.	Pork, Carcases.	Butter, Boxes.	Cheese, Crates.	Wool, Bales.	Wheat, Sacks.	Oats, Sacks.	Rabbits, Crates.	Hemp, Bales.	Tow, Bales.	Kauri-gum, Pkgs.
January,	1916	166,700	295,170	41,726	179	108,593	101,917	92,849	..	..	..	7,438	1,666	1,218
,,	*1915*	*137,816*	*296,439*	*45,622*	*339*	*138,081*	*85,123*	*87,393*	..	..	*2,860*	*683*	..	*1,209*
February,	1916	170,973	266,414	29,056	23	96,096	84,740	96,016	..	..	..	8,161	1,804	1,900
,,	*1915*	*433,585*	*517,581*	*77,421*	*311*	*119,371*	*96,090*	*159,347*	..	..	..	*13,111*	*6,619*	*2,763*
March,	1916	327,977	363,269	83,725	..	59,671	62,082	49,750	..	..	474	2,666	637	1,247
,,	*1915*	*80,439*	*203,480*	*30,176*	..	*55,280*	*51,811*	*49,809*	..	..	..	*8,410*	*185*	*274*
April,	1916	108,488	195,707	106,369	..	24,703	81,652	41,725	..	..	..	3,782	337	450
,,	*1915*	*286,155*	*328,779*	*45,340*	..	*6,703*	*38,561*	*41,371*	..	..	*1,011*	*9,328*	*1,474*	*3,461*
May,	1916	170,164	282,156	134,971	..	26,789	56,961	26,356	..	..	1,000	2,892	235	731
,,	*1915*	*257,953*	*433,831*	*34,780*	*655*	*148*	*17,065*	*21,615*	..	..	*2,923*	*4,968*	*808*	*2,636*
June,	1916	138,303	290,319	41,593	..	10,289	18,463	22,998	..	..	5,439	5,260	2,076	1,219
,,	*1915*	*99,080*	*154,785*	*19,316*	*932*	..	*26,869*	*11,946*	..	..	*9,800*	*5,027*	*1,320*	*1,229*
July,	1916	367,827	593,670	42,322	..	4,209	30,940	50,804	..	..	10,950	9,244	3,720	3,230
,,	*1915*	*243,420*	*340,476*	*21,231*	*154*	..	*21,520*	*16,039*	..	..	*5,968*	*5,068*	*1,639*	*4,184*
August,	1915	510,418	570,381	51,750	35	..	18,287	19,416	..	..	31,790	7,138	1,466	4,848
,,	*1914*	*84,251*	*63,111*	*19,094*	*516*	*1,979*	*50*	*4,845*	*600*	*38,220*	*10,403*	*367*	*245*	*3,705*
September,	1915	299,715	330,643	59,487	..	26,416	2,595	5,360	..	..	7,750	2,022	3,091	595
,,	*1914*	*53,386*	*49,200*	*2,353*	..	*15,885*	..	*3,337*	..	*5,896*	*7,288*	*1,143*	*57*	..
October,	1915	367,198	417,794	87,104	..	111,468	49,160	7,272	..	..	56,636	5,650	1,645	1,230
,,	*1914*	*291,432*	*128,016*	*49,104*	..	*81,842*	*30,487*	*8,938*	..	*68,660*	*38,121*	*2,042*	*1,650*	*1,683*
November,	1915	93,777	92,601	21,609	..	81,102	47,243	18,715	..	..	13,538	5,064	1,789	868
,,	*1914*	*136,346*	*27,577*	*48,302*	*27*	*98,729*	*70,048*	*37,604*	*15*	*24,289*	*35,783*	*885*	*110*	*1,377*
December,	1915	91,124	59,231	36,467	..	214,967	81,939	33,527	..	..	3,052	6,016	1,940	5,555
,,	*1914*	*192,952*	*149,835*	*44,876*	..	*172,990*	*80,144*	*86,317*	..	..	*9,306*	*1,136*	*116*	*2,157*

STOCK EXPORTED.

THE following table shows the numbers and descriptions of stock exported from the Dominion during the month of July, 1916:—

Port of Shipment.	Horses.		Sheep.			Cattle.		Pigs.
	To Australia.	To Eastern Pacific.	To Australia.	To Eastern Pacific.	To San Francisco.	To Australia.	To Eastern Pacific.	To Eastern Pacific.
Auckland ..	2	..	..	193	..	..	18	25
Gisborne ..	..	..	..	..	..	..	..	..
Napier ..	..	..	..	..	..	..	..	..
Wellington ..	7	..	..	..	..	..	..	..
Lyttelton ..	2	..	96	..	..	..	..	..
Dunedin ..	..	..	..	..	..	..	..	..
Bluff ..	22	..	10	..	..	..	..	..
Totals ..	33	..	106	193	..	..	18	25

The following are the particulars of horses shipped: Clydesdales, 11 stallions, 17 mares, 1 gelding; thoroughbreds, 1 mare, 1 colt; 1 trotting gelding; 1 pony stallion.

STOCK IN QUARANTINE.

THE following stock was received into quarantine during the month of July, 1916:—

No.	Description.	Sex.	Port of Origin.	Owner or Agent.	Address.
		MOTUIHI ISLAND (AUCKLAND).			
1	Collie.. ..	Male ..	Sydney ..	J. Ferry ..	Auckland.
		SOMES ISLAND (WELLINGTON).			
1	Aberdeen Angus	Male ..	London ..	F. Armstrong ..	Akitio.
1	,,	,,	,, ..	Burdling Bros. ..	Pongaroa.
3	,,	Female	,, ..	,,	,,
		QUAIL ISLAND (LYTTELTON).			
2	Collies ..	Female	London	J. Lilico ..	Lochiel.
7	Collie pups ..	Male ..	Dropped on voyage	,, ..	,,
6	,, ..	Female	Dropped on voyage	,, ..	,,