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OF

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VOLUME VIII.

1910.

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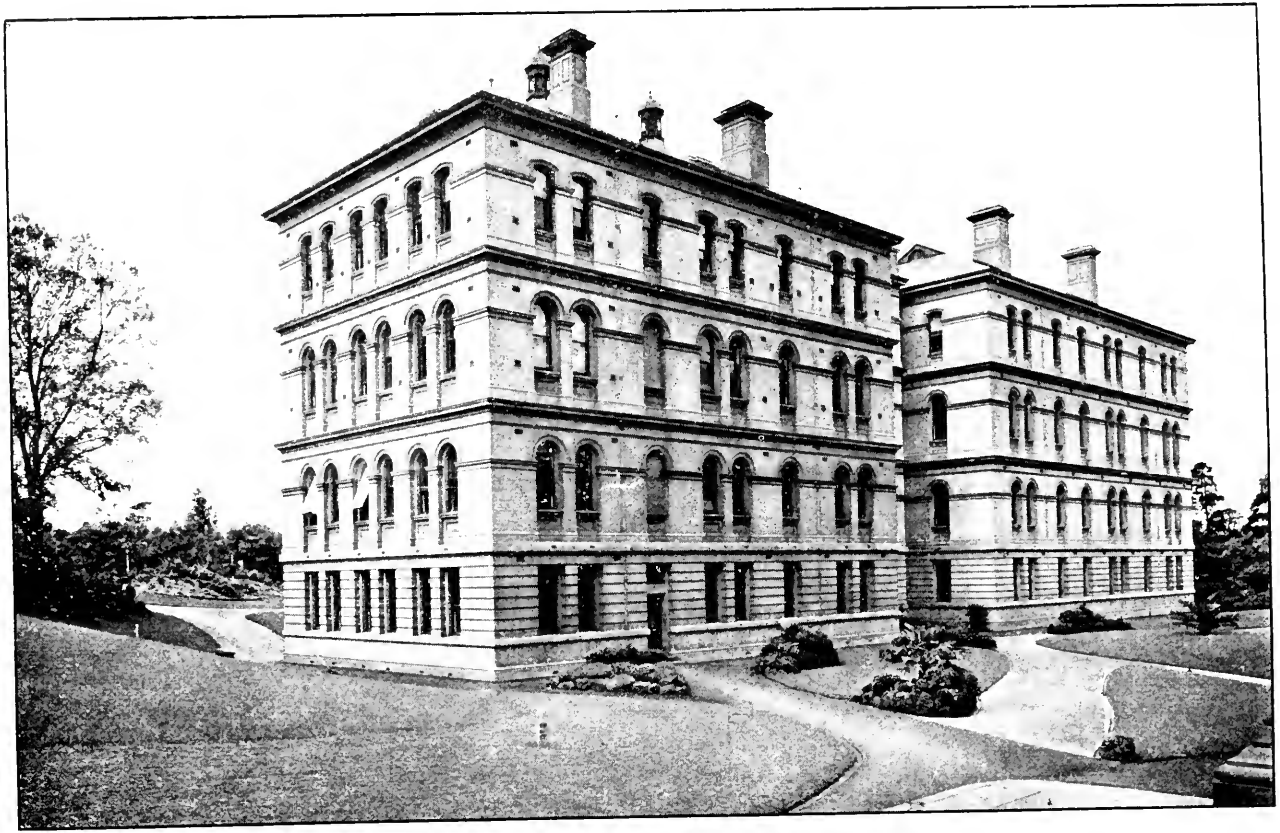

HEAD OFFICE, DEPARTMENT OF AGRICULTURE, MELBOURNE.

G. R.

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OF

VICTORIA,

AUSTRALIA.

PUBLISHED FOR AND ON BEHALF OF THE GOVERNMENT BY DIRECTION

OF THE

HON. GEORGE GRAHAM, M.L.A.,

Minister for Agriculture.

VOLUME VIII.

1910.

A. T. SHARP, Editor.

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INDEX.

Vol. VIII. POULTRY FARMING. Part 1.

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CONTENTS.

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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. VIII. Part 1. 10th January, 1910.

POULTRY FARMING ON SMALL HOLDINGS.

H. V. Hawkins, Poultry Expert.

The annual value of poultry products raised in the State in 1908 was estimated by the Government Statist at the excellent total of £1,547,000. This, of course, includes not only the poultry and eggs sent to market, but also those consumed on the farms. These figures increased by £47,000 over those for 1906, and were equal to more than one-half of the value of the aggregate output of the mining industry (£3,031,000) for 1908. But there is room for expansion. Poultry-raisers do little more than supply the demand in the State. Indeed, they are not able yet to fully meet the requirements for eggs. In 1908, after deducting exports, there was a net importation into Victoria of 589,322 dozen eggs, valued at £22,631, from the other States. But these figures are trifling when compared with those for New South Wales and Western Australia. In the same year, the former State's net imports of eggs were no fewer than 1,339,315 dozen, valued at £56,713, and those of Western Australia, 1,129,709 dozen, worth £55,345. The only States in the Commonwealth which are able to show a balance on the right side of the ledger in respect to the Inter-State egg trade are South Australia, which exported 2,825,882 dozen, valued at £127,203, to the other States in 1908; and Queensland, which provided 261,185 dozen, worth £10,687.

THE INDUSTRY IN DENMARK.

Since the advent of co-operative stores or collecting centres throughout Denmark, poultry breeding has become wonderfully stimulated. The following figures indicate the progress made since 1888:—

Year.	Fowls.	Turkeys.	Ducks.	Geese.	TOTALS.
1888 ...	4,592,000	32,000	643,000	213,500	5,481,800
1893 ...	5,856,000	40,000	723,700	230,400	6,850,600
1898 ...	8,748,400	52,000	803,200	210,900	9,814,700
1903 ...	11,555,332	58,000	889,413	187,929	12,690,919

It will be seen that in fifteen years the number of fowls increased 150 per cent. (7,962,132); turkeys by 80 per cent. (25,045); ducks 38 per cent. (245,513); and geese decreased 13 per cent. (25,571). A reasonable estimate is that the total poultry crop is valued about £3,000,000 per annum, which is equal to £1 4s. per head of the population. Not only have the numbers increased, but the egg has advanced in value :—

Year.	Value per 120. s.	d.	Year.	Value per 120. s.	d.
1890	6	3¼	1900	7	6¼
1892	6	7½	1902	7	9
1894	6	9	1904	8	1¼
1896	6	8	1906	8	10¾
1898	6	9½			

The question naturally arises: "What has brought about Denmark's success?" Firstly, co-operation; secondly, the Government creating centres for breeding purposes, of which there are 25. Before a farmer can receive the distinction of his farm being created a breeding centre he must show that his yearly income from poultry products is satisfactory. Although the subsidy is small (about £5 per annum), the Government provides him with stud stock free, and he is then under the supervision of the Poultry Expert, who is employed to visit and advise. This scheme has worked remarkably well, so much so that a spirit of healthy rivalry has sprung up amongst the farmers, who are privileged to select birds at 5s. each from these centres, which all have the trap nest in use.

The egg exporters offer prizes each year for the best kept centres, which is a further inducement.

The writer is firmly convinced that some such system would add a stimulus to the industry, and it would not be long before Victoria stood out prominently as a large exporter of eggs.

EGG CIRCLES.

Should the Government accept the writer's recommendation, *i.e.*, that the time is ripe for the adoption of a system of forming egg-collecting circles, as is done in Denmark and quite recently in South Australia, the egg trade will become gigantic. In addition to supplying our own markets, we should, I feel confident, share in the Home market, which pays to foreign nations close upon £8,000,000 per annum for eggs. A photograph of one of the South Australian egg-circle cases is here reproduced.

BUYING EGGS BY WEIGHT.

Much has been said of buying and disposing of eggs by weight. As far as selling to the consumer is concerned, the present method is far from satisfactory. No incentive is given the breeder to build up a flock of layers averaging 2¼-oz. eggs. At the time of writing, 1¾-oz. eggs are fetching equal prices with those ¾ of an ounce heavier.

In Denmark, all eggs are bought from the farmers by weight, and sold by the dozen in standardized grades; some form of discrimination against small eggs is undoubtedly a part of the needed reform in buying eggs from the producer. This discrimination may be brought about by buying by weight, by docking all lots of eggs of less than a certain average weight, or culling out all eggs less than a given weight or size, and paying considerably lower prices for these culls. If this were done, we should see farmers weeding out the hens laying small eggs.

The greatest handicap to the egg trade in Victoria is, in my opinion, the storekeeper with his custom of bartering merchandise for eggs. He reckons his profits on goods as more than his loss (if any) on eggs. No effort is made by the storekeeper to buy eggs on a quality basis or to induce his clients to improve their flocks.

Preserving Eggs.

The method of preserving eggs by means of waterglass is the most satisfactory process of keeping them for a few months. Waterglass is a cheap product that may be secured from any chemist or storekeeper. It is used in the proportion of one part of waterglass to ten parts water. The water should be well boiled, and afterwards cooled prior to mixing. One gallon of waterglass will be sufficient to pack 50 dozen eggs. Large tin cans, or small barrels, may be used to advantage in packing the eggs. Eggs should, on no account, be stale; the fresher they are, the longer they will keep. Care should be taken to keep the eggs so preserved in a cool cellar or shed with an even temperature.

When using preserved eggs for culinary purposes, it is best to puncture the shells on the broad end, to remove the accumulated gas. If this is not done, the egg is almost sure to crack when boiled.

Agricultural Value of Poultry Manure.

I have often wondered, when reading the results of egg-laying competitions, and balance-sheets furnished by agricultural students, why no mention was made of fowl manure. One is led to the conclusion that most poultry breeders either neglect gathering the manure daily, or else throw it into the rubbish heap. When it is remembered that each bird of 8 to 9 lbs. live weight drops nearly 52 lbs. of manure each year at night-time alone, and basing the average daily droppings at nearly 100 lbs. per bird per year, what must the value of this manure, wasted or trodden in yearly, amount to in Victoria?

To get a fairly accurate idea of its value, I have had gathered daily the droppings from four pens, the size of each pen being 75 feet x 25 feet. In two of the pens there were eight birds, in the other two seven, short grass being in each pen. The result was as follows:—From the pens of eight birds, weighing 8 lbs. each, the manure was gathered and partially dried (seven days), the weight from each bird averaging (during day-time), $1\frac{1}{2}$ oz., and on dropping-board under perch (night-time), 2 ozs., or 46 lbs. per annum. It will thus be seen that the night manure from large birds is worth at least 1s. per annum. This conclusively demonstrates that thousands of tons of fowl manure, representing thousands of pounds sterling, are lost yearly in this State alone.

Roughly speaking, the fresh manure is worth £2 per ton, and, when dry and properly stored in casks, £4 per ton. It will thus be seen that little, if any, manure from live stock is so rich in fertilizers as the fowl manure.

According to an eminent authority, its true market value is as follows:—

	Fresh Manure.	Partially-dried Manure.
Moisture	61.63	41.06
*Organic matter and ammonia salts	20.19	38.19
Tribasic phosphate of lime .	2.97	5.13
Magnesia, alkaline salts, &c.	2.63	3.13
Insoluble salicious matter (sand)	12.58	12.49
	100.00	100.00
*Containing nitrogen	1.71	3.78
Equal to ammonia	2.09	4.59

One thing should be borne in mind, *i.e.*, that lime must on no account be used in the runs, or houses, as lime liberates the ammonia, and when such is the case, its value as a manure is practically gone.

The collected manure should be stored in an old barrel, where it must be kept dry, and mixed with a little sand, gypsum, or wood ashes, also a little soot. This tends to prevent the loss of ammonia. The manure may also be placed in a tub with water, and allowed to stand over-night; then stir and use the liquid for watering. Vegetables of all kinds, also flowers and plants, especially pelargoniums, roses, lemons, &c., do well with it.

The growth of the onion and tomato, &c., is largely increased by the use of this manure, and to nurserymen it is of the greatest value. The vegetable acids are as important as protein to growing chicks, both being an absolute necessity. It is therefore an easy matter where land is available, for every farmer of poultry to utilize to its fullest extent the valuable manure referred to in growing vegetables.

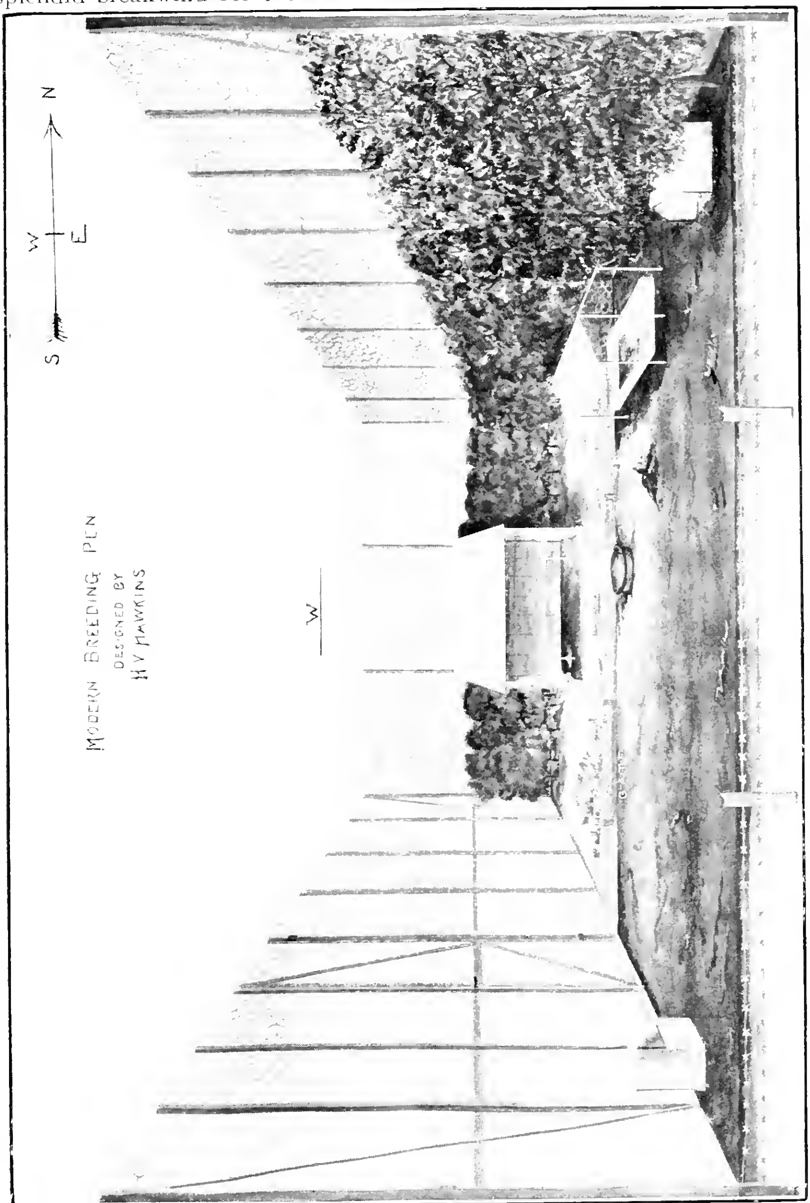
Breeding and Feeding.

The Breeding Pen.

Locality plays a most important part in the success or otherwise of poultry breeding. Badly drained, sour, or very stony land should be avoided; rather select a site having an easterly aspect, sloping so that the early morning sun may sweeten the ground, which is a great factor in warding off disease. All cannot secure sandy soil, but look for loose soil, and, wherever possible, secure the sandy spot. It dries out quicker, and is much easier to keep clean.

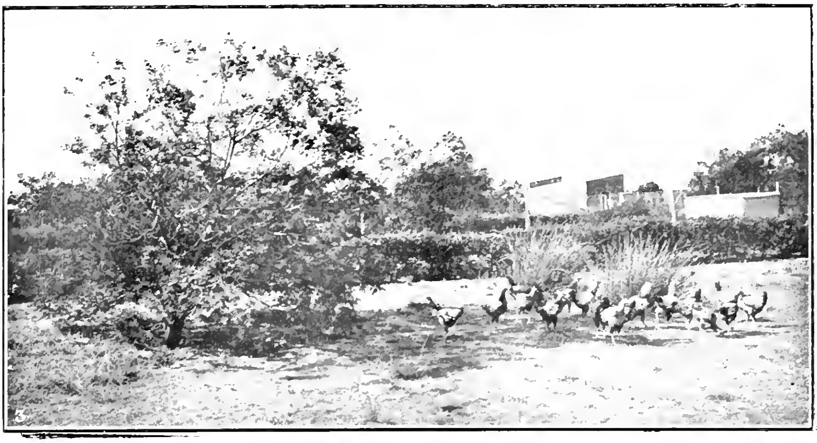
Farmers know little or nothing about the breeding pen, but to my mind this is the key to success. The old idea of keeping a few fowls round the homestead is passing. The farmer should know something about the fowls he has. Before he thinks of incubating he should be careful to watch for the layer of 150 to 200 eggs; hence the necessity of a breeding pen. A fair sized pen, say, 50 by 20 ft., should be set apart for this purpose. First of all, run the plough round, making a trench of, say, 10 to 12 ins. deep. Then place the posts (8-ft. lengths) about 2 ft. in the ground, 12 ft. apart—good saplings barked will do. Before filling up the trench, run two rows of barbed wire all round. This will be a safe investment, and will effectively keep out foxes or wild dogs.

Breakwind.—After this, run a batten round 3ft. from the ground, to keep posts straight, but on no account have any top rail; it only encourages the birds to fly over, and is also a source of danger where foxes are troublesome. The latter will never attempt to jump on wire mesh, but if you give them a foothold, trouble will begin. Use 6 ft. palings cut in half, or, if funds permit, plain sheet iron. The palings or iron should be nailed on to the middle batten all round the pen, and will provide a splendid breakwind for the stud birds.



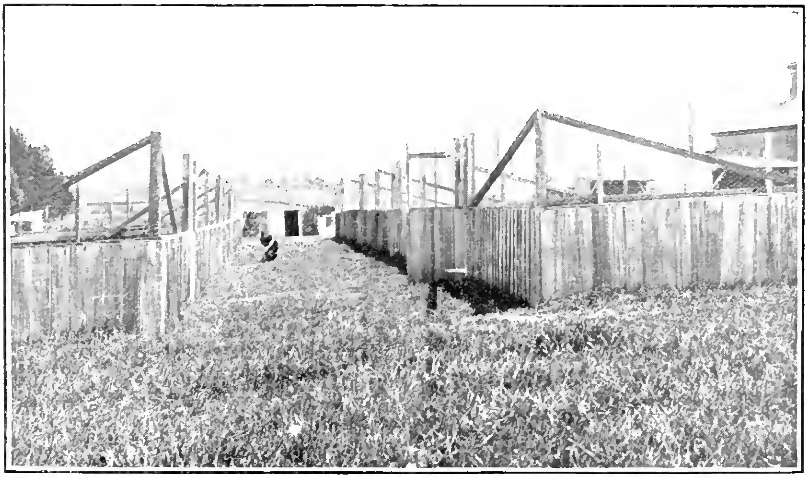
MODERN BREEDING PEN, 50 X 20 FEET.

SHADE AND SHELTER.—It must not be forgotten that shelter is absolutely necessary in a breeding pen. The temperature of a fowl's body being greater than our own, it stands to reason that shade from the sun's rays must be provided. The best and most quickly grown shelter hedge is the tree lucerne (*Tagasaste*). It will grow in almost any part of Victoria, and will stand drought well. The tops should be cut every month, and utilized in the morning meal. Then it thickens and shoots out at the lowest part of the stem, throwing shade along the ground, where the birds can rest comfortably from sun and wind.



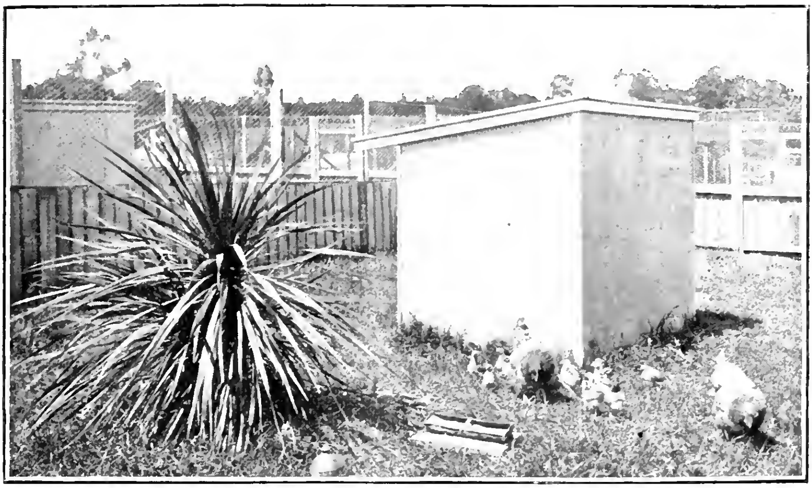
SHADE AND SHELTER.

Construction of Houses.—The next consideration should be housing in the breeding pen. A small portable house is all that is required to hold only such birds as are selected typical layers; or you may wish to cater for the export trade. In any case, seven to twelve birds will be sufficient in one pen, no matter what breed you intend keeping. The house should in all cases face the east, so as to get as much sunshine as possible. It is not necessary in this climate to build expensive or warm



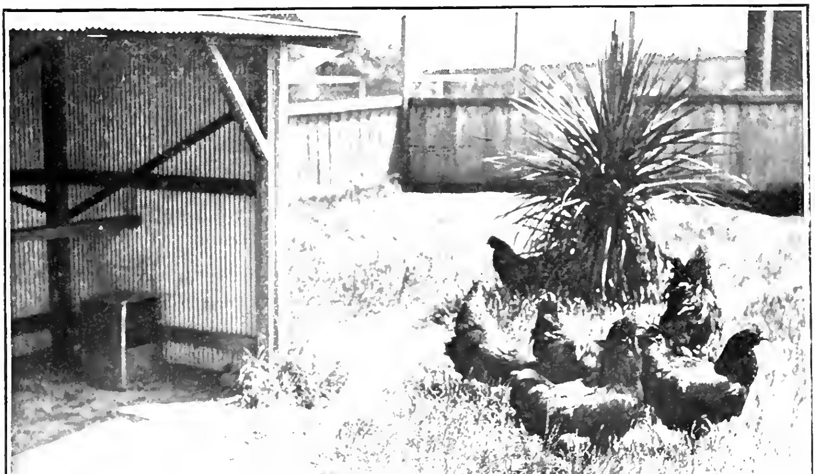
ARRANGEMENT OF YARDS ON CORRIDOR PLAN.

houses. The north, south, and west sides should be closed in, and should be quite free from cracks and draughts, the east side alone being entirely open. The roof should slope eastward, and project 2 feet over frontal uprights; this will effectively prevent an easterly rain (a rare occurrence) from driving in on the birds at night-time, and will allow the rain to drop clear of the base of house. A good plan to safeguard the floor is to run a small piece of spouting round the house, and have the downpipe placed



BREEDING PEN, SIZE, 50 FT. X 22 FT., WITH PORTABLE HOUSE.

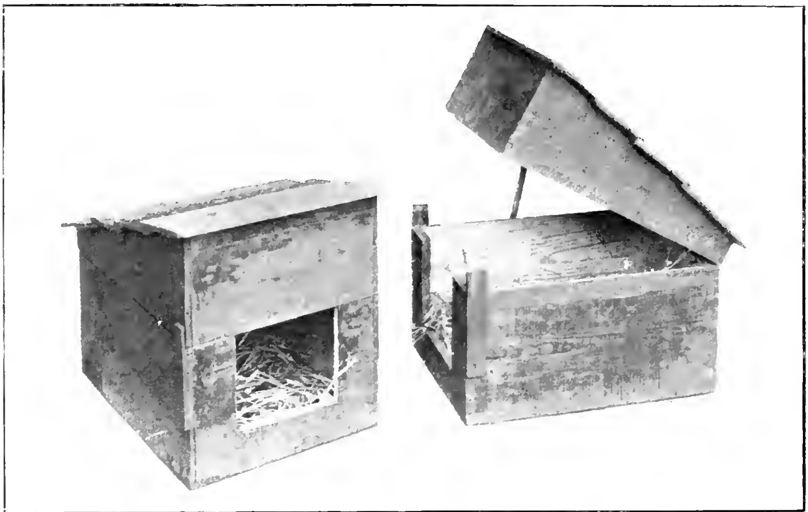
in position to carry the water clear of the pen. For example, a portable building 6 ft. long by 4 ft. wide, the back 5 ft., and the front 4 ft. high, makes a serviceable house. Ten sheets (5 x 2) of narrow gauge galvanized iron will suffice, 3 sheets for roof, 3 for back, and 2 for each end. Having no floor, it is easily moved, simple to spray, and is almost insect proof.



ANOTHER VIEW SHOWING CONSTRUCTION OF HOUSE.

Many make the mistake of coddling their fowls. Coming off the perch of a warm house at dawn in June, the birds receive a severe shock, and very often take cold, which may lead to roup, the fowl's worst enemy. An even temperature, a house free from draughts, a dry floor, and good ventilation, are requisite.

PERCHES.—These should always be low. Eighteen inches from the ground is ample, and the perches should not be nailed. When nailed you have always to contend against the vermin trouble. The little red mite, if allowed sufficient latitude, will drain the system of any fowl, and the very essence of egg-production is drawn from the body of a hen in an infested house. It will pay better to secure insect-proof perches, which may be constructed as follows:—Take a piece of iron tubing 24 inches long, and an ordinary jam tin, cut a hole in the bottom of tin sufficient to allow the tubing to pass up through the tin within 6 inches of the top, then solder the tin to the iron. The perch should be about 8 inches shorter than the length of the house. Bore a hole in both ends of perch the size of tubing, and when the tubing is fixed on to a heavy stand or driven into the floor, place the perch, which should be made of 3 in. x 2 in. hardwood, on top. Perches require to be about 3 inches wide to prevent crooked breasts. These are often caused through the birds roosting on narrow perches. When the perch is in position, pour a little kerosene into the tins at each end, and the perches will be insect proof.



NEST BOXES—DARK AND EASY TO CLEAN.

FLOOR CATCHMENT.—The continual cleaning of the floor is usually followed by the ground becoming basin-shaped, and the result is a damp floor in winter time. A cheap and effective plan to prevent this is to purchase a piece of black tarpaulin, about the size of the floor, and nail this on to two pieces of wood, one at each end, and place on floor of house. Every morning roll it up and empty the droppings into a wheelbarrow. If the birds have been scouring, through eating too much wet grass, and the carpet of tarpaulin has become very dirty, remove it to a tap, and put the hose on. Then hang over a fence to dry. It is advisable to throw a little sand on to prevent the droppings adhering to the tarpaulin. This system works well, saves a great deal of time, and prevents the spread of vermin.

TRAP NESTS.—Trap nests will assist the farmer to discover the good layers, and will enable him also to pick out the unprofitable birds, which are too often bred from unknowingly. These should be used for table purposes; on no account waste food in keeping bad layers. Nests should never be made inside the fowl-houses, nor yet adjoining. The better plan is to have them in a shady, darkened spot, away from the house. If the hens are allowed to make nests in the houses vermin is encouraged.

DUST BATH.—A dust bath should be provided in every breeding pen, and should consist of a shallow box 5 by 4 feet, in which sand, ashes, and some sulphur, and a little insectibane, should be placed. This should be shaded, and kept moist in summer time. In the winter months, keep dry, and have a cover to take on and off. Neglect of the bath means an increase of the fowl fleas, which, unlike the blood mites which are only found out at night, live on the body of the hen, and drain it of much of the egg-forming elements. These parasites lay countless small white eggs, almost the size of silk-worm eggs, on the downy part of the feathers, especially under the wings and near the vent. In the early autumn, when the birds usually lose their old feathers, these eggs are carried about the farm, are duly hatched, and return to the newly feathered flock; therefore the necessity of a dust bath is apparent, if we expect our birds to do anything above the old-time barnyard fowl. We live in the days of improved methods, and the more we attend to the little details, the better results accrue.

GRIT BOX.—Every fowl requires some form of grit for the gizzard's proper work. Fowls have no teeth, and their only means of grinding is done in the gizzard by means of grit, say, sharp pieces of broken earthenware, smashed to the size of a pea, or half the size of a grain of maize. This form of grit is that most relished, and I have known birds to leave quartz until they have exhausted all the earthenware. Oyster shell, broken into small pieces, may also be given to assist shell making, but it is not hard enough to serve the double purpose.

DRINKING VESSEL.—Many poultry-keepers make the mistake of using open receptacles, such as an old saucepan or cracked dish, filling it up once a week, and allowing it to be exposed to the sun's rays. This is a serious error. Should a touch of disease appear on the farm, the bird affected naturally drinks a lot, and in so doing leaves the germs of disease behind for the others which follow, and so disease is spread broadcast. The scalding of the tins is very essential. No disease spreads so rapidly as by means of infected drinking water. Keep the water cool and absolutely pure.

A cheap water vessel can be made out of a kerosene tin, cut from the front, half way down on both sides, and again cut across the centre of tin. Raise the piece of tin slightly. It will not only form a shade to the water, but also more important still, it prevents the fowls' feet from getting into the water, and thereby forms another safeguard against disease germs. See illustration of breeding pen.

Keep a rusty horseshoe in the water, and occasionally add 80 drops of sulphuric acid to each gallon. Once a month add a packet of Epsom salts to each half gallon. The colour of the comb should be observed: the whitish red, the blackish purple, or the very pale comb denotes something radically wrong. A bright, healthy, appearance is desired.

CLASSIFICATION AND DESCRIPTION OF BREEDS.

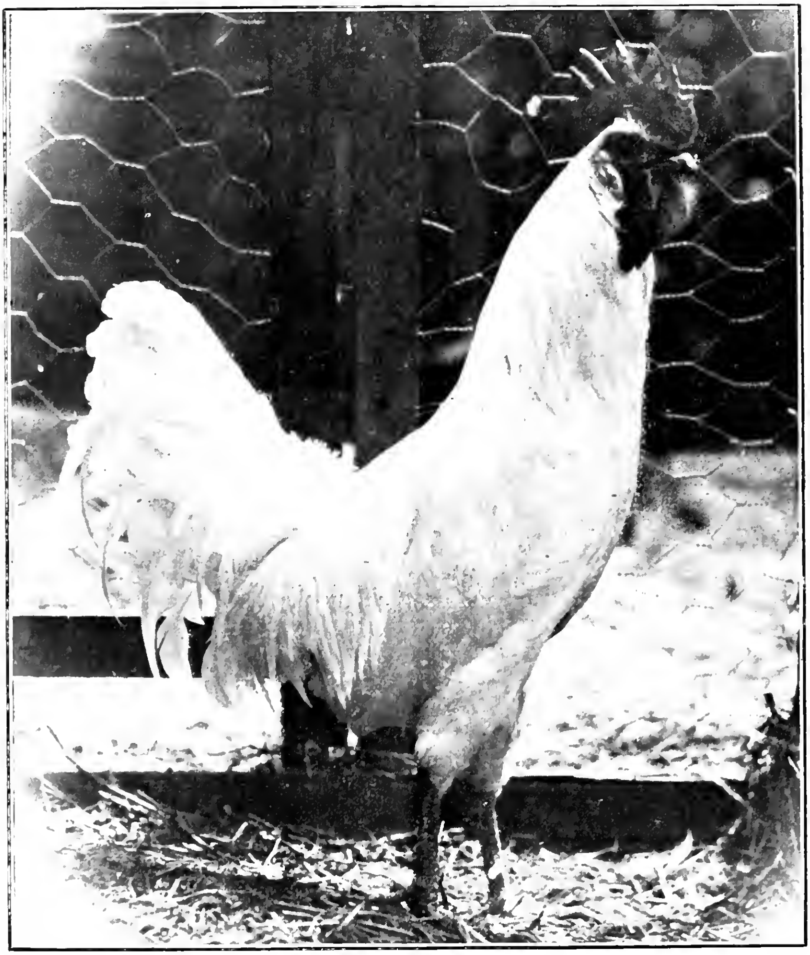
The methods of classification usually adopted by poultrymen divide the races of domestic fowls on the basis of their general utility. Four general classes or divisions are made:—

1. Meat or Table Breeds.
2. Egg or Laying Breeds.
3. General Purpose Breeds.
4. Ornamental Breeds.

Meat or Table Breeds.—The best known types of this class in Victoria are the Dorking, Indian Game, Old English Game, White and Buff Orpington.

In England, a great deal of attention has been given to the production of a fine quality of meat for table purposes, and the result is a very compact, fine boned, low set fowl, carrying a large amount of breast flesh. The English Dorking (Silver and Dark) is the best example of this.

Egg or Laying Breeds.—The chief representatives of the egg breeds belong to what is known as the Mediterranean class. As the name implies,

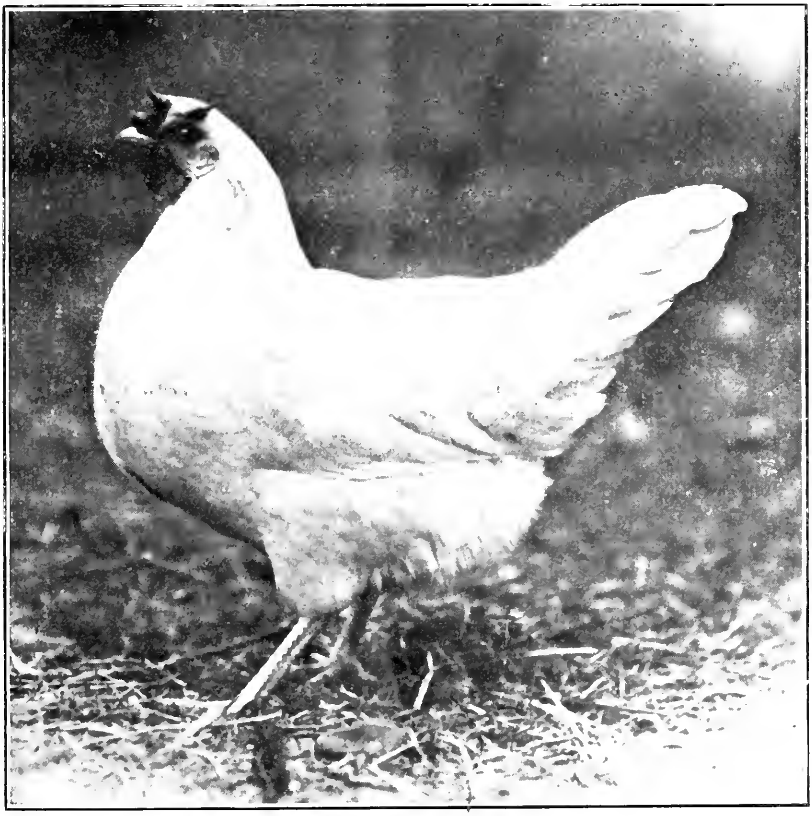


WHITE LEGHORN COCKEREL.

(The type to produce great layers.)

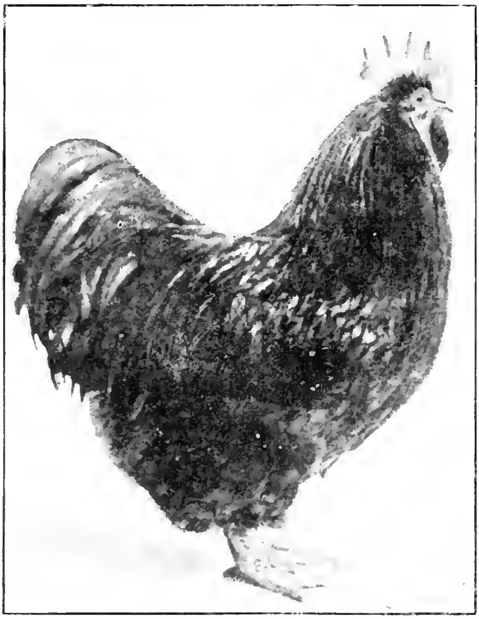
they originated in the countries adjoining the Mediterranean Sea. The Leghorn and Ancona breeds are native to Italy, the Black Spanish, Minorca and Andalusian to Spain. The breeds in this class are small to medium in size, are quick, alert and active. They mature earlier than the heavy breeds, but do not do so well in confinement. The chicks are easy to raise, and the widespread popularity of the Leghorn is an indication of its value as an egg-producer. All the breeds in the egg type class lay white shelled eggs. The hens are not to be trusted as sitters, and the quality of the flesh is decidedly poor.

GENERAL PURPOSE BREEDS.—With the exception of the English Orpington, the best known breeds of this class are American. The Wyandotte and Plymouth Rock are the more popular types in this country. The birds in this class are of a type midway between the two special purpose classes just described, and possess a combination of qualities which form a splendid table bird, yet a bird with a remarkable tendency towards egg production. During the past year, the writer placed six Black Orpington pullets in a run of 50 ft. x 20 ft. with open fronted house facing the east. They averaged 210 eggs each, no mean achievement, as few Leghorns can equal 200 in the year.



WHITE LEGHORN PULLET.

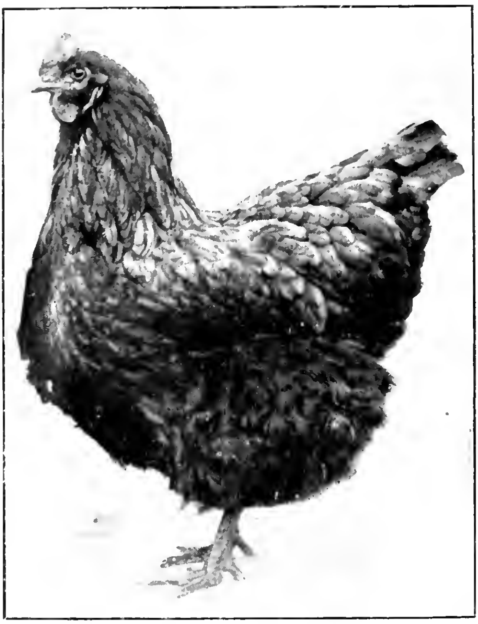
Plymouth Rocks.—This breed of poultry has been aptly termed the farmer's fowl, due probably to their foraging habits, docile disposition, and ability to stand confinement. It was a great favourite, ten years ago, but suffered through the Wyandotte craze, but it is pleasing to record that several large breeders have taken them up and they promise to again become one of the most popular farmers' breeds. The Plymouth Rock has a long deep body, with well rounded appearance. They are good sitters and make excellent mothers. They furnish a splendid quality of meat, although yellowish in texture, and now rank high as layers of a large brown egg.



BLACK ORPINGTON COCK.

Wyandottes. — This is a breed of very composite origin and consists of many varieties. They are somewhat smaller than the Plymouth Rocks and are low set, rather square, compact birds. A distinguishing feature with this breed is the rose comb, although they often throw back to the single comb. The latter is a disqualification in the show pen.

The pullets mature early and invariably commence laying at five and six months' old, but the size of the egg is much against them. Cockerels respond quickly to the fattening pen and realize good prices for market purposes. The most profitable and popular are the Silver and White; the Golden and Partridge are rather poor layers—due, in a measure, to the introduction of Indian Game blood in the one case, and of the Partridge Cochin in the other.



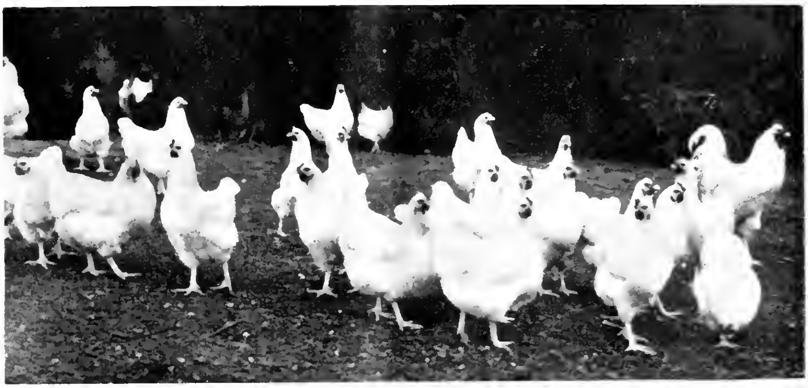
BLACK ORPINGTON PULLET.

(The best utility fowl for Victoria.)

ORNAMENTAL BREEDS. — Under this heading are classified many breeds of poultry kept only by the show man, which are of little economic value. Farmers should disregard them: the Polish, Silkies, Houdans and Bantams may be placed under this class.

SELECTION OF BREEDING STOCK.—Birds that are intended for breeding purposes should be selected from the flock, or purchased from breeders, in May or early June, so as to familiarize them with their new surroundings and accustom them to the male bird, seven days being required for fertilization. Discard very fat hens, they seldom produce fertile eggs; hens that have been fed heavily are poor stock getters. Immature, undersized birds, or those lacking stamina, should never be placed in the breeding pen. Health and constitutional vigour, as indicated by birds of active and sprightly dispositions, are of great importance. Breeding birds of good size should be chosen, and, if pure breeds are kept, they should conform to the standard breed requirements, especially in regard to types. Breeding from late pullets is not desirable, but forward pullets may be successfully mated with two year old cocks.

When heavy breeds, such as Orpingtons or Wyandottes, are selected, care should be taken not to have too many hens in the breeding pen Seven two year old hens to a one year old male bird are ample, and fertility will be assured. As the Leghorn, Minorca, and Andalusian breeds are lighter and more active, one may look for good results by adding ten to twelve hens to a cockerel. Should it be desired to keep only one breed and to economize for a year or two, in the matter of suitable pens, twenty hens, having their liberty, will not be too many for a vigorous cockerel. But it must be distinctly understood, that hens lay much earlier when confined in pens, than those having the run of the block. Too much wet grass militates against egg production ; it scours the birds, so that the less they have during the autumn and winter, the better results will follow.



WHITE ORPINGTONS.

FEEDING OF BREEDING STOCK.—Plenty of green food is required during the breeding season and a fair amount of animal food. It is not wise to feed maize during this period ; wheat and oats are better. Feed the male bird by himself, otherwise an over-kind cockerel will almost starve himself. This is a common cause of infertility, and at times, is largely responsible for chickens being dead in the shell.

ADVANTAGES AND DISADVANTAGES OF POULTRY-KEEPING.

For the beginner at least, it is quite probable that the first year or two, small poultry-keepers will find it necessary and more convenient to raise their stock by natural methods. However, with the small cost of the present-day incubator, and its simplicity of working, it is doubtful if he is acting wisely in disregarding the artificial methods of hatching : a single machine, of 100-egg capacity, will hatch as many chickens as will 8 hens of fair size and in most cases at much less trouble. One has to consider the cost of keeping sitting hens in and out of season :

the incubator costs nothing to feed during nine months of the year. All that is required, after the hatching season is over (July, August and September), is to thoroughly disinfect the egg drawer and expose the parts to sunlight, after which the machine should be safely stored for future operations. To those who doubt their ability to successfully handle incubators, a judicious blending of the two methods will be found profitable. By setting enough hens to care for the incubator hatch when it comes off, the artificial foster mother, or brooder, can be dispensed with.

NATURAL INCUBATION.

Avoid setting the nervous hen; one can soon discover an excitable broody hen. Practise the handling of sitters, by placing the hands under both wings and raising the hen gently off the nest; by so doing there will be no fear of breaking eggs. On the other hand, if one carelessly lifts the hen from her nest, there is the risk of the eggs dropping and being broken through being caught in the hen's wing in her excitement. It will usually be found that Buff and Black Orpingtons, Plymouth Rocks, and Wyandottes are trusted breeds in this connexion.

A separate pen should be set off in the poultry house for the exclusive use of sitting hens, and care taken to prevent them being disturbed. A simple nest box can be made out of half-inch boards. For the average sized hen, a nest 12 in. x 14 in. is large enough. The sides, back and top should be completely enclosed. The front may be left open with the exception of a 5-inch strip along the bottom. Loose earth slightly hollowed in the centre and covered with fine straw or hay, makes good material for the nest. The hollow should not be too concave, as too much pressure on the eggs is likely to crack them. Thirteen fair-sized eggs fit the nest better than twelve that is for a hen of ordinary size—whilst a large Orpington can comfortably cover fifteen eggs. Much depends on the season, *i.e.*, July sitters should have only eleven eggs, and early in September, with more genial conditions prevailing, it would be quite safe to increase the number.

No attempt should be made to remove the hen for the first 72 hours of sitting—she will then usually come off of her own accord. She should be fed on grain—wheat and crushed maize are the best foods to give. Avoid sloppy or sticky food as it will cause indigestion and will make the hen restless and irritable while on the nest, and often results in the eggs being cracked and broken. Keeping the hen free from vermin is another important consideration; she should be well dusted with insectibane before placing on the eggs, and have frequent access to dust bath. A little powder on the nest will be helpful in keeping down the mites. A successful hatch is next to impossible when the hen is worried by these pests; she becomes uneasy and restless, often breaking several eggs and spoiling the others by closing up the pores with the substance from the broken eggs, and thus shutting in the carbon di-oxide which smothers the chick, the hen frequently deserting the nest altogether. At times she is found dead on the nest through the inroads of lice.

Should an egg get broken, thus fouling the nest, the remaining eggs should be taken out and carefully washed with warm water until clean, for if the pores of the shell become clogged in any way and remain so, this will cause death to the chick. It may be found necessary to replace the nest with fresh straw or dry grass.

ARTIFICIAL METHODS OF HATCHING.

The incubator is a necessary adjunct to the modern poultry farm operated on a strictly commercial basis. Indeed, to a large extent it has been responsible for the growth of the industry throughout the world during the past 17 years. The advent of the incubator, and the artificial brooder, has rendered feasible the handling and rearing of immense quantities of chicks and ducklings at a much lower cost, and with less labour, than under the old natural methods, while autumn and winter laying pullets are raised in greater numbers. A complete dependence on the maternal instincts of the hen is now no longer necessary, and chicks may be hatched in the early spring, whilst under the old system, farmers and others had to pay high prices for sitting hens in July and August.

The incubator has also revolutionized the table bird industry. It is not long since it was necessary to import, from the other States, birds fit for the great consumption at the time of the Melbourne Cup carnival. Now, things have changed; the poultryman who knows his business has all his incubators filled by 1st June, in order to meet the large demand for fat chicks in November—4 months' old chicks being sought after to meet the requirements of the great influx of visitors from the other States.

SELECTION OF INCUBATORS.—Many kinds of incubators are on the market, each having its advantages and advocates. No make, however, can be recommended as the best, as most of them give satisfaction when handled with intelligence after a careful study of the maker's directions. Good machines are the rule, rather than the exception. There are two general classes of incubators, viz., the hot water and the hot air machines. The principle involved is the same in both, namely, that of supplying all portions of the egg chamber with a uniform degree of heat. A kerosene lamp furnishes the heat in both kinds of machine.

SELECTION OF EGGS.—An egg must be strongly fertile to produce a chick with stamina. To insure the best fertility, eggs should always be selected from a pen of vigorous and mature hens, two to three years old. Give them a fair range and a variety of wholesome foods. Do not feed on grain alone, as grain by itself will not be conducive to good results; animal food (untainted) is of greater importance than grain. Both are necessary. The size, shape and colour should be the basis for the selection of eggs for incubation. Eggs that show thinness of shell, or are unusually porous, misshapen, too large, or too small, should be discarded. In most cases they would be infertile, or would, at an early stage, die in the shell. It should also be remembered that the fresher the egg the better for incubation. Unsatisfactory hatches are usually obtained from eggs more than seventeen days old.

LOCATION OF INCUBATOR.—The proper location of the machine has much to do with its success. A dry cellar is a good place, but it will give better results by placing it in a well ventilated room, free from draughts, and preserving a uniform temperature.

The rules which govern the working of an incubator are few and simple. Printed directions, which usually accompany each machine, should be strictly observed. Close attention must be paid to the merest detail. Neglect in this direction often results in disaster, especially to the beginner.

THE MOISTURE PROBLEM.—No other phase of artificial methods of incubation has been so much discussed as the practice of supplying moisture to the eggs during the period of incubation. The opinion of most breeders is that only in dry atmospheres should moisture be added. I find that the addition of added moisture to the egg drawer during the last three days is beneficial, and undoubtedly tends to soften the membranes adhering to the shell, thus assisting the chick in breaking the shell and rendering its exit more easy. Climatic conditions play an important part in incubation—dry seasons have to be considered here. During the last drought, many duck breeders found it necessary to add moisture for periods varying from seven to fourteen days, and with excellent results; in fact, during the time of airing the eggs, many immersed the eggs in warm water and the results were satisfactory. In October the floor of the incubator room should be kept wet during the last week.

FEEDING LAYING HENS.

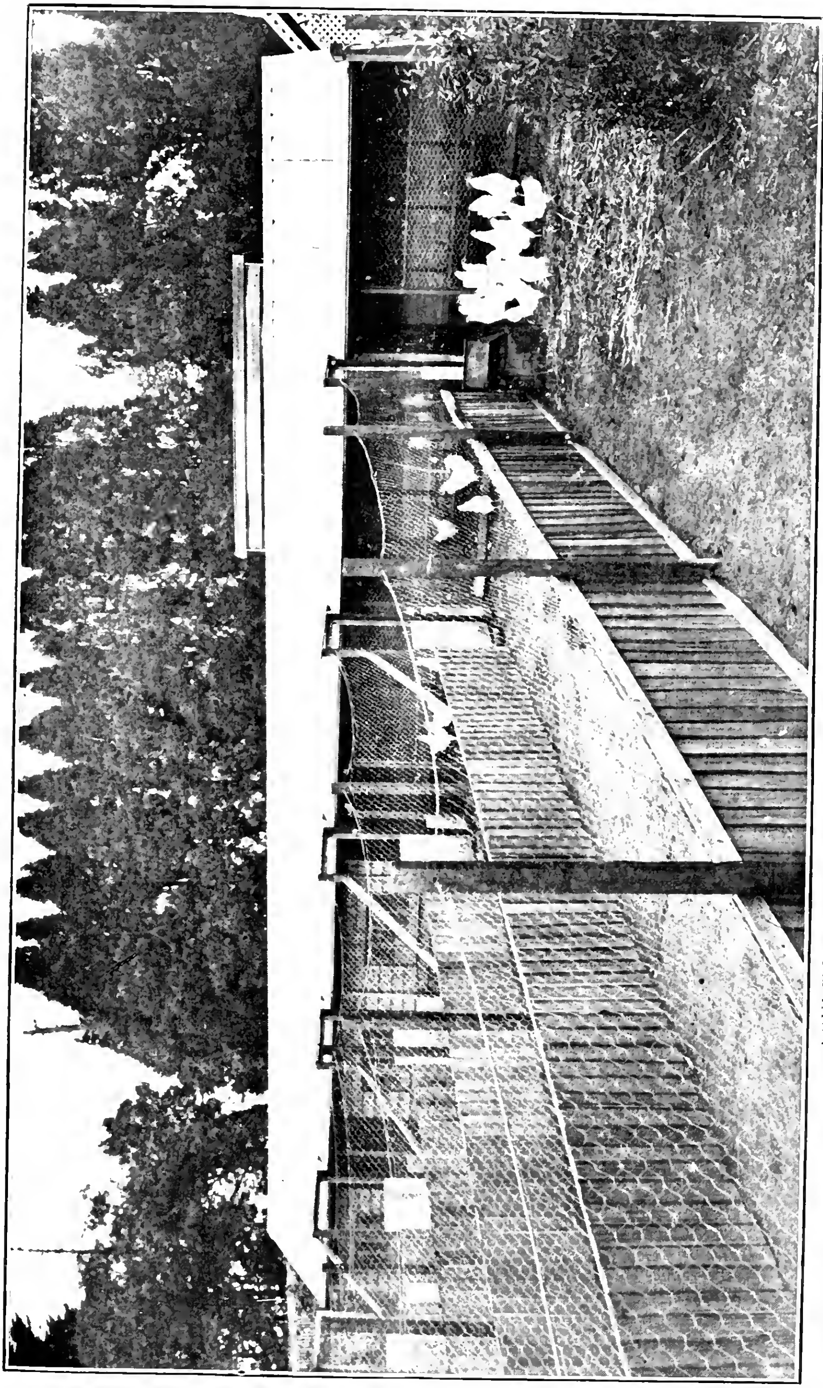
The great variety of smaller cereals grown on the average farm in this State makes the adoption of a liberal ration for the farm flock of poultry practicable. All of the staple grain products make desirable poultry food. Wheat ranks high as feed for laying hens. Oats is a highly nitrogenous food and should form a large part of the ration. Fowls do not readily take to barley, but when fed as a mixture with other grain, it will be found beneficial. Millet is another excellent food, which may, with advantage, be added to the ration, more especially for young chicks and growing turkeys. Crushed maize is one of the best of all grain, when fed to the flock during the winter months; but the writer prefers to use equal parts of maize with short white oats. Maize is a cheaper food than wheat, but the aim of the poultry breeder should be to give a variety of grains in making up the daily ration.

The exact quantity of food to be given in the daily ration to a pen of layers, or to a number of stock birds, cannot be definitely stated in a single rule which will apply in every case. One has always to remember that the climatic conditions, the locality, and the breeds, are all considerations for the breeder to carefully weigh. Hens laying in winter quarters require more than those out in the pens, and a greater variety of food is desirable. An insufficient supply of green food will cause a paleness in the yolk of the egg. A hen that is a heavy layer can scarcely be overfed; but, on the other hand, the good feeder will always aim to have the hens eager and anxious for their feed at meal times. Much depends on the judgment of the feeder, and his discretion should be exercised at all times. When kitchen scraps are available, they give variety to the morning mash. Skim milk is of great value as an aid to egg production, and when available should take the place of water.

METHOD OF FEEDING.—The plan of feeding laying hens followed at the Burnley School of Horticulture, under the supervision of the writer, is as follows:—

Morning meal.—Pollard (by measure), 2 parts; bran, 1 part; lucerne chaff, about 1 part; dry animal meal, about 1 oz. to each bird. Mix with hot water until thoroughly friable, and allow $2\frac{1}{2}$ ozs. to each hen. Should any of the birds show signs of liver troubles, raw onion, finely sliced, is added. It is an excellent tonic, and adds lustre to the plumage. At noon, a little grain is thrown in the dry litter, and during the warm weather, silver beet, lettuce and cabbage are fed in addition.

Evening meal.—The value of grains has already been referred to, but a word as to quantity and mixing is all that need be added. Equal parts of wheat and short oats (avoiding the use of smutted wheat) should be given. A handful to each bird will approximately weigh $1\frac{1}{2}$ ozs., so that the daily allowance of food works out at 4 ozs. to each bird, which allows, at least, half-an-ounce to each 1 lb. of a bird's (live) weight.



POULTRY YARDS AT THE BURNLEY SCHOOL OF HORTICULTURE.

First Care of Chickens.

CHICKENS HATCHED BY HENS.—When the hatch is completed, the hen and chickens should be removed to a dry clean coop, with a good layer of dry sand and containing short cut straw or dry grass; chaff also is good for the purpose, and affords good scratching exercise. If several broods are hatched at the one time fifteen to twenty chickens may be placed with one large hen. Care should be taken not to give chickens of another colour to the hen that has hatched out black chicks or *vice versâ* as she may kill them.

The youngsters require a great deal of brooding for several days and the mother hen should be confined in a small space. If given her liberty she will run them off their legs, and the weaker ones will gradually become exhausted and drop behind, get chilled and die. It is much safer to use a coop and daily remove same to clean, fresh ground, until they are three weeks old when they will have found their legs.

CHICKENS HATCHED BY INCUBATOR.—Chickens should be left in the machine for at least twenty-four hours after exit from shell, so that the young downy feathers may get thoroughly dried out and the joints sufficiently exercised. Artificial brooders should be in readiness, warmed up to about 88 degrees Fah. I am not a believer in the old idea of having the temperature at 95 degrees. Too high a temperature is decidedly injurious; 88 degrees may with safety be sufficient heat for four days, then gradually decrease daily until the young are three weeks old, when they may safely be removed to the pens provided for their keeping.

A cheap brooder may be made in the following way:—Cut up an old woollen hearthrug and tack the strips on the inside of the top of an ordinary case, about half-an-inch apart; little or no heat is required when this is available. I am not a believer in coddling chicks by artificial heat. Leg and bowel troubles are often caused by an overheated brooder. I have reared hundreds of pure stock without the aid of any fancy or expensive brooders. The woollen rug is what they like to feel dangling over their heads—providing always there is no draught, but a fair amount of ventilation.

Care is necessary during windy and wet weather. More chicks, artificially hatched, die through this than anything else. Shelter from both is an absolute necessity, and so is a dry floor. Do not encourage chicks to crowd into corners together; it is the cause of crooked tails. Do not permit them to roost on the edge of a box, as many do. The little breast bone is very soft, and gradually it will become quite crooked if the young birds are allowed to roost in this way, and this is a decided fault in a table fowl. Keep them on floors covered with plenty of clean dry grass or *Pinus insignis* needles. They need something to grip so as to exercise their toes. Hard floors cause the toes and nails to grow crooked, and you do not want to have a lot of deformed chicks. These little items should be noted, as they are all important, and will lead to success.

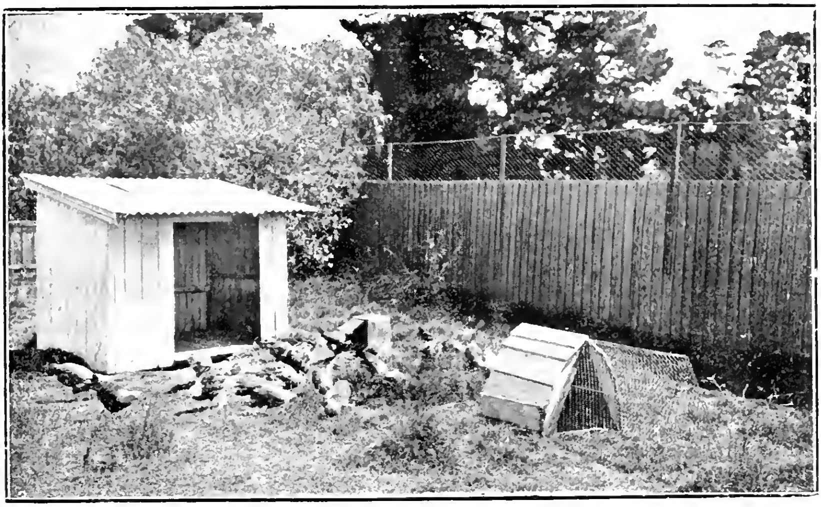
When no brooder is available, the chickens may be given to a hen that has been sitting for at least sixteen to twenty-one days. This should be done at night time, care being taken to place them under her wings, otherwise they may get chilled. A dark coop is the best for a day or two, until she realizes her responsibility.

FEEDING OF CHICKENS.—Chickens should not be fed until they are at least thirty to forty hours old. The first two or three meals should be dry bread mixed with finely chopped hard boiled egg, scattered well about the floor, so that every chicken may feed comfortably. Then add to that some oatmeal and mix with skim milk; it must not be sloppy or pasty—the drier it is the better the chickens will thrive. Until three weeks old they may be fed five times a day. Feed little and often.

The evening meal should consist of hulled oats, ground wheat, millet, and, in cold weather, finely ground maize in equal parts. This makes an ideal food and should be scattered about the floor.

Skim milk will increase the growth of chickens and wonderfully assists feather and bone making. There need be little fear in giving them a plentiful supply.

GREEN FOOD.—Add to the morning meal a little raw onion, very finely chopped; give a little at first and slightly increase quantity gradually. This will prevent bowel troubles and is absolutely a preventive of intestinal worms. Onions also act as poison to the gape worm, which lodges in the trachea.



CHICKEN RUN, HOUSE, AND COOP. SIZE, 50 FT. X 20 FT.

ANIMAL FOOD.—Do not attempt to feed animal meal during the first week, and on no account should green cut bone be given young chicks. It is difficult to digest and will cause diarrhœa; preference should be given to sheep's liver or beef scraps gently stewed and cut up very finely. A small supply of dry bone meal and charcoal in the morning meal is all they require while in their infancy.

FRESH WATER AND GRIT ESSENTIAL.—If giving water to chickens to drink, care should be taken to have it fresh, and the drinking vessel should be kept thoroughly cleansed.

If kept in small pens, with a deficiency of coarse sand, chickens will get digestive disorders. If sand is not available, a good substitute will be found in breaking up crockery into very fine fragments and scattering amongst them.

It must also be borne in mind that chicks require plenty of exercise to thrive well.

SUBSEQUENT CARE AND FEEDING.—At the age of one month, chickens are well able to look after themselves, and it is preferable to place them where they can have all the range and shelter possible. Place them in small portable houses with no floor under the shade of a pine tree or shrub. These houses may be moved when necessary.

At first, the feeder will require to put a few yards of wire netting temporarily tacked, either from each side of the house or around the trunk of the tree, until they become familiar with their surroundings and their night quarters. After a few days they will grow accustomed to the spot and will keep to themselves and always return to their roosting house after the day's wandering about. The more liberty chicks have the stronger they grow as they are getting nature's own food to a large extent—insects and grass seeds in great variety, which all tend to promote frame work. The plan of feeding the four weeks' old chickens need not differ from that of the adult birds except that they require three good meals a day instead of two.

At about ten weeks old the cockerels should be separated from the pullets, particularly the forward birds, and unless they are to be kept for breeding purposes, they should be put into fattening sheds and forced with an ample supply of barley, maize meal, and bran, one part of each,

A LIGHT AND SERVICEABLE CRATE.

giving them plenty of skim milk. At mid-day they should have just sufficient green food to keep them in a healthy condition. Avoid hard food; they do better without it. Three weeks' fattening will be ample. Always bear in mind that cockerels should be marketed at from thirteen to seventeen weeks old. When hatched in July or August they find a very ready sale in November, as before mentioned.

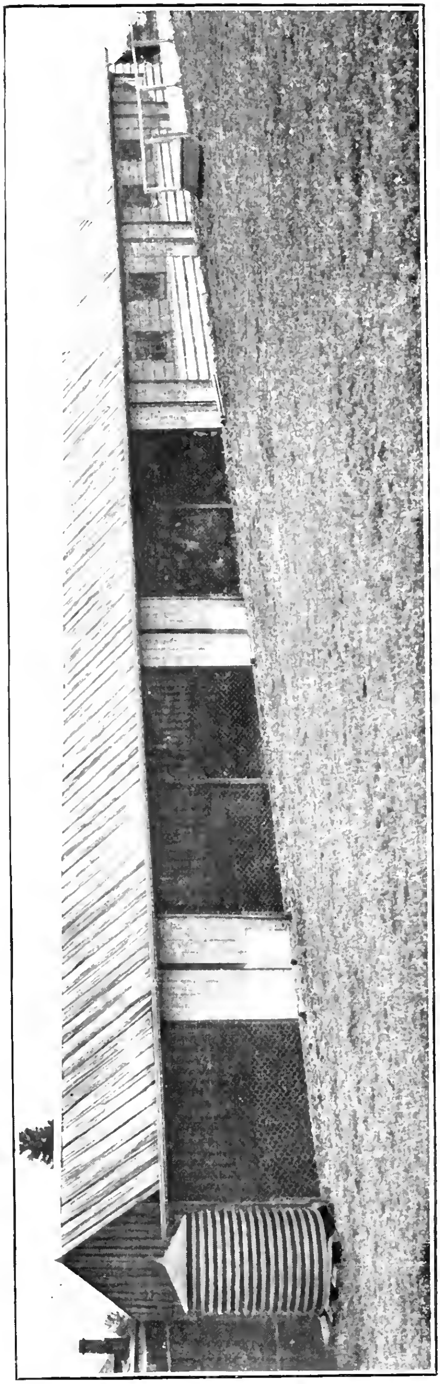
All poultry shrink more or less, while *en route* to market. Turkeys and large soft chickens usually lose more weight than do the older birds. Prior to putting them in crates, give them a double quantity of food. Crushed or whole grains are preferable while journeying to market; this will keep up the body temperature for a longer period than soft food, being more slowly assimilated.

WINTER QUARTERS.

Pullets, when four months old or more, may become much more profitable when housed in winter quarters. The views on pages 17 and 21 serve to illustrate the system followed at Burnley and by the writer. The shed is 90 ft. long, subdivided into ten equal compartments of 9 ft. x 9 ft. It is cheaply constructed, being made with palings, uprights of red gum, and battens of 3 x 1 hardwood. Spouting is placed all round the roof to keep the houses dry; the water thus caught runs into a tank and supplies the whole stock with fresh water and saves time in carting. Half of the houses are open fronted wire netting, the other half closed, having glass windows, which may be so worked that good ventilation is assured. Although the latter are more costly, the birds seem more contented in the closed fronts, than those in the open wired fronts. Dry straw is placed on the floor and they are kept busy. Exercise is necessary for laying fowls, and measures should be adopted by all poultry keepers to insure a reasonable amount of activity amongst their flocks.

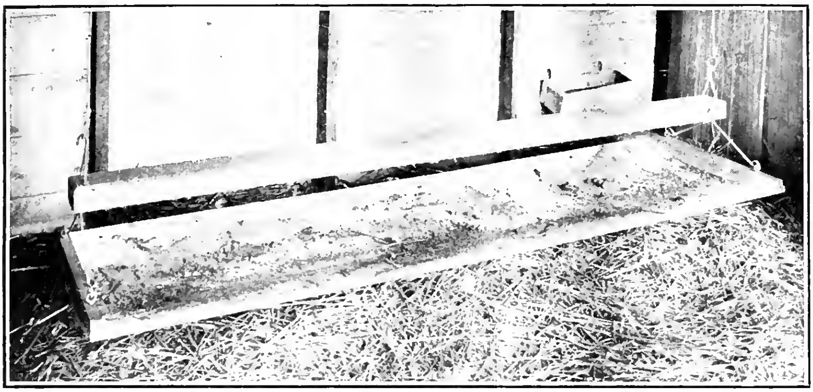
Swing perches are provided of 3 x 2 hardwood, 8 ft. in length, and suspended by wire from the roof. Immediately underneath there is a dropping board, 16 ins. wide, which is also suspended by a hook at each end of the perch, and in such a manner that the birds cannot remain on the dropping board, as it tips up immediately they jump on to it. Secluded nest boxes are provid d in each compartment, made out of kerosene boxes as shown on page 8.

When the weather is fine, the birds are permitted to run out for two hours to



WINTER QUARTERS SHOWING TANK FOR WATER CATCHMENT.

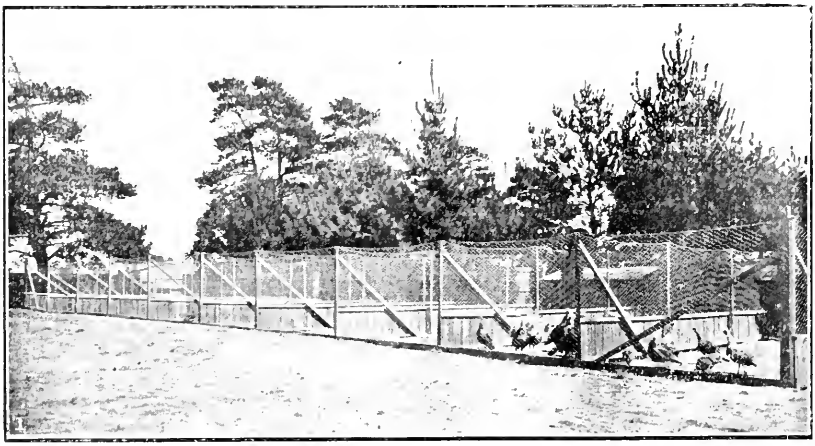
allow of their having a dust bath, which is an absolute necessity, in order to keep down the hen mites which are so troublesome to many of our farmers' fowls. Four times a year, at least, the perches require a thorough washing with kerosene, and in cases where saplings are used,



SWINGING PERCH WITH SUSPENDED DROPPING BOARD ATTACHED.

they should be burnt and replaced by new ones. The mistake made by many, is in nailing the perches—they should always be movable and thus easy to cleanse.

As grit takes the place of teeth with poultry, a liberal supply should be always available; broken china or earthenware smashed up will be readily taken. Oyster shell should also be added to the grit box, as lime



WINTER PENS FOR INTENSE EGG CULTURE. SIZE 36 FT. X 10 FT. EACH.

in some form is a necessity for all laying hens, otherwise soft-shelled eggs and ovary troubles will result. The stronger the egg shell, the less risk is run from breakages. Thin shelled eggs are useless for incubation, as the pores are too large and admit too much air into the embryo. Another reason is that when the shell is too thin there is not sufficient lime material for the formation of the structure of the chick, as the greater part of the chicken's bone work is drawn daily from the shell. Thus the egg shell at twenty days loses its strength of porosity and is easy to break, being at hatching time almost devoid of lime.

Mention has already been made of the importance of a dust bath to all fowls, as they do not thrive well without the necessary cleanser, it being their only means of keeping vermin in check.

MARKING HENS.

It is quite impossible to tell the age of a hen, when she is past the pullet stage (12 months). Farmers should know the age of all their birds, as it will be found unprofitable to keep hens past the third year, unless for breeding purposes. Leg bands with numbers may be used when the pullets arrive at maturity, and if records are kept, the identity of each fowl can always be established. A good method is to punch a hole in one of the four webs of the foot, each web representing a certain year. Punches may be purchased from the leading firms in Melbourne. The hole is punched very easily when the chicks are taken from the incubator or hen. The whole of one season's chicks may be marked on the same web; the following year mark the next web, and so on, so that no difficulty may arise when disposing of the older birds, or when it is desirous to breed from any particular birds.

Diseases and Pests.

Unless a fowl is valuable from a breeding point of view, it is doubtful whether it pays to doctor. Time and drugs often cost more than double the value of the affected bird. In very bad cases the best remedy is the axe, and burning of the body. Should a valuable stud bird go wrong, by all means persevere with it. First try to discover the cause. Possibly it may be a crack in the house, causing a draught, or a badly-ventilated damp or unclean crowded house may have caused the trouble. Rectify the error, and isolate the sick one, to prevent contagion to others.

Every poultry farmer should erect a suitable shed in an out-of-the-way corner, distant from all other birds, and build facing the north-east, so that as much sun as possible may reach it. The front should consist of a glass frame, with ventilation at top, closed well round at foot, to prevent birds from throwing out, by scratching, the germs of disease. The hospital should be kept clean, and all droppings and feathers burnt, and afterwards buried. Disinfect well with phenyle, Condy's fluid, or a carbolic solution. A syringe should be kept for the purpose.

There are two classes of poultry parasites. First, those that live on the fowl's body, and drain the life out of a bird, and swarm all over a neglected house. They get on the keeper's legs at times, and it is as well they do. It surely should remind him that the syringe has not been used for some time. Then there are the red mites. These hide under the perches, and in cracks, and are often found where the perches have been nailed. They attack the birds at night, and after having their fill, return to their haunts. In the former case use insectibane, spraying well all over the body of the bird. The red mites can be easily destroyed with a syringe charged with kerosene, phenyle, or carbolic acid solution, say a cupful of either to an ordinary bucket of water. If made weaker than this, some of the vermin may escape. I find kerosene to be the surest destroyer of all fowl parasites, including fowl tick.

The old method of lime-washing the fowlhouse is not sufficient by itself. Add crude carbolic oil or strong phenyle to the lime wash. Kerosene emulsion is a splendid preparation. Take 1 lb. of hard common soap, and dissolve in a gallon of hot water. While hot, add 2 gallons of kerosene, stir well till cold, after which add 8 to 10 parts of water to one part of the stock. Spray on with a syringe or a brush. Should it clog the syringe, add a little additional water, and stir again.

When a bird dies, make an intelligent examination, and learn something by it. It will often pay to lose one bird, if you can save a whole flock by that experience.

The primary causes of disease are:—

1st. Unhealthy surroundings.
2nd. In-breeding.
3rd. Breeding from birds hatched out of season (these are usually wasters).
4th. Careless feeding of the parent birds in the breeding pens. Example: Pollard and potatoes will not produce a strong embryo chick.
5th. Hatching out of season.
6th. Setting every egg laid in the breeding pens.

The second season hens' first forty eggs produce the strong embryo germs; those laid later, say in November, December, and January, should be marketed. Breed only from the best, in every sense of the word, and disease will be almost unknown to you.

Caring for Sick Fowls.

After isolating, give a nourishing meal. The soft food given in the mornings to the other birds will be the best. Always feed the sick fowls on soft food morning and night, but avoid all grains. A raw egg beaten up with a teaspoonful of brandy will often save a fowl's life. In giving liquids of any kind, use a spoon, which should be kept for the purpose, and take great care to place the spoon over the top of the tongue, so that the liquid passes down the right channel. Carelessness in this may choke the bird.

Remedies.

Always be prepared for emergencies with a thoroughly equipped medicine chest, containing:—

Epsom Salts, a safe aperient in cases or roup; one packet to a quart of water.

Chlorodyne, for severe cases of diarrhœa, or whitish-green discharge from vent, with tail drooping. Give seven drops on piece of bread three times a day.

Quinine Sulphate, for roup; half a grain mixed with half a raw egg a teaspoonful of whisky or brandy, and two drops of eucalyptus oil, twice a day.

Linseed Oil, a teaspoonful to an adult bird twice a day for catarrhal affection.

Vaseline, applied in cases of accident to comb and feet when cut through birds quarrelling.

Boracic Acid, diluted in warm water for inflamed eyes. Dry with soft rag after bathing eyes.

Kerosene, for cleansing nostrils and mouth when affected with roup. It is a sure death to germs or insect life affecting poultry.

Iodine, for sprains, &c.

Sulphur—Eucalyptus Oil—Carbolic Acid.—These, mixed well together, say, a dessertspoonful sulphur, three drops eucalyptus oil, and two drops carbolic acid, are applied to chicken-pox marks, or fowl warts, usually found on comb and eyes of young birds.

Keep medicines away from children's reach, on a high shelf, as some are deadly poisons.

Chicken Pox or Fowl Warts.

This usually makes its appearance in the autumn, and affects the young stock principally. The first symptoms are loss of appetite, dullness, and an excessive thirst. The first thing necessary is to isolate and keep the bird away from water for two days, giving a little milk. The more water they drink the greater the fever becomes. In about three days, small yellowish warts may be seen on comb and head. Give the tonic (sulphuric acid and sulphate iron), called Douglas's mixture. Then make an ointment of sulphur, sufficient to half fill a pill-box; eucalyptus oil, three or four drops; carbolic acid, two drops; and a little sweet oil or vaseline. Mix up well and apply to affected parts. Should warts appear on the eyelid, do not allow the eyes to close, or seal up, but apply glycerine freely, and when the warts appear to develop on the lids, anoint carefully and regularly with the above mixture.

Should the eye be neglected, serious trouble will result. If it is allowed to seal up, the inflammation is sealed also, and the ball of the eye becomes much swollen, and often a growth forms behind the eye, resulting in its loss. I had a case of this brought under my notice at one of the agricultural classes. The eye simply stood out of the socket to the size of a large cherry and the growth had eaten into the eye-ball. I promptly removed the eye, and saved the bird's life.

Damp, stuffy, unclean houses are the primary causes. Feed the affected bird on soft food, with plenty of raw chopped onion, which is in itself a splendid blood purifier.

Roup.

Roup is usually the result of a neglected cold. The first symptom is a watery discharge, throwing off an unpleasant smell, from the eyes and nostrils. This odour is an easy means of detecting roup. Those most subject to it are the late hatched chicks. In severe cases, the eyes become very much inflamed, and a cheesy growth forms in the roof of the mouth. It sometimes extends to the back of the eye. Bad cases are very hard and tedious to cure, and unless a bird is of more than the average value, it should be killed and the body burnt.

Isolate at once all cases of this kind, and feed on soft nourishing food consisting of a little pollard, bran, egg, milk, and onion, and occasionally, a little meat. Avoid grains entirely. The nostrils and mouth should be thoroughly washed with a feather dipped in kerosene. A small syringe will be found even better than a feather for this purpose. Then give the following, morning and night:—Half a raw egg, a teaspoonful whisky or brandy, two drops eucalyptus oil, and one grain of sulphate of quinine. Mix these well together. This has proved to be the most satisfactory roup cure I have ever tried. It seems to promote vitality, and reduces the fever at the same time. Wash the head and under-wing feathers with a solution of permanganate of potash.

Do not breed from any bird that has had roup.

DIPHTHERIC ROUP.

This must not be confounded with roup. The bird suffering from this trouble makes a peculiar noise like a cough, and as it does this the head is thrown forward, with the mouth open, and it looks as if it were going to choke. There is no bad smell arising from the throat, and the bird appears to be fairly well, except for the terrible attacks of choking. When these paroxysms occur the comb suddenly darkens.

The treatment recommended is as follows:—Open the mouth, place your finger under throat, and raise up the windpipe. Should there be a cheesy growth around windpipe, make a V-shaped funnel, and place a very little quantity of lime in this, and blow down. Failing lime, use sulphur. I have had very good results by using a paste consisting of a little sulphur, vaseline and one drop of carbolic acid, thoroughly mixed and applied to the parts with the aid of a piece of thin wood, to which a piece of clean soft rag, like a mop, is attached. Feed on the best and most easily swallowed food. *i.e.*, raw egg, and some oatmeal given soft. It may seem strange to advise eggs for fowls, but I know of nothing that has assisted me more, in cases of extreme weakness amongst valuable stud birds, than the fowl's own gift, the egg. I usually add a little spirit.

HEAT APOPLEXY.

Every summer, many fowls succumb to heat apoplexy, especially where insufficient shade has been provided. Many people think that any place will do for a fowl run. This is not so. Shelter trees or hedges are as essential as cleanliness and proper food to birds. They cannot live without shade. The symptoms show themselves by a sudden fit of running round and round, as if the head were trying to take hold of the tail. Immediately this is noticed, catch the bird, and if a heavy-combed variety, bleed the head at the base of comb, after which hold the head under the tap, and place the bird in a dark basket in a cool place.

No food is required by the bird for two days, but a little milk may be given twice a day. On no account allow other fowls to worry the sick one, and, in most cases, a cure will be generally effected. When the fowl is recovering, feed on soft but not heating food. Avoid maize meal and animal food for a time.

GAPES.

This is a disease caused by the presence in the windpipe of a small thin red worm, usually described as gape-worm. The symptoms are constant gaping or yawning. It is seldom found in adult birds, and more frequently attacks chicks four to five months old. Place some air-slacked lime in a barrel, and put the affected bird into it, covering the top over for a minute or two with a piece of hessian, and allow the bird to flap her wings, making a dust, which will find its way down the windpipe. This will prove very effective in removing this trouble.

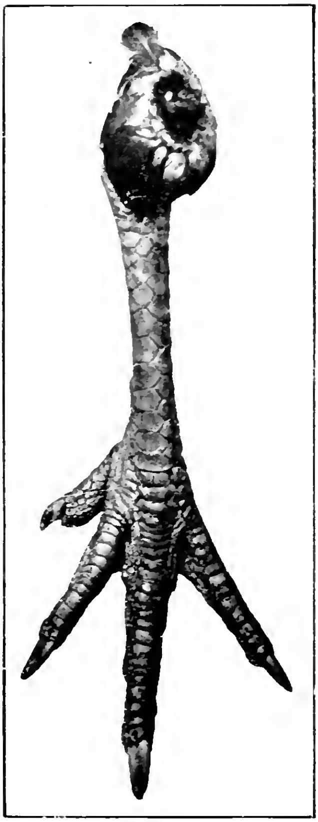
SCALY LEG.

This trouble is caused by a small mite which gets under the scales on the legs, and especially the toe joints. The mites stay there and lay innumerable eggs, until the legs become covered.

Scrub the legs and feet with a hard nail brush and warm water and soft soap, until the scale becomes soft. Then hold the legs in kerosene occasionally. This will destroy the insects, and gradually the legs will improve. A little sulphur and sweet oil rubbed in will also assist in bringing this improvement about quickly.

HEN FLEA.

This pest is dull yellow in colour, with darkish sides; is angular in front, and has four bristles and a few hairs on lower parts, oval-shaped. It is the most active of any of the insects which attack poultry, and is smooth to the touch; it cannot live upon the human subject, and soon dies. Male birds should always be sprinkled with insectibane prior to their being placed in the breeding pen, as the flea is transmitted from bird to bird, its favourite spot being close to the vent. Insectibane should always be used; on no account should fowls be dipped in any solution, such as kerosene or phenyle, as the quill feather is very sensitive to any dip.



HEALTHY SHANK AND FOOT.

(The result of proper attention and treatment.)

SCALY LEG.

(Brought on by dirty fowl houses and runs.)

Fowls will never fatten when the hen flea is present on the body; it also predisposes birds to disease. More than half the poultry breeders' troubles are brought about by this worst of all pests (save the fowl tick). It attacks young chicks under the wings and on the head. A good plan is to put a little carbolic paste at the back of the head. The greatest care is necessary in cleaning up the droppings every day as the pest thrives best in filth. Spraying once each week the chicken brooders with kerosene and carbolic acid diluted will be the surest plan to adopt, as it will answer a double purpose—disinfect the brooders and destroy the parasites.

FOWL TICK.

Although dusting the birds at times with insectibane will rid them of the hen flea, yet it is almost useless when fowl tick (*Argas americanus*) makes its appearance. Fortunately Victoria is almost rid of this deadly pest, but in parts of the Riverina in New South Wales and along the Murray frontages in South Australia, the tick thrives and destroys thousands of chickens annually. It is much to be regretted that the neighbouring States do not assist more to eradicate the worst enemy the laying hen has to contend with. It is not advisable to purchase poultry from tick infested areas.

The tick belongs to the spider family, having eight legs, and should not be confounded with the wood bug. It is of a slate colour and is oval-shaped, the female being twice as large as the male. The young ticks are about one-fourth the size of the male, and are of a reddish brown colour. The female lays as many as one hundred and three eggs at one period. These are generally laid in cracks and crevices in old perches and in the houses and fences, so that the pest is not one to be trifled with. Kerosene is by far the most effective remedy, both for the tick and for her eggs, but when an outbreak occurs, the quickest and safest plan is to burn down the old buildings.

LICE AND MITES.

The two most difficult and common parasites which trouble poultry are the hen louse and the red mite. These pests are universal and cause immense damage every year to the poultry industry. Lice feed on the feathers and on the dead cuticle of the birds, while the mites gnaw the flesh and suck the blood.

If lice are present in large numbers, they may be easily detected under the wings, or close to the vent. As a rule, mites do not remain on the fowls during the day, but secrete themselves under the perches, in crevices and cracks. At night they are very active and attack the fowls on the roost. When satisfied, they will have a very red appearance, due to the quantity of blood they have drawn from the birds' bodies. Their whereabouts may be detected by making an examination of the perches, especially where cracks exist, for signs of their excrement, which is of a greyish white colour, and very minute, similar to fly specks, but lighter in colour.

Lice more usually attack birds that are confined, or birds lacking in health and vigour. The debilitated bird is a sure victim and it is astonishing with what rapidity the lice multiply. Sick fowls of any kind should be kept at a distance from others.

It is just as important to isolate a debilitated bird, as it is in a case of roup, as the lice are very rapid in their movements and may find a resting place on hens or chickens near by. Usually a hen that is active and has access to a dust bath will not be troubled much. Care should be taken when purchasing new stud birds to thoroughly dust them with insectibane before placing in the breeding pens. It will be more effective if sprayed under the wings and tail, and around the fluffy portion.

Mites are not easily got rid of when once they get a hold. Carelessness is responsible in most cases; for instance, in permitting the droppings to remain on the floor too long, not gathering up the old feathers, or neglecting to give the building a good wash of crude carbolic acid.

The whole of the fixtures should be taken down—perches, nests, and any old bagging that has been used to stop up cracks. In many cases, the wisest course would be to burn the lot. Thoroughly spray with a solution made by dissolving six ounces of crude carbolic acid to each gallon of hot water, repeating in a few days' time; after which whitewash thoroughly the whole interior.

Cleanliness, well-lighted houses, and good dust baths are the best preventives to secure a fair degree of cleanliness and immunity from lice and mites. The droppings should be removed each day. The scratching shed litter should be replaced directly it becomes fouled. Plenty of sunlight is essential to good sanitation and the construction of the poultry houses should receive proper attention. Common road dust mixed with ordinary ashes should be within reach of each bird confined in pens or winter laying sheds. Farm fed birds have plenty of scope and can easily find a dry spot for themselves.

Every settler is anxious to secure the best return from his pens, but, failing to remedy the evil alluded to, he will lose an immense number of eggs each year, as the very essence of the egg, viz., protein, is drawn from the hen in very large quantities.

EGG-EATING.

This habit usually begins by the feeder neglecting to supply lime food such as is contained in oyster shell, bone meal, and burnt bones, all of which are rich in carbonate and phosphate of lime, so necessary in shell forming. If the birds once taste the egg, they crave for it. Many remedies have been advised. One is to collect some stale eggs, and scatter them about the yard; the hens will then eat so many that they will get tired of them. A better plan is to have special nest boxes, the floors of which are sloped. Directly the egg is laid it rolls to the lower part, where there is a fair-sized hole; the egg rolls into a small chamber of the box away from the egg-eater, and there remains until gathered by the daily collector. This safety box is also a preventive to other hens who may acquire the troublesome habit of egg-eating.

FEATHER-EATING.

This is even a worse vice than egg-eating. Birds confined in small miserable yards and lacking a variety of foods, especially animal food and vegetables, will pluck the small juicy feathers out of their companion's body, and I have known them to attack themselves, and make parts of their bodies quite bare. The best way to cure this habit is to hang a boiled rabbit or raw sheep's liver up just out of the birds' reach, and let them jump for it. This will supply them with the food which, in the moulting season, is very necessary to feather making. It will at the same time keep them active.

MISSHAPEN EGGS.

One of the inquiries that have come under notice lately reveals clearly that many breeders have in their flocks hens laying malformed eggs. This is due to an ulceration of the oviduct, followed by a dilated spot where the egg in its course becomes partly blocked, causing a ring-like appearance in the egg when laid. It is most common amongst our non-sitting breeds. Pullets that have been unduly forced by stimulating food, condiments, and an excess of meat, become likely victims to the disorder.

The remedy is a low diet, with plenty of vegetables. Avoid meat for a time, and on no account should maize be given to birds affected. As the complaint is an hereditary one, breeding from birds affected with ovarium troubles should be avoided.

Eggs Without Shell.

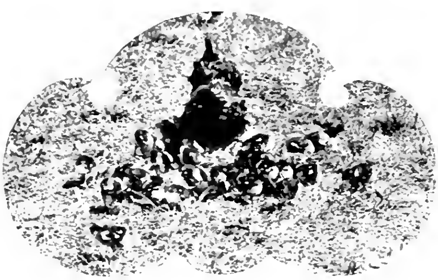
This is generally due to a lack of shell-forming material. Sometimes dilation of the shell-forming chamber of the oviduct is responsible, and at times a sudden fright will bring about the trouble, viz., premature expulsion of an egg before the shell has been deposited.

Give the fowls plenty of shell-forming material. Place a tin close by the layers and fill with a mixture of burnt lime, old mortar, oyster-shells, cut or burnt bone, the latter for preference. Add more green food, wheat, bran, and crushed egg-shells to rations. All of these will improve matters, reducing at the same time the amount of animal food—too much meat will produce soft eggs.

What Poultry-raisers should Avoid.

Low-lying ground—it is difficult to drain.
Second-hand material—risk of disease.
Making perches too high.
Buying mixed lots of fowls—they may be past the laying stage.
Leaving eggs in nest—gather daily.
Keeping cockerels with laying pullets—infertile eggs keep better.
Cheap and musty food.
Kitchen scraps from hospitals.
Late hatching—means lack of stamina.
Too much grain—causes liver troubles.
Giving water when birds suffer from diarrhœa.
Overcrowding.
Too wide a ration—it should be quality rather than quantity.
Feeding grain to sick birds.
The sitting hen with wing cut—eggs get chilled.
The leggy sitter—too clumsy and often breaks eggs.
The hen covered with vermin—the chicks will also have them.
Using a broody hen twice in succession—her temperature will be low.
Breeding from deformed stock—like begets like.
Breeding from birds after suffering from roup.
Dirty water in the pens.
Feeding tainted meat—affects flavour of eggs.
An excess of condiments—they irritate and cause thirst.
Spices—A sheep's liver or boiled rabbit is better.
High nest boxes—the hen breaks more eggs than she hatches.
Thin-shelled eggs for incubator.
Opening egg drawer in incubator before three days have elapsed.
Opening egg drawer when shells chip—chicks get chilled.
Feeding chicks for first thirty hours.
Too high temperature in incubator—keep at 103 degrees.
Too high temperature in brooder—85 degrees is sufficient.
Delay when bad symptoms appear in the flock—isolate sick birds.
Placing duck eggs in cool storage—they do not keep.
Packing eggs in musty chaff—it taints them.
Packing eggs in cases on which kerosene has been spilt.
Carbolic powders in nest boxes—eggs are affected.
Setting hens in flat-bottomed boxes.
Putting too many eggs under hen.
Damp houses—ill-ventilated ones conduce to catarrh and roup.
Narrow perches—contracts the breast bone.

Incubation during the summer months.
Using the winter laying shed during the summer.
Keeping the male bird with hens when breeding is over.
Having more than one gobbler to twelve turkey hens.
Fertile eggs for storage—infertile keep better.
Keeping hens over three years.
Inbreeding—it promotes disease.
An excess of the three W's—wind, wheat, and water.
Overcrowding the crate for market.
Mixing brown and white eggs—grade them to size and colour.
Changing your agent too often—get his confidence and he, yours.
Missing the Cup markets, &c.
Access to orchard during spraying operations.
Sending old with young birds to market—grade them.
Heavy combed hens when selecting layers.
Exciting laying hens—often causes death.
Feeding cock with hens.
Running pullets from one yard to another—often causes ovary troubles
Building fowl-houses adjoining your neighbour's fences.
Too many fowls in a small yard.
Glass as grit—earthenware is best.
Egg-eating hens.
Leaving infertile eggs in incubator after 7th day—use for chick feed.
The hen laying double-yolk eggs.
Disposing of eggs in the early spring if you want winter layers yourself.
Keeping cockerels beyond five months.
Feeding too late in the mornings.
Cold pollard.
Exposure of drinking vessel to sun's rays—induces bowel troubles.
Leaving diseased carcases about—burn them.
Poultry in the pig-sty.
Tainted soils—plough and use lime, or grow a root-crop first to cleanse.
Starving fowls during moulting season.
An excess of meat—it is as bad as none at all; 1 oz. daily is sufficient.
High poultry buildings—they are difficult to disinfect and cost too much.



BUILDING HINTS FOR SETTLERS.

VI.—Three-Roomed Weatherboard Cottage.

A. S. Kenyon, C.E., Engineer for Agriculture.

As there seems to be a need for a building costing less than the four-roomed cottage described in the August and November numbers of the *Journal*, the accompanying plan, &c., of a three-roomed weatherboard lean-to have been prepared. This form of plan is not so economical as a square one, but is more suitable for future additions.

It will be noticed that the cost of lining the inside is a very big proportion of the total. If only one side of the dividing walls is lined, 400 feet less of lining will be required, which would effect a saving of 24s. for material. By making a dado 4 ft. high, and covering the studs above the dado with hessian, 1,300 feet less of lining will be needed, and 45 yards of 72-in. wide hessian, and 200 feet of 3 in. x 1 in. batten required. This would mean a saving of £2 11s. 6d. for material. The saving would be very slight if the hessian were papered, and the result would be much less satisfactory than lining.

Specification.

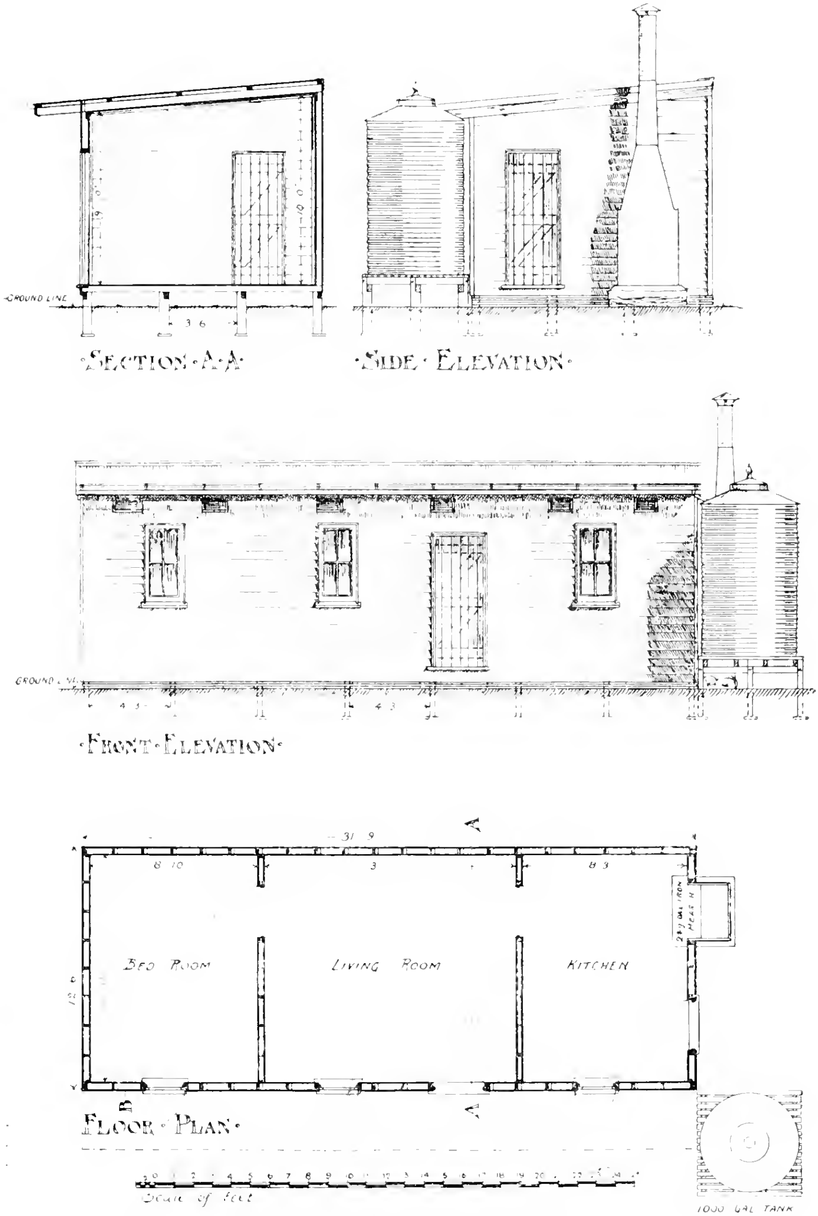
Excavator.—Excavate the ground for stumps and sole plates to a depth of at least 20 in., and well ram the earth put back round stumps. In ramming, only a small portion of the earth is to be put back at a time, and then rammed before any more earth is put back, using a little water when ramming.

Timber.—The timber is to be sound and free from all defects. All timber is to be hardwood unless otherwise specified.

Stumps and Sole Plates.—The stumps, 6 in. x 3 in., x 2 ft. 6 in. red gum, are to be spaced **4** ft. 6 in., centre to centre, the length of the building, and 4-ft. centres across the building (the 6-in. face going across building), and to stand upon 8 in. x 8 in. x 2 in. red-gum sole plates. Halve the stumps as shown in detail drawing for a length of 8 in. from top of stump, the four corner stumps being further checked at top 2 in. deep x 4 in. on inside of stump.

Sleepers and Joists.—Sleepers, 4 in. x 3 in., are to be run the length of building, resting on their edges on the shoulders of stumps to which they are to be bolted with one $6\frac{1}{2}$ in. by $\frac{3}{8}$ in., bolt to each stump. The sleepers are to be halved at joints. The joints in one row of sleepers must not be in a line with the joints in the next row. The 4 in. x 3 in. sleepers supporting the studs in end walls and dividing walls are to rest on the longitudinal sleepers, and to be bolted to the stumps with one $6\frac{1}{2}$ in. x $\frac{3}{8}$ in. bolt to each stump. Joists, 4 in. x 2 in., to rest on the longitudinal sleepers, to which they are to be well skew-nailed with 3-in. nails. Joists to be spaced 18-in. centres, every third joist which will come against the top of a row of stumps to be bolted to stumps with one $5\frac{1}{2}$ in. x $\frac{3}{8}$-in. bolt to each stump.

Studs.—Corner studs, 4 in. x 3 in., window and door studs, 4 in. x 2 in., and other studs, 4 in. x $1\frac{1}{2}$ in., to be spaced 18-in. centres, which will place the studs in the front and back walls alongside the floor joist to which they are to be well skew-nailed with 3-in. nails. Corner stud to rest on longitudinal sleeper, and to be checked 2 in. on to transverse sleeper, to which it is to be well nailed. Transverse sleepers to be checked $\frac{3}{8}$ in. for ends of studs. Studs of dividing walls to overhang $\frac{1}{2}$ in. on each side of sleeper, and inside of studs of end walls to be flush with inside of sleeper. All to be well skew-nailed.



PLAN OF THREE-ROOMED WEATHERBOARD COTTAGE

Top Plates.—The inside of studs in front and back walls to be checked 1 in. deep x 4 in., the top of check being 5 in. from top of stud. In this check, well nail 4 in. x 1 in. plate.

Rafters.—Rafters 5 in. x $1\frac{1}{2}$ in. to be spaced 3-ft. centres, to rest on top of back and front plates, to be well nailed to sides of studs, and lower ends to project 2 ft. 6 in. beyond studs. The studs in end walls to be checked $\frac{3}{4}$ in. on the outside for end rafters, and studs in dividing walls to be checked 2 in. for rafters resting on them. The rafters to be well nailed to these studs.

Bracing.—The walls are to be braced diagonally with 3 in. x 1 in. battens, for which the studs are to be checked 1 in., the studs in the outside walls to be checked on their outer edge. The sleepers supporting dividing walls to be checked $\frac{1}{2}$ in. for brace.

Purlins.—Purlins, 3 in. x $1\frac{1}{2}$ in., to be spaced as shown in section and well nailed to top of rafter.

Fascia and Barge Boards.—Fascia, 6 in. x 1 in., to be well nailed to projecting ends of rafters, as shown in drawing, finishing at ends against barge boards. Barge boards, 6 in. x 1 in., to be nailed on to outside of end rafters, the top being flush with top of rafter, and lower end finishing flush with fascia.

Window and Door Openings.—The 4 in. x 2 in. studs to be checked $\frac{3}{8}$ in. for the ends of 4 in. x 2 in. heads, and the 7 in. x $1\frac{1}{2}$ in. sills. Heads and sills to be well skew-nailed to studs. Each door opening to have 6 in. x $1\frac{1}{2}$ in. red gum step, the top of step finishing $\frac{1}{4}$ in. above floor.

Flooring.—Nail to top of joists and transverse sleepers with two $2\frac{1}{4}$-in. nails to each joist, the nails being well punched, 6 in. x $1\frac{1}{8}$ in. T. and G. red deal flooring. Carry the flooring right through in as long lengths as possible. The cross joints must not be in a line.

Weatherboards. — Cover the outside of studs with hardwood weatherboards showing a 5-in. face. Nail to studs with $1\frac{3}{4}$-in. nails to each stud. The weatherboards on front wall to be cut in between rafters as shown, and on end walls to be taken up to the under side of rafter. The weatherboards to be stopped at corners with 3 in. x $1\frac{1}{2}$ in. stops nailed to corner studs, and at openings to stop against jamb lining. Finish at bottom with 3-in. strips of weatherboard nailed to stumps, one row on back and front, and two rows on end walls.

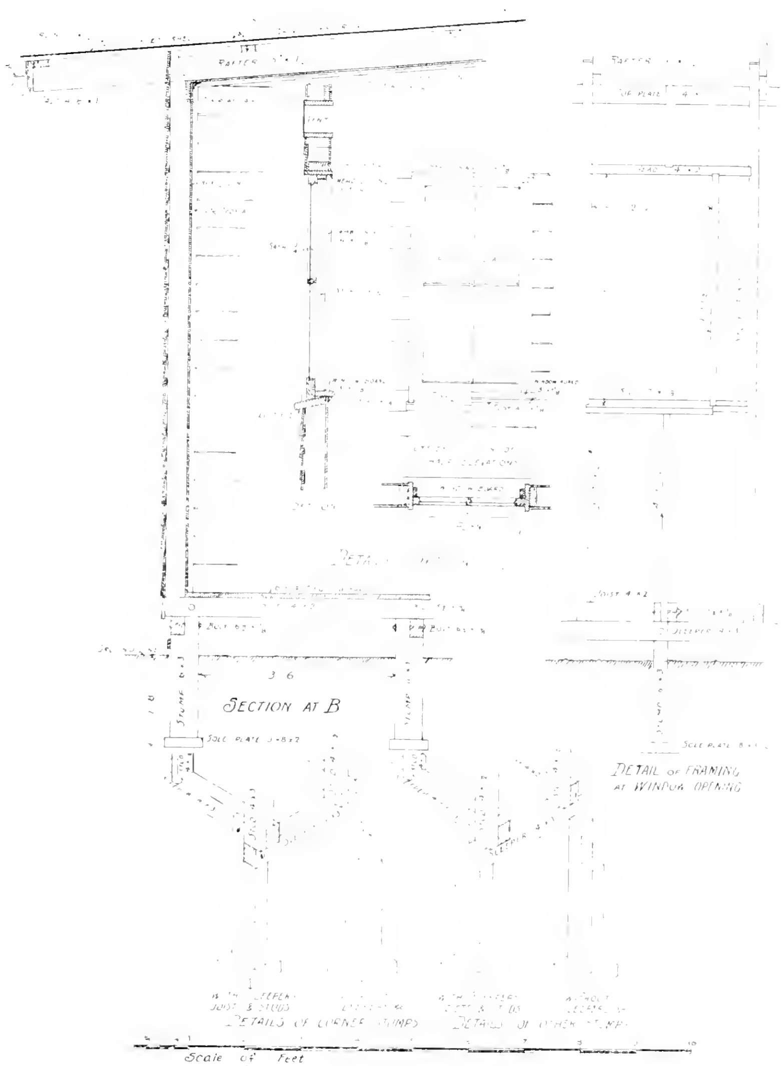
Lining.—Line the inside of studs in outer walls and both sides of studs in dividing walls, and under side of rafters, with 6 in. x $\frac{1}{2}$ in. T. and G. beaded white deal, lining to stop against jamb lining at openings. Plant 1 in. x $\frac{7}{8}$ in. scotia in angles of wall and ceiling and angles of walls.

Jambs, Stops, &c.—Jambs and heads of door and window openings to be lined with 6 in. x $\frac{7}{8}$ in. white deal, projecting $\frac{5}{8}$ in. on the inside to stop lining. Plant on 2 in. x $\frac{7}{8}$ in. white deal stop. Window board to be 5 in. x $1\frac{1}{8}$ in. red deal, returned at ends and finished underneath with 1 in. x $\frac{7}{8}$ in. scotia. All as in detail.

Sashes.—Sashes to be 4 ft. high x 2 ft x $1\frac{3}{4}$ in., four lights glazed with 16-oz. glass, hung on one pair of 3-in. butts, and furnished with one 4-in. iron barrel bolt and 6-in. cabin hook to each sash.

Doors.—Doors to be 6 ft. 8 in. x 2 ft. 8 in., ledged and braced, hung on one pair of 18-in. tee hinges, and furnished with one 6-in. rim lock, with brass handles to each door. Ledges, braces, and sheeting to be 6 in. x $\frac{7}{8}$ in. T. and G. white deal, all securely nailed together with 2-in. nails, well clinched.

Ventilators.—Six 14 in. x 6 in. box ventilators, of 6 in. x $\frac{7}{8}$ in. white deal, to be constructed near ceiling in front wall, and covered on the outside with fly-proof wire netting.



DETAILS OF THREE-ROOMED WEATHERBOARD COTTAGE.

Roof, &c.—Cover the roof with 8-ft. sheets of 26-gauge galvanized corrugated iron. Allow a lap of $1\frac{1}{2}$ corrugations, and nail to purlins with 2-in. galvanized springhead nails at every second corrugation. Iron to be turned down at ends of building on to barge boards, and securely fixed thereto with $\frac{3}{4}$-in. clouts every 6 in. Cover the angle of roof and back wall with 18-in. galvanized iron ridging, secured with springhead nails to purlin and studs. Fix 4-in. galvanized iron O.G. spouting to fascia with stout galvanized iron straps at each rafter secured with $1\frac{1}{4}$-in. clouts. Spouting to have slight fall to down-pipe, to be stopped at ends, to be double soldered and riveted at joints and connected with tank by $\frac{3}{4}$-in. diameter down-pipe.

Tank and Stand.—Tank to be 1,000 gallons 24-gauge galvanized corrugated iron, double soldered and riveted, having a 26-gauge galvanized cover, with an 18-in. diameter manhole and lid. Tank stand to have 3 in. x $1\frac{1}{2}$ in. decking, spaced 1 in. apart, and well nailed to 4 in. x 3 in. joists, resting on 4 in. x 3 in. sleepers, supported on 6 in. x 3 in. x 3 ft. red-gum stumps spaced as shown on 12 in. x 12 in. x 2 in. sole plates. Tops of stumps to be halved on and bolted to sleepers $6\frac{1}{2}$ in. x $\frac{3}{8}$ in. bolts, and corner stumps bolted to joists with similar bolts. Stumps to be braced with 4 in. x 2 in. red gum, bolted with $\frac{3}{8}$-in. bolts. Tank to be provided with brass turnover tap, having padlock and two keys, also an overflow pipe and length of waste pipe equal to height of tank.

Fireplace.—Fix iron fireplace and chimney against outside of end wall as shown. The bottom of fireplace to be level with floor and to be supported on solid foundation. Form hearth as shown of 24-gauge galvanized iron secured to floor with $\frac{3}{4}$-in clouts. Set oven in fireplace.

QUANTITIES.

		£	s.	d.
Red-gum—				
Sole plates for tank-stand,	12-in. x 2-in. 9 1-ft.			
Sole plates	8-in. x 2-in., 32 8-in.			
Stumps	6-in. x 3-in. 9 3-ft., 32 2-ft. 6-in.			
Door-steps	6-in. x $1\frac{1}{2}$-in., 2 3-ft.			
Braces for tank-stand ...	4-in. x 2-in., 4 5-ft.			
225 feet super. at 16s. 6d.		1	17	2
Hardwood—				
Sleepers and corner studs	4-in. x 3-in., 4 18-ft. 6-in., 4 14-ft., 4 12-ft. 6-in.			
And tank joists	2 11-ft., 2 10-ft., 7 5-ft. 6-in.			
Studs, joists and heads,	4-in. x 2-in., 18 12-ft. 6-in., 6 11-ft., 10 10-ft., 8 3-ft.			
Studs	4-in. x $1\frac{1}{2}$-in., 32 11-ft., 24 10-ft.			
Fascia and barge boards	6-in. x 1-in., 2 15-ft., 3 11-ft.			
865 feet super. at 9s. 6d.		4	2	3
Rafters	5-in. $1\frac{1}{2}$-in., 12 15-ft.			
Window sills	7-in. x $1\frac{1}{2}$-in., 3 3-ft.			
Top plates	4-in. x 1-in., 2 18-ft. 6-in., 2 14-ft.			
Purlins, weatherboard, stops, tank-floor	3-in. x $1\frac{1}{2}$-in., 5 18-ft. 6-in., 5 14-ft., 2 10-ft., 2 11-ft., 16 5-ft. 6-in.			
253 feet super. at 10s. 6d.		1	6	7
Bracing	3 in. x 1-in., 8 13-ft., 4 11-ft.			
104 feet run. at 2s. 6d.		0	2	7
Weatherboards, 2,300-ft. run. at 5s. 6d.		6	6	6
Baltic Pine—				
Flooring and window boards, 6-in. x $1\frac{1}{8}$-in., T. and G., red, 800-ft. run. at 12s. 6d.		5	0	
Doors, jambs, stops, and vents, 6-in x $\frac{7}{8}$-in., T. and G., white, 450-ft. run. at 9s. 9d.		2	3	11
Inside lining, 6-in. x $\frac{1}{2}$-in. T. and G., B white, 3,200-ft. run. at 6s....		9	12	0
Scotia, 1-in. x $\frac{7}{8}$-in., 300-ft. run. at 4s. 6d.		0	13	6
Sashes, 4-ft. high x 2-ft. x $1\frac{3}{4}$ in., 3 only, at 10s....		1	10	0
Ironmongery—				
Galvanized iron, 26-gauge, corrugated, 34 8-ft. sheets at 2s. 6d. ...		4	5	0
" " 24 " plain, 1 6-ft. x 3-ft. at 3s. 6d.... ...		0	3	6
" " 24 " 4-in. O.G., spouting, 6 6-ft. lengths, at 1s.		0	6	0

	£	s.	d.
Ironmongery—continued			
Galvanized iron, 26-gauge, 18 in. ridging, 6 6-ft. lengths, at 1s. 4d.	0	8	0
" " 26 " 3-in. diameter down-pipe, 1 6-ft. length, at 11d.	0	0	11
" " straps for 4-in. O.G. spouting, 1 dozen, at 3s. 6d....	0	3	6
" springhead nails, 2-in., 400, at 8d.	0	2	8
Fly-proof wire netting, 1 sq. yard	0	2	0
Rim locks and brass handles, 4 6-in. (3 right, 1 left), at 4s. 6d. ...	0	18	0
Tee hinges, 18-in., 4 pair, at 2s. 3d. pair	0	9	0
Butt hinges, 3-in., 3 pair, at 6d. pair	0	1	6
Iron barrel bolt, 4-in., 3 only, at 4d.	0	1	0
Cabin hooks, 6-in., 3 only, at 6d.	0	1	6
Bolts, nuts, and washers, $\frac{3}{8}$-in., 4 9-in., 67 $6\frac{1}{2}$-in., 14 $5\frac{1}{2}$-in., 6 $4\frac{1}{2}$-in.	0	7	6
Wire nails, 20-lb., $2\frac{1}{4}$-in., 10-lb. 2-in., 10-lb. $1\frac{3}{4}$-in., 20-lb. $1\frac{1}{2}$-in, 14lb. 3-in., 14-lb. 4-in.	0	16	0
Wire clouts, 1-lb., $1\frac{1}{4}$-in., 1-lb. $\frac{3}{4}$-in.	0	0	8
1,000 gallons galvanized corrugated iron tank, 24-gauge, complete	4	5	0
Iron chimney and fireplace	1	10	0
Oven	1	10	0
Total cost of material at Melbourne prices ...	£48	6	2

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

Keep the soil loose. Supply water to the trees.
Spray for Codlin Moth and Woolly Aphis.
Commence Budding.

CULTIVATION AND MOISTURE.—The unexpected early December rains have given orchardists an excellent chance to work up their ground, especially those whose work was backward owing to the heat and dryness of November. The soil is now in very suitable condition for surface cultivation, and the harrows, disc cultivator or scarifier should be kept going to keep up a good condition of surface looseness. Even where the soil had been previously well cultivated, the cultivators should be again run over the surface, as any succeeding hot weather will cause the soil to form a crust, which would be the means of dissipating a very considerable amount of soil water. Every effort should be taken to retain this moisture so that the fruit crops shall have all they require for their perfection. To further attain this end no weeds should be allowed to grow in orchard soils. It is well to remember the old adage, that "Every weed is a pump," and so every weed left in the orchard is continually pumping away into itself, and through itself into the atmosphere, the water which should be for the sole use of the fruit trees.

A good watering, if water be available, should be given to the trees that are maturing their fruit. It is not wise to be sparing of water at this time. A tree that is growing, and carrying fruit, needs all the stimulus that can be given to it in this way. The tree is more likely to set strong fruit-buds for next season, in addition to perfecting this season's crop of fruit, if sufficient moisture be given to it. Over irrigation should be guarded against, especially in stiff and undrained soils. So long as a tree is growing well, and producing fair average, and good quality crops of fruit, the water should be applied but sparingly. The problem to be decided by each grower is, what is the minimum quantity of water to give a tree, in order to produce the maximum results; and this can only be definitely solved by a knowledge of local soil, temperature and rainfall conditions.

SPRAYING.

CODLIN MOTH.—The fight against the Codlin Moth should still be continued. The second broods will now be on the wing, and it will be well to have the whole of the apple and pear trees sprayed this month with arsenate of lead, to insure a clean and full crop. Last season the first brood chrysalides were observed in the bandages at Queenstown as early as 11th December; and moths were captured leaving the bandages at Panton Hill on 19th December. This shows the urgent necessity for what is generally called the Christmas spraying. Eggs of the Codlin Moth were found last year on 5th December at Burnley Gardens. These would hardly be the eggs from the second brood of moths; they would in all probability have been laid by some moth of the early brood, which had emerged from a deep crevice, or a cool spot, where its entrance into the stage of perfection had been delayed by the cool temperature of the hiding place of the chrysalis. If the late December spraying has not been given, all apple and pear trees should be sprayed at once, and the fruit should be kept covered with spray for the rest of the season. Provided that no rain occurs to dilute or to wash off the spray, an interval of three or four weeks may elapse between each application.

Bandages, fruit rooms, second-hand cases, &c., should all be kept under strict supervision, and the chrysalides all searched out of every possible hiding place.

WOOLLY APHIS.—Where any Woolly Aphis had remained on the trees, it received a severe check with the advent of the hot winds and hot spell in mid-November. The subsequent cool change in December was very favourable to its increase; and should the season continue cool, it will be well to make further attacks on this pest, before it fully destroys the valuable fruit spurs and laterals upon which it may have settled. A strong spray of tobacco solution is very effective, and this should be given without delay. Where attacks are light, the sulphur-potash paint, a strong nicotine solution, or kerosene emulsion may be applied to the affected parts.

BUDDING.

Young trees, or old trees that have been previously cut down in preparation for budding, may be worked over towards the end of the month. It is advisable to select dull, cool weather for this operation, so that the sap may run more freely, and so that the weather will not have too drying an effect on the bud. The operation of budding is a very simple one, and is easily performed. To gain a successful end, the sap should be flowing freely, so that when the cuts are made, the bark should "lift" or "run" easily, and without any clinging or tearing of the fibres; and it should separate freely from the wood. The bud selected should be firm and well matured, and should show no signs of premature growth whatever. It is cut from the scion with a shallow cut, and if any wood, in the cutting, be left in, this should be taken out of the bud. A smooth clean spot should be selected on the bark of the stock, and a T-shaped cut made; the vertical cut being longer than the horizontal one. The bark at the point where the cuts meet should be raised, and the bud inserted between the bark and the wood of the stock. The bud should be gently pushed down into position, and it should then be bound with soft twine, string, or raffia. If the bud be too long for the cut, the top may be cut off level with the horizontal cut. With practice, it will soon become possible to cut buds that will need neither cutting nor trimming.

After two or three weeks the buds may be examined to see if the buds have "taken"; that is, if the bud has united thoroughly to the stock. When that occurs the tie may be cut. If a growth be desired at once, all wood above the bud may be cut off as soon as the bud has "taken." The wood may be cut off some short distance above the bud, so as to prevent any bark splitting and consequent loss of the bud; and so as to throw the bud out at a fair angle. Ultimately, this should be properly trimmed.

If desired, the bud may be left dormant throughout the autumn and winter, till next spring. In this case, the lateral or branch is not cut off, but is left on until the usual winter pruning.

FRUIT.

The apple crop will now be approaching maturity, and such early varieties as William's Favourite, Irish Peach, Red Astrachan and Gravenstein will shortly be on the market. The latter is perhaps one of the finest flavoured of all apples, and its pure white flesh, juicy and crisp, along with its aromatic flavour, makes it a popular, and easily saleable apple. The nature of the tree is such that it will not retain its fruit until it is well coloured, but allows it to drop prematurely. With this apple, colour goes a long way to increase the market price. A very fine colour may easily be obtained by allowing the fruit to remain where it falls on the ground, in the shade of the tree, for two or three days; the ground having been previously well covered with a good layer of straw, or dry sweet grass. The fruit should be kept out of the direct rays of the sun as much as possible.

COOL STORAGE OF FRUIT.

It is now a matter of a very short time when the system of cool storage which was originated at Doncaster, will be extended to other parts of the southern districts. It has been demonstrated by Mr. French, Manager of the Doncaster Cool Stores, that with care, and a careful study of their requirements, almost every variety of fruit may be cool stored for varying periods. Rome Beauty, Munroe's Favourite and Jonathan apples, and Broom Park, Vicar of Winkfield, and Winter Nelis pears, have been successfully preserved in the Doncaster stores for over twelve months, and have come out in perfect condition.

Almost all varieties of soft fruits may be kept for some considerable time; even strawberries have been kept, and their delicate flavour well preserved, for six weeks. During the past season, pears were stored at a time when their market value was from 2s. to 2s. 6d. per bushel case. After being kept in the stores for some few months at a cost of about 2s. 3d. per case, they were shipped to various Inter-State markets, and sold at prices ranging from 11s. to 15s. per case.

Flower Garden.

The deservedly popular flower, the Delphinium, which has frequently been called the "King of the Blues," now occupies a prominent part in most of our flower gardens. It is easy of management, and yields such fine results, that no one can go astray in cultivating this beautiful summer flower. It should be in full flower at the present time. If the old flower stems are removed at about ground level, as soon as the flower has passed its beauty, another crop of flower shoots will spring up from the base, and give another succession of bloom. With crowns that have been well matured, and that were planted early, it is thus possible to obtain four successions of bloom each season. If seed be desired, one stem of each variety will yield abundance of seed. This should be saved from the early flowers. It may now be planted, so as to get young plants in the autumn. The Delphinium requires a fair amount of water and manure, and a good summer mulching is always beneficial.

January should be a busy month in the garden. The waterings will be constant and frequent; and after every watering the surface should be well loosened and stirred with the hoe, to keep it moist and cool. More cultivation and less water is a good rule to be observed. If the hoe be used more and the hose less, in summer, greater benefits will accrue, and the water bill will be considerably reduced.

Mulchings with straw, grass, &c., are very useful just now. The mowings from lawns form valuable mulching. Waste tobacco stems are also valuable as a mulch; they will considerably reduce insect pests, snails, and slugs; and as they contain about 2 per cent. of nitrogen, 4 per cent. of lime, and 5 per cent. of potash, as well as about 1 per cent. of phosphoric acid, they are valuable as a manure.

Dahlias, Chrysanthemums, and other tall growing slender herbaceous plants will require support in the way of stakes; they will also need mulching considerably. These plants should receive no check whatever, but should be continued with a regular even growth right through the season. Another desideratum is that the soil should be well drained. Plants of all descriptions thrive far better in well drained soils, and they require a far less amount of water.

Constant watch will need to be kept for the various small caterpillars that attack the buds of these plants. Spraying with a weak solution of Paris Green and lime, or similar insecticide, will be useful; hand-picking should also be resorted to.

Carnations require layering this month; and seeds of Cosmos, Zinnia, Iceland Poppy, Aster, Pansy and Delphinium may be sown.

Vegetable Garden.

The work in this section is much the same as in the flower garden. Frequent waterings, good mulching, and regular soil stirring will be the work for the month. As soon as any bed is cleared of vegetables, it should be manured and well dug over in preparation for the next crop. Deep digging is always desirable in vegetable growing. Cabbage, cauliflower and celery plants may be planted out. In planting it is the usual practice to water the soil, so as to cause it to set well around the young roots. The upper, or vegetative part of the plant should also be sprinkled occasionally. This will vitalise it considerably; and as the leaves absorb the moisture, it will assist in keeping the plant alive while its roots are taking hold of the soil. A sowing of potatoes, and also cabbage, cauliflower, turnip, peas and leek may now be carried out.

BURNLEY SCHOOL OF HORTICULTURE AND SMALL FARMING.

E. E. Pescott, Principal.

The Burnley School of Horticulture and Small Farming is situated in a picturesque and sheltered bend of the River Yarra, at Burnley, about 4 miles from Melbourne. It may be reached by train, either from the Burnley, Hawthorn, or Heyington stations; by tram to the Richmond terminus; or by the Auburn horse tram.

The flower gardens, lawns, and shrubberies are extensive, and this portion of the estate is a very popular visiting resort.

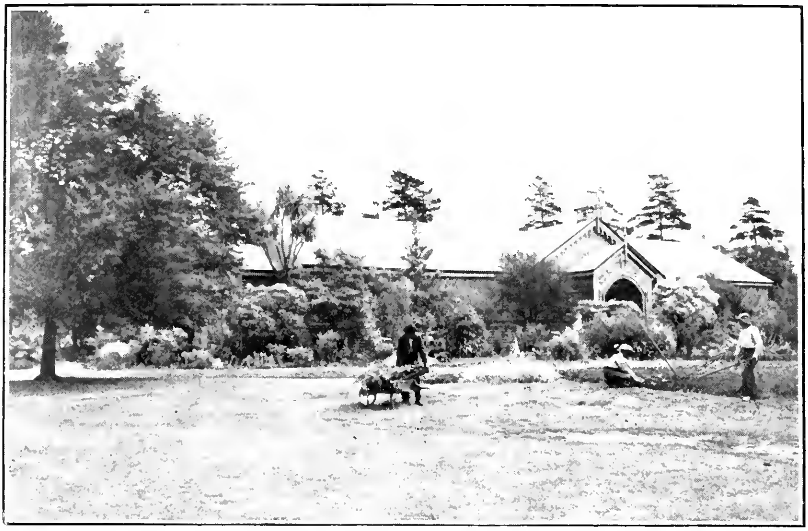
PRINCIPAL'S RESIDENCE.

The two orchards comprise about fourteen acres of fruit trees and vegetable garden. Over twelve hundred varieties of fruit trees are at present under culture. The apple collection includes considerably over six hundred varieties, mostly on the dwarf Paradise stock, and there are over three hundred varieties of pears. Such a collection of fruit trees in full bearing is unequalled in Victoria, and its instructional value is very great.

The dairy herd is comprised of pure stock of the Ayrshire and Jersey strains, ten cows being kept.

The poultry runs contain pure stock of the leading breeds, including White Leghorns, Black Orpingtons, Wyandottes, Minorcas, and others. About two hundred chickens are raised annually by means of incubators; and of these, both pullets and cockerels find a ready sale throughout the State. Sittings of eggs from the selected stock are also sold and despatched largely during the season.

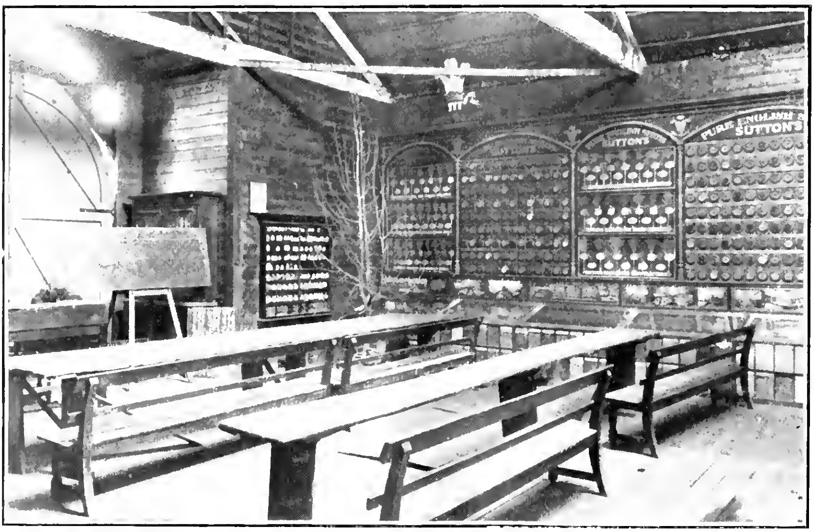
The School is controlled by the Department of Agriculture, and in it youths over the age of fourteen years are trained in the sciences of horticulture, especially as related to fruit-growing, and agriculture, on a scale now known as "Small farming." The students receive instruction which will enable them to become orchardists, orchard managers, or managers



PAVILION AND LECTURE ROOM.

of properties whereon intense culture and closer settlement conditions obtain.

The estate at Burnley is subdivided into commercial and collection orchards; vegetable and flower gardens; lawns and shrubberies; cultivation



INTERIOR OF LECTURE ROOM.

and pasture paddocks; with nursery, stables, fowl yards and houses, cow-sheds, dairy, barns, silo, &c.

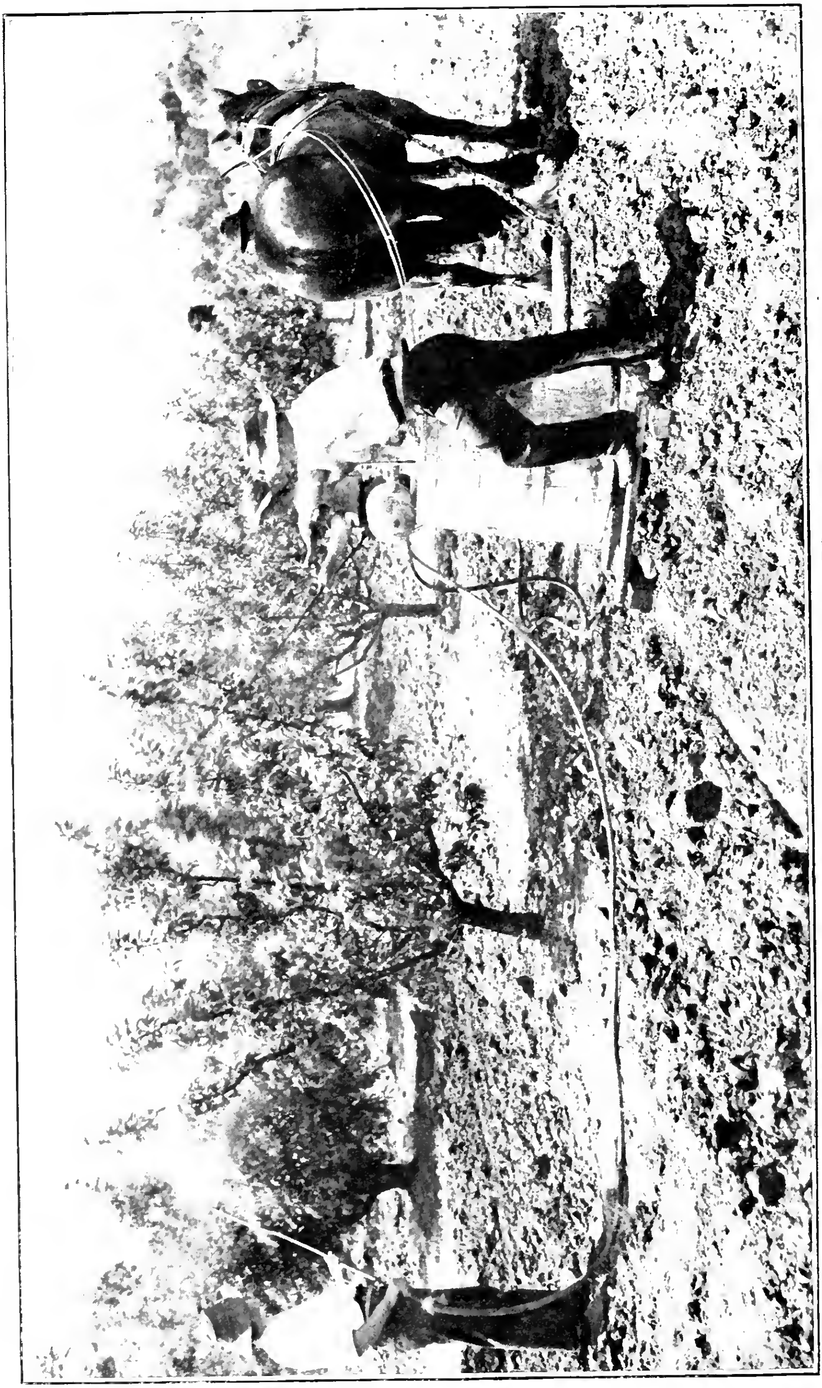
Lecture courses on all phases connected with horticulture and small farming are given. The practical side of the curriculum includes the

CLASS LESSON—PRUNING CITRUS TREES.

whole of the work necessary to manage and maintain the above subdivisions and estate. For the silo, two crops are annually produced, and made into silage. The winter crop of grain and leguminous plants is

PORTION OF COLLECTION OF DWARF APPLE TREES.

harvested in October, and the summer crop of maize is planted immediately afterwards. The silage is used for fodder for the dairy herd.



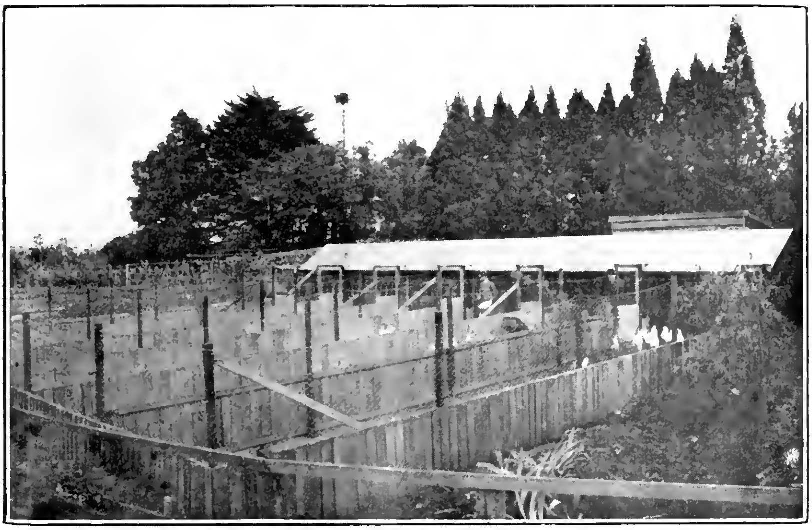
STUDENTS SPRAYING APPLE TREES.

The whole ofthe stock and equipment is thoroughly modern, and every opportunity is thus provided for the thorough training of the students.

Experiments are carried on continuously with various cereals for fungus diseases, such as rusts and smuts ; fungus diseases are also experimented with in connexion with potatoes and other root crops. These experiments are under the control of Mr. D. McAlpine, Government Vegetable Pathologist, who visits the Gardens regularly.

Students may enter for a general course of instruction, or they may select one or more of the following divisions :—

i. Orchard Work and Fruit Production.
ii. Dairying, Pigs, Poultry and Fodder Crops.
iii. General Gardening (Flowers and Vegetables).



ONE OF THE POULTRY YARDS.

The school year commences early in February, and continues throughout the year until December. Students are expected to be regular in attendance and they must keep full notes of all lectures and instructional work.

The terms are £5 per annum, payable in advance. The fee does not cover residence, but good accommodation may be obtained in the neighbouring suburbs.

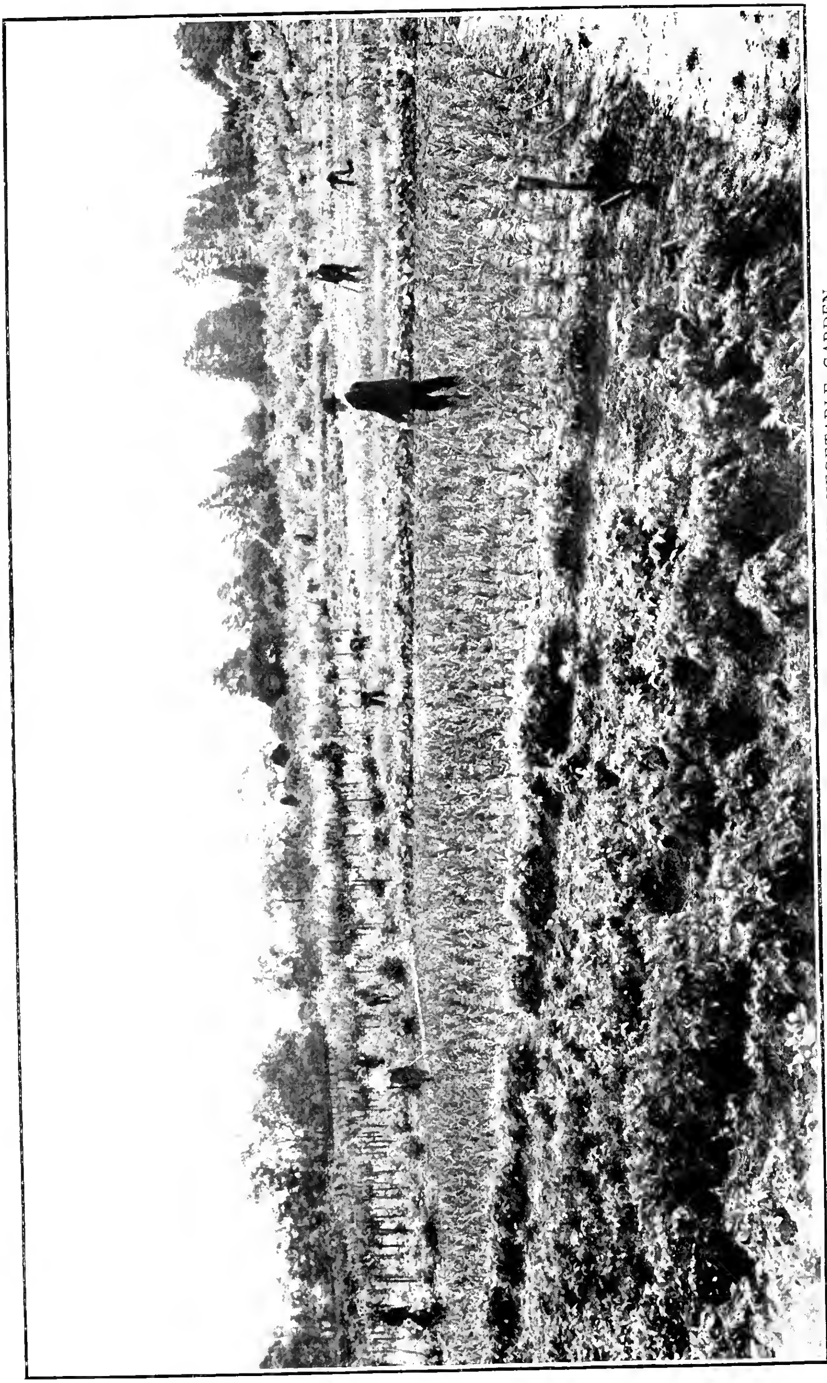
Applications for admission should be made to The Secretary, Department of Agriculture, Melbourne.

NEW WORKS FOR 1910.

The new work for the coming sessions will include the following :—

1. The collection of grape vines, numbering over 200 varieties, is to be regrafted on the Phylloxera resistant varieties, the stocks having been specially selected and purchased by Mr. de Castella on his recent visit to Europe.

2. Various parts of the orchard and shrubberies are to have their systems of underground drainage further continued and completed.



COMPREHENSIVE VIEW, SHOWING ORCHARD AND VEGETABLE GARDEN.

3. Surface levelling in both orchards is to be carried out.

4. The subject of suitable stocks for various varieties of fruit trees is to be specially and practically studied; and as far as possible it is intended to produce from the School nursery, all trees required for the orchards.

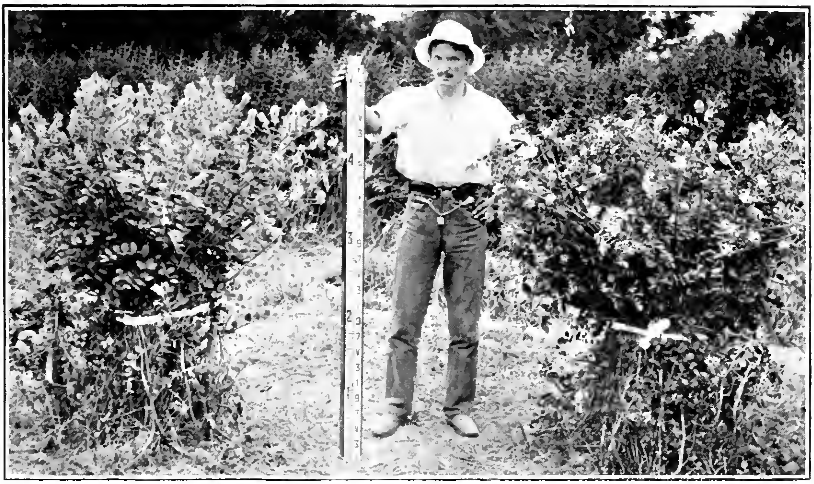
5. The planting of shrubberies of native Australian trees and shrubs will receive prominent attention.

SULLA CLOVER.

(*Hedysarum coronarium*, L.)

G. A. Sinclair, Principal, Longerenong Agricultural College.

The accompanying illustration shows some bushes of this valuable fodder plant, which was described by the late F. von Müeller as "one of the best of perennial fodder herbs, yielding a bulky return." It was tried at this College in 1900, by sowing seed obtained locally; but no plants grew therefrom. Through the kindness of Mr. F. de Castella, Government Viticulturist, some seeds of two varieties were received and sown in November, 1908.



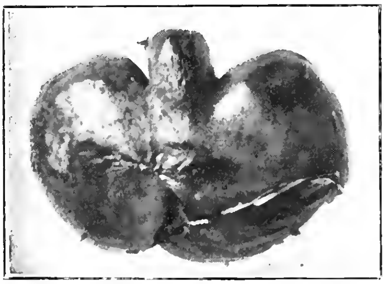
SULLA CLOVER.

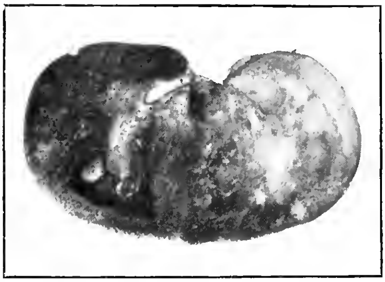
The germination results were not very good, but the seeds which germinated made very vigorous growth all through the autumn. No irrigation was applied at any stage. A stray cow ate the plants bare in the late autumn, but they grew quickly again, and in the spring reached a height of 5 feet. The flowers set badly at first, but after the bees got to work there was no further trouble in this direction. The blossom of the one variety is white, and of the other red, the former seeming the more vigorous of the two. Mr. de Castella mentions that he found it was widely grown in Andalucia (Spain) and in the South of France. It is also common in Italy, and in the north of Africa.

IRISH BLIGHT IN TOMATOES.

D. McAlpine, Vegetable Pathologist.

A diseased tomato was forwarded to me by Mr. J. G. Turner, Senior Inspector of Fruit Exports and Imports, from a line of 26 cases imported from New South Wales and arriving here on 22nd November. The stalk end was of the ordinary red colour and healthy looking, but the blossom end was of a dirty-green colour mottled with brown. On cutting the tomato across, it was found that the flesh beneath the discoloured skin was of a brown rusty colour and extended towards the centre as shown in Fig. 2. After being cut for some little time there was a rotten disagreeable smell. On placing slices of the diseased tomato in a moist chamber, the fructification of the Irish Blight developed luxuriantly on the cut surface in 22 hours. The time taken for the development of the fructification of the fungus on the cut surface of a diseased tomato varies considerably, probably owing to the varying degrees of heat and moisture. Another slice from the same diseased tomato was placed in a moist chamber and closely observed. In this instance the fructification developed on the cut surface in $7\frac{1}{3}$ hours, and this is the shortest time yet recorded.





1. TOMATO AFFECTED WITH IRISH BLIGHT. 2. SECTION OF SAME TOMATO.

It is exactly the same fungus in the tomato as that causing potato blight, and this was proved conclusively by infecting a healthy potato with the spores of the fungus from a diseased tomato and a healthy tomato was infected with the spores of Irish Blight obtained from one of the diseased potatoes grown in Beech Forest. This fungus may attack other members of the potato family as well as the tomato, but the latter is the only one of economic importance which requires to be specially attended to. It is not always sufficiently realized by growers how closely related potatoes and tomatoes are, for the one can be used as a stock for the other. Potato plants will grow on tomato plants, and tomato plants on potato plants. If the potato is used as the root, both tomatoes and potatoes may be produced, but if the tomato is the root, neither potatoes nor tomatoes will be developed.

It is not only the potato industry which is threatened by the Irish Blight, but also that of the tomato, and when it is remembered that the value of the tomato crop is reckoned to be worth over £18,000 in 1908-9 to Victoria, it can readily be understood that the disease is not one to be trifled with, and that it should be stamped out wherever possible. That the risk to which the tomato-grower is exposed is not exaggerated, may be seen from the losses sometimes incurred from this cause alone. It is recorded in the *Journal of the Board of Agriculture*, England, that one grower lost 50 tons of tomatoes grown in the open air in 1907, out of a total of 70 tons, or 71 per cent., owing to the plants being attacked by *Phytophthora infestans.* The same disease, causing considerable loss, is also found in tomato plants in New Zealand, both when grown in the open and under glass. The disease generally attacks tomatoes similarly to potatoes, first appearing on the leaves, then passing to the stems and finally causing the fruits to rot. From the succulent nature of the tomato, it is a splendid breeding ground for the fungus, and if the diseased fruits are allowed to lie on the ground and not destroyed, they produce spores in countless millions, readily carried by the wind to other tomato plants. Some of the most luxuriant crops of spores reared in my laboratory, have been developed from tomatoes.

INOCULATION EXPERIMENTS.

It is important for the grower to know if the disease is communicable from tomatoes to potatoes, and *vice versâ*, for he can thereby be on his guard against spreading the disease from one crop to the other, by means of the diseased fruit or the diseased tubers as the case may be. Healthy tomatoes can be inoculated from diseased potatoes and healthy potatoes from diseased tomatoes, as the following experiments will show:—

1. A healthy green tomato had sporangia from a diseased potato placed on its skin in a drop of water. In course of time, the surface around this spot became discoloured and depressed, and the infected portion was clearly marked off from the diseased by being paler at the junction. The tomato was cut through, showing the brown tissues beneath the skin, and on being placed in a moist chamber developed the fructification in 49 hours. The time which elapsed altogether from the inoculation of the tomato to the production of the fructification of the fungus was sixteen days.

2. A clean tomato was placed in a vessel where a diseased tomato had been freely shedding its spores, and from mere contact with the spores, the healthy tomato was infected, so much so that in nine days the fructification appeared on the surface of the skin, ready to be blown away and carried to fresh plants.

3. A healthy potato of the Southern Cross variety was infected at the crown end with spores from a diseased tomato. In $6\frac{3}{4}$ days the fructification appeared in various patches with a profuse development of sporangia, and the young green shoots of the potato were literally covered at the base with the fructification of the fungus.

It is a well established fact, therefore, that diseased potatoes and tomatoes are mutually infective, and every care should be taken only to have seed potatoes or tomato plants from clean districts. So far affected tomatoes have only been found in imported material from New South Wales, but wherever the Potato Blight occurs in Victoria, there is a danger of tomatoes being affected if grown in the same districts. Eternal vigilance is the price we must pay for freedom from this, as well as other pests, and now that we know how to control the disease by spraying and to destroy the spawn of the fungus in the seed potatoes by sterilising, if representatives from the different States were to meet and agree upon a common course of action, based upon our knowledge of the cause of the disease, it would be found that the difficulties are not so great as they appear, and that the losses caused by it could be reduced to a minimum.

A NEW FRUIT PEST.

Tomato Moth.

(*Heliothis armigera*, Hubn.)

C. French, Junr., Assistant Government Entomologist.

This exceptionally common insect, known as the Tomato Moth, Cutworm, &c., is unfortunately too well known to need a detailed description, as much has been written about it by entomologists. But, for growers who are not acquainted with it, the accompanying plate will serve to show what the insect is like. It has a bad reputation as a destroyer of tomatoes; in fact, hardly any vegetable or garden plant comes amiss to the larva of this insect. Tomatoes arriving from the other States are often badly attacked, and much loss results to the growers.

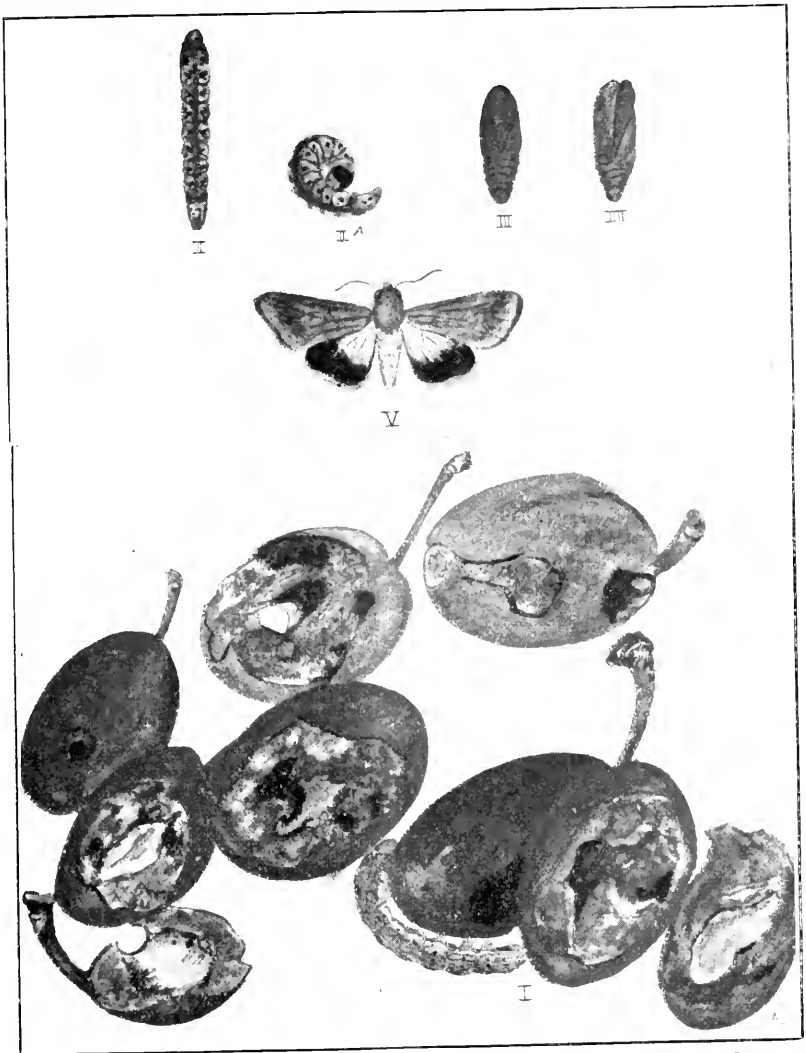
During November I received specimens of apricots and caterpillars attacking the same from the Department of Agriculture of South Australia for identification. They were the above-named insect, and in South Australia were causing much damage to stone fruits. Mr. Geo. Quinn, the Chief Horticultural Expert, is under the impression that the same caterpillar is causing damage to apples in that State. A grower from Western Australia also informs me that Cutworms cause considerable damage to stone fruits in his State.

Recently, Mr. S. A. Cock, Vegetation Diseases Inspector in the Bendigo district, forwarded some plums damaged by caterpillars. At my request he sent the following notes on his observations of the pest:—

"It is the first time that I have been able to catch the caterpillar at work, although last year I noticed plums and apples affected in the same way. Seeing the looper caterpillars on the trees, I blamed them, although I could scarcely credit them with making such a deep bore into the fruit. This caterpillar attacks the green fruit on the tree in exactly the same manner as it does the tomato, making directly for the kernel of the fruit, and when it has destroyed that, either withdraws and attacks another fruit, or bores clean through and attacks the adjoining fruit. One caterpillar will destroy many plums, apricots, or apples. The young caterpillars live on the leaves of the tree, and I have observed both large and small larvæ eating the foliage. The pest is very severe on plums, and plays sad havoc where the crop is heavy, boring out whole bunches. The plums wither, and then drop off. The plum most attacked is the Diamond. I have also observed the pest attacking apricots, and on Friday last detected it on the apples. The apples attacked were not sprayed, and were eaten into the pip, and hollowed out in the same manner as the plums and apricots. The pest is in Harcourt, Walmer, Maldon, and other places."

It is most unfortunate that it has developed a liking for fruits as the moths of this species are found in countless numbers in all parts of Victoria. The egg or eggs are deposited on the leaves or fruits of the tree, and the young, after being hatched, feed on the leaves for a short time, and bore into the fruit (see figures on plate), eating the centre out and in some instances leaving only a thin skin. They then eat their way out through the opposite side and continue this procedure through many fruits, as mentioned above by Mr. Cock.

Spraying with arsenate of lead has proved successful when the fruit is young, but should not be used when it is ripening. During October and November, when the moths are hatching out from their chrysalides in the ground, they could easily be attracted to the light of a lamp placed on a brick in a tin vessel containing kerosene. An ordinary



L. C. VALD ANDERSEN, DEL. C. FRENCH, DIREXIT.

HELIOTHIS ARMIGERA, HUBN. (TOMATO MOTH).

Fig. 1. Plums showing damage caused by caterpillars. Natural size. From Nature.
Fig. 2. Larva, back view. Natural size. From Nature.
Fig. 2A. Larva, side view. Natural size. From Nature.
Fig. 3. Chrysalis. Natural size. From Nature.
Fig. 4. Chrysalis after moth has emerged. Natural size. From Nature.
Fig. 5. Perfect Insect. Natural size. From Nature.

hurricane lamp would answer the purpose. By this means the moths will be destroyed, which will prevent egg-laying. The ground around the fruit trees should be kept well worked, as the caterpillars go into the crevices to pupate. Logs, bags, or stones in the orchard should be removed as they are favourite hiding places for the moths, and also for the caterpillars to pupate under. Bran mash placed under the tree may be of some use. Caterpillars, if placed together in boxes, devour each other, sucking the contents until only the skin remains.

SHEEP DIPPING.

H. W. Ham, Sheep Expert.

Generally speaking, undipped sheep, no matter how well and carefully bred they may be, cannot produce fleeces to their fullest natural extent, either from the point of quantity or usefulness. Of course, there is a stage of inferiority of fleece when dipping may not increase its value per lb. in the same way as with some inferior bred fleeces skirting does not always pay. But, with careful and proper dipping, sheep must be very ill-bred indeed when freedom from parasites does not allow of more wool per head; further, the extra comfort thus secured means, all else being equal, increased ability to put on flesh.

Farmers owning sheep with any pretentions at all to good breeding, lose better prices per lb. and an increased yield per head through the sheep not being dipped, and especially in a season such as the one just passing. The better bred the sheep are, the more the advantages of dipping are seen; ill-bred inferior woolled sheep show the least benefits.

Northern sheep farmers will find dipping more beneficial in preventing the spread of lice than of ticks. Lice is the worst of the two evils. Ticks are not likely to spread, or even appear, to any extent, in dry districts; they increase most in wet winters and in timber country, and are more natural to the areas of heavier rainfall. During the early summer, when the wool is short, the heat and dust destroy the young ticks soon after they are hatched. But this is not so with lice. The latter have been prevalent in the northern areas where ticks are seldom seen, and a very small proportion of farmers appear to realize the reason for so much wool-plucking and the scraggy and "tippy" appearance of their sheep, especially the lambing ewes.

Lambs on their mothers are often just as bad in the north, with lice, as the lambs are in the southern districts, with ticks. A lamb irritated with lice and living on the little milk a ewe affected in the same way can give, has little chance of developing into the type of sheep one would desire. Its chances for export as best quality are certainly poor. Towards the end of winter, lice seem to lessen, and at shearing time the bulk of them are taken off with the fleece. The shortness of the fleece at that time discourages the development to any extent of those that remain. About April, however, the mild weather and the additional covering of wool, cause the conditions to be again favourable for them to breed in greater numbers. Poverty is often credited with bringing on these pests; but during the autumn, even when perfectly clean, sheep will be low in condition in any case. It is more correct to say that sheep with lice or ticks at that time must become poorer still. Sheep properly dipped, especially in powder dips, will not breed lice, no matter how poor they become. In some seasons, lice are prevalent in the southern districts also, and sheep when very neglected have both lice and ticks.

(To be continued.)

THE TREATMENT OF STINKING SMUT OF WHEAT.

Experiments at Longerenong Agricultural College.

D. McAlpine, Vegetable Pathologist.

In March, 1909, I was requested to give a practical demonstration to the Wimmera farmers on the best methods of treating wheat for the prevention of Stinking smut or Ball-smut as it is frequently called. Between 200 and 300 farmers attended at the Longerenong Agricultural College, and I was able from the facilities placed at my disposal by the Principal, Mr. Sinclair, to make up the necessary solutions and dip the wheat in their presence.

Bluestone and formalin are the two recognised substances for pickling wheat, and both were used on this occasion. The necessity was impressed on the farmers for having solutions of a definite strength, so that all the grain may be treated equally and with a minimum of risk as to its being injuriously affected in germination. Accordingly, 10 lbs. of bluestone were dissolved in 50 gallons of water, and a similar solution was kept ready in an extra barrel to replenish the dipping solution as it was used up. Half a bag of seed wheat was taken and dipped in the solution for about half a minute, shaking it up well so that every grain was wetted and any floating smut-balls were carefully skimmed off. In this way a large quantity of seed wheat can be treated in a comparatively short time.

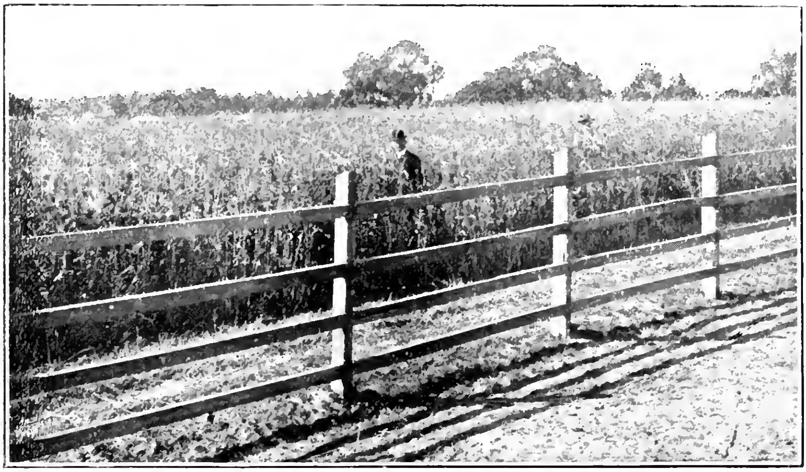
The formalin solution was easily prepared by taking a 1-lb. bottle of the proper strength, as prepared by Cuming, Smith & Co., and adding it to 40 gallons of water, when, after stirring, it is ready for use. A bag was suspended in the solution, fixed to the edge of the barrel by a ring, and the seed wheat was poured in slowly, so that all the smut-balls, light grains, &c., rise to the surface and are easily skimmed off. After stirring the grain occasionally and soaking it for ten minutes, the bag was lifted out by a pulley arrangement and drained. As soon as it is dried it is ready for sowing.

In order to prove the efficacy of the treatment, plots were laid out of nearly one acre each, on land which was as nearly as possible equal throughout. During the three preceding years there was fallow, wheaten hay and oats, and the season was a very wet one up to August. Seed wheat of the variety Jade was chosen, which had a little smut, with smut-balls scattered through it. The grain was treated as above with bluestone and formalin respectively on 17th June, and eleven days afterwards it was sown at the rate of 50 lbs. to the acre, together with a similar plot untreated. The plots were critically examined on 9th December, with the result that while the untreated plot yielded nearly 1 per cent. of ball-smut (.85), that treated with formalin did not show a single smutty grain, and in that treated with bluestone only one diseased plant could be found with a single ear affected. This result is just in keeping with numerous previous experiments. If the seed is treated with a solution of the proper strength, and every grain wetted, with all the smut-balls skimmed off and the grain kept in disinfected bags, there is no danger of ball-smut appearing in the crop, for it is only by means of seed infection that this smut can be propagated.

WINTER CROPS FOR THE SILO.

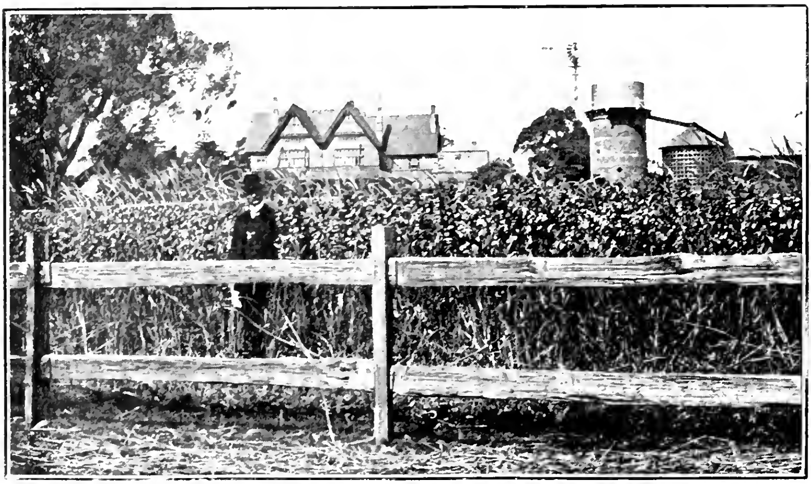
J. M. B. Connor, Dairy Supervisor.

In every dairying district and particularly in the north of Victoria where summer fodder crops cannot be successfully grown without irrigation, it is more important to take advantage of crops which grow rapidly



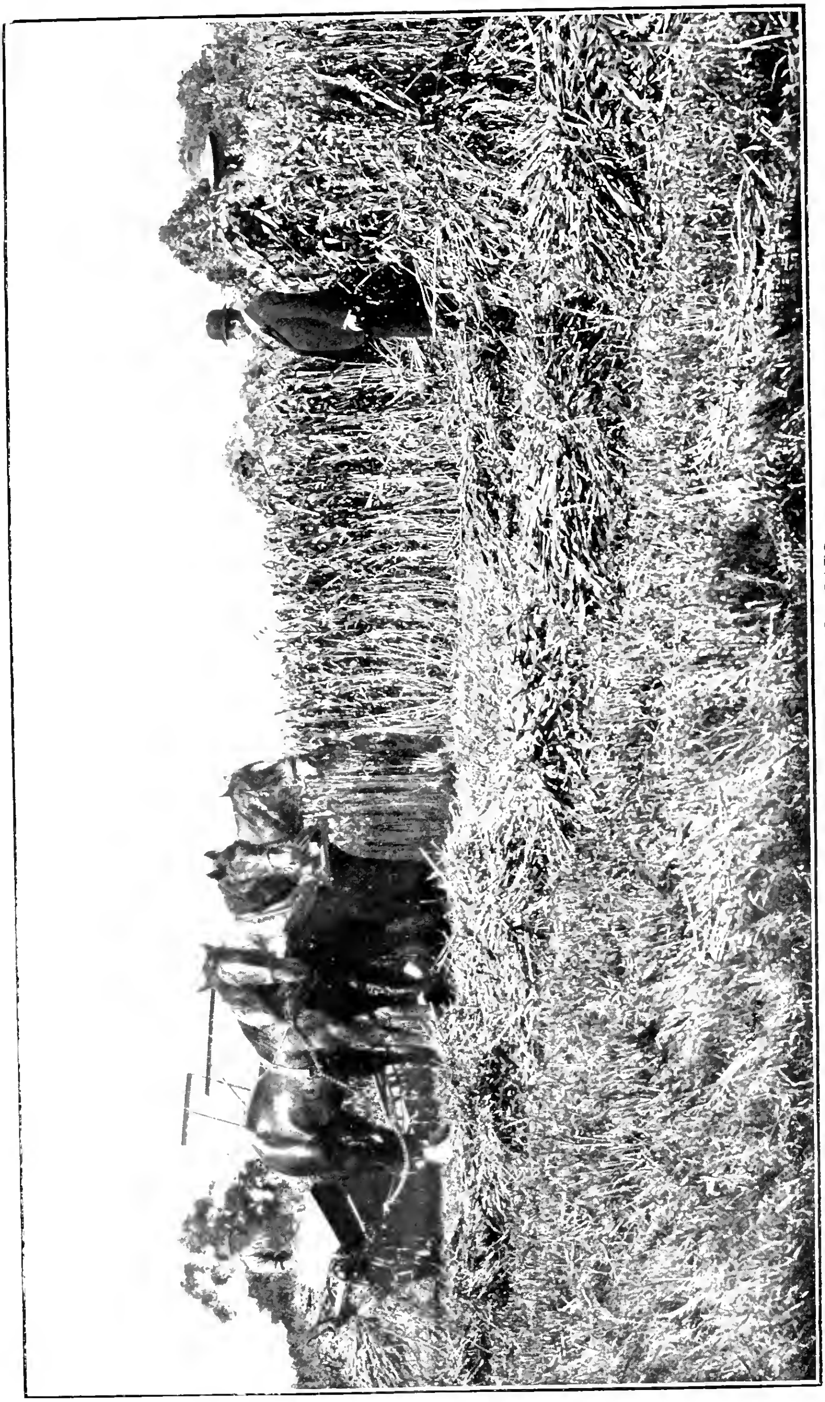
1. OATS, BARLEY, RYE, AND TARES.

during the winter months in order to produce a supply of silage to carry the dairy herd over the ensuing summer.

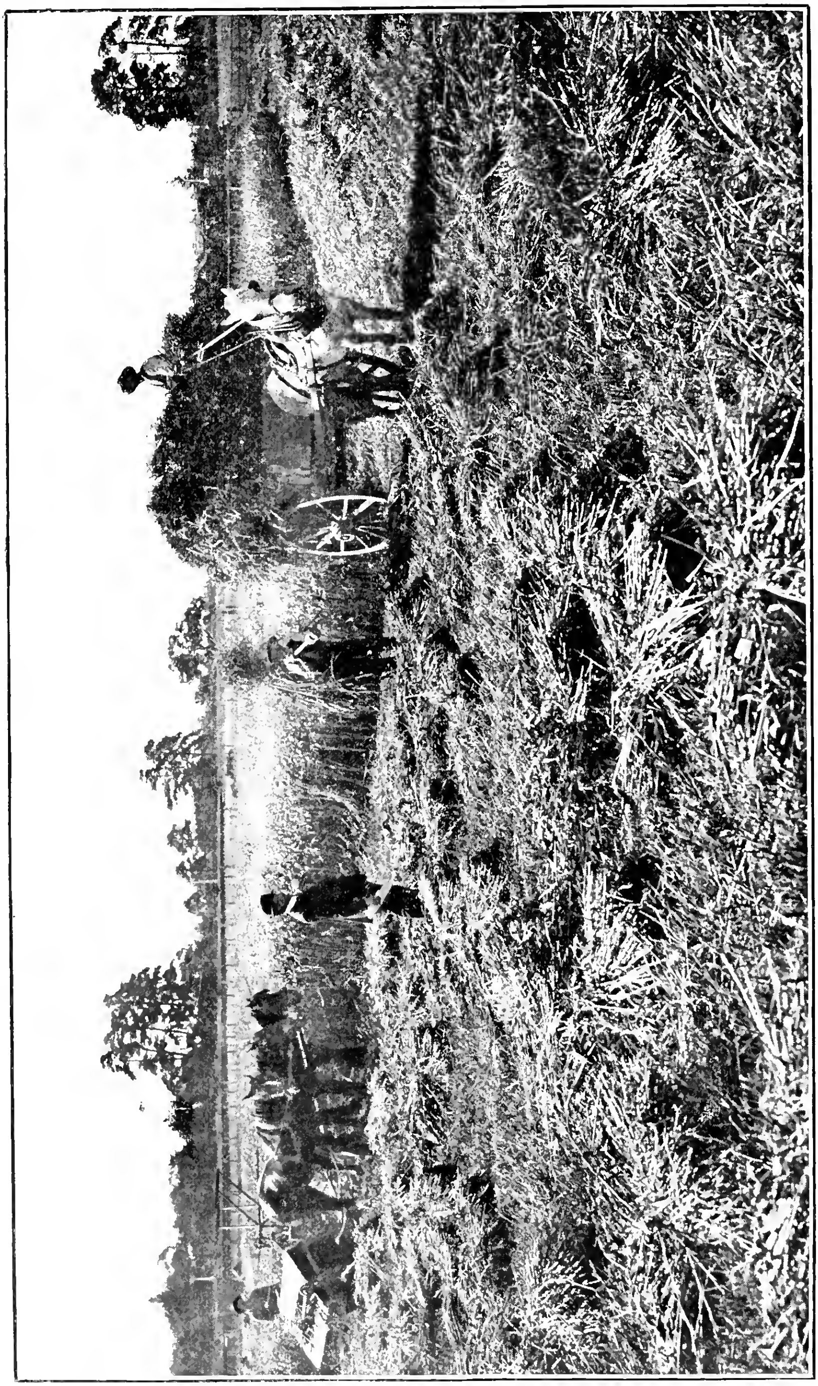


2. BARLEY, OATS, RYE, AND TICK BEANS.

Oats, barley, rye, beans and tares fulfil these requirements. If sown early in the autumn, they make a rapid start and continue to grow steadily through the whole of the winter months. By the end of



3. CROP OF ABUNDANCE OATS.



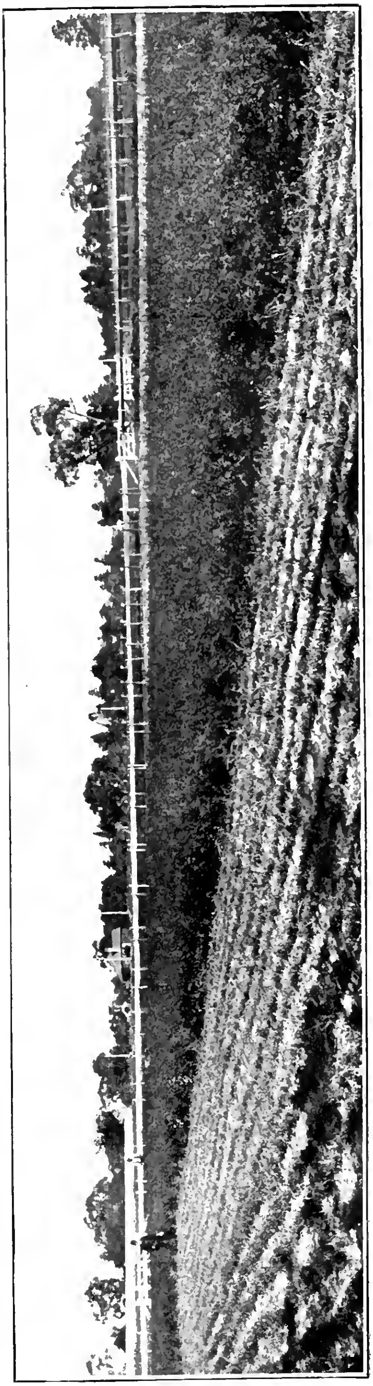
4. GENERAL VIEW OF THE HARVESTING OPERATIONS.

October they are ready for filling into the silo. Green crops weigh at least three times as much as the summer crop when dried in the form of hay. A three ton crop of hay would represent fully ten tons of silage to the acre.

The results obtained by Mr. G. Hope on his dairy farm at Caulfield serve to illustrate what can be done on ordinary sandy land with a moderate amount of artificial manures to the acre. Three acres of land, ½ an acre of which was planted to oats, and 2½ acres to mixed fodder, produced over 60 tons of silage. This extraordinary yield was due to the uniformly heavy crop over the whole of the area. Twenty tons to the acre from crop 6 feet high represents an average of 9 lbs. to the square yard, or a sheaf from the binder every two square yards. Many heavy patches may be found yielding at the above rate, but it is unusual to find the average hold good for several acres.

Photographs Nos. 3 and 4 represent the crop of oats grown at Mr. Hope's. The land was ploughed 9 inches deep, harrowed three times and worked to a fine tilth. It was manured with 1½ cwt. blood manure per acre, and sown on 12th March with Abundance oats, at the rate of 2½ bushels per acre. This crop was harvested for the silo on 3rd November, '09, and returned 25¾ tons of green fodder to the acre.

Prior to sowing the crop illustrated on page 54 (No. 1) the land was ploughed, at intervals, three times, viz. :—3 inches deep, 6 inches deep, and 9 inches deep respectively. On the 21st April it was sown with the following mixture:—Black oats, 1 bushel; barley, 1 bushel; rye, ½ bushel; and tares, ½ bushel per acre. Manure (mixed) at the rate of 3 cwt. per acre was applied. The crop was harvested on 8th November for the silo, and yielded 17 tons of green fodder to the acre.



5. LUCERNE PADDOCK, SHOWING PORTION OF CROP CUT.

Another mixed crop was sown on 28th April, the preparation of the land and the manuring being the same as in the case of the crop sown on the 21st April. The seed used was the following:—Tick beans, $2\frac{1}{2}$ bushels; rye, $\frac{1}{2}$ bushel; black oats, $\frac{1}{2}$ bushel. It was also harvested on the 8th November for the silo and returned 18 tons per acre.

A view of Mr. Hope's lucerne paddock is also given. This paddock was ploughed 10 inches deep, harrowed four times, cross-harrowed and rolled. It was sown on 10th September, 1908, in drills, at the rate of 7 lbs. of Hunter River seed to the acre. This crop has done remarkably well, and has returned five cuttings since sown. When cut on the 3rd November 12 tons per acre of green fodder were obtained. The lucerne is cut and chaffed daily and mixed with the dairy herd's ration.

BEE MORTALITY IN THE STAWELL DISTRICT.

Consequent on the heavy mortality which has recently occurred in the apiaries located on the eastern side of the Grampians, Mr. R. Beuhne was deputed to make inquiry. Mr. Beuhne visited many of the apiaries and from the owners of nineteen he was able to obtain reliable information showing that out of 1,293 colonies the losses had been no less than 599. He also secured specimens for bacteriological investigation which has been undertaken by Mr. C. A. E. Price of the Government Laboratory at the request of the Director. The matter was also brought under the notice of the Commonwealth Analyst by Mr. Beuhne.

The results of Mr. Price's investigations and also of those of Mr. Willgerodt of the Commonwealth Customs Laboratory, are published herewith.—Editor.

I.—EXAMINATION OF BEES FOR BACTERIAL DISEASE.

C. A. E. Price, Microscopist, Government Laboratory.

During a recent inspection of 19 different apiaries situated along the eastern base of the Grampians, extending from Glenorchy to Great Western, Mr. R. Beuhne found that out of a total number of 1,293 colonies examined by him there had been an absolute mortality from some obscure malady of 599 colonies, equal to over 46 per cent.

During the last week in October I received through the post two small cages containing a number of living bees. Each of the cages contained about 20 individuals. In the cage marked No. 1, the bees were said to have been from a normal hive. The bees in No. 2 cage were taken from a hive showing effects of the disease (or dwindling).

APPEARANCE OF THE BEES.—The normal bees on inspection appeared to be of an active robust character, while those from the affected hive, although at this period equally active in their movements, did not appear to possess the same vitality as the bees taken from the normal hive.

There was no evidence on the floor or walls of either cage of excrement of any nature voided by the bees, which, if present, might tend to give some indication of a disease similar in character to the dysenteric troubles which affect bees in the spring months, when the bees it is stated, discharge their excrement not only over the comb but on the sides, floor, and alighting board of the hive; the dry fæces take the form of a long streak of dirty red brown material. About four days, however, after the bees came to hand, those which were supposed to be suffering from the malady became sluggish in their movements without showing the trembling motion of the organs generally associated with bee paralysis: nor were there any special features of a clinical nature to aid in diagnosis. Eventually, by the end of the sixth day, all of the affected bees were dead, while of the normal bees none had died, the only change noticeable amongst them was that they were somewhat less active.

DISSECTION.—Within a short time after arrival at the laboratory a number of both normal and abnormal bees were dissected, and a careful examination made of the intestinal tract, special attention being given to the lower portion of the bowel which, according to some recent investigation carried out in the years 1907 and 1909, Mr. Imms* concluded that the mortality amongst the bees in the Isle of Wight was brought about by an obstruction or distension of the colon, caused by certain forms of food in the shape of pollen grain and particles of a wax-like nature forming hard compact masses in that region. Some of the bees on dissection certainly did present a similar aspect as regards the distension of the lower bowel; but as exactly the same conditions were met with in both the normal and abnormal bees, this cannot be regarded as a factor tending to elucidate the disease under investigation.

Portions of the semi-fluid yellowish material taken from the colon of the normal bees, on being submitted to a microscopical examination, were found to be composed of several different forms of pollen, whilst the pollen present in the colon of the unhealthy was principally that collected from flowers belonging to the natural order, Compositæ, together with a few particles of a waxy material. No micro-organisms of a special character were detected in this preliminary microscopical examination of the bowel contents of either the unhealthy or healthy bees.

DIGESTIVE CANAL OF A BEE.

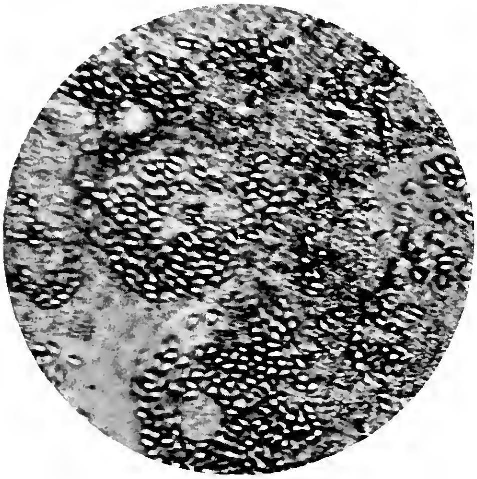
1, Esophagus; 2, Honey stomach; 3, Chyle stomach; 4, Malpighian tubes; 5, Small intestine; 6, Colon; 7, Rectum; 8, Anus.

BACTERIAL EXAMINATION.—Smear preparations were next made from the blood and juices of the bees obtained (a) by removing a leg; (b) by opening the dorsal wall of the thorax. The specimens were then stained in the usual way by carbol-fuchsin and others by Loeffler's methylene blue. Although a few rod shaped organisms were noticed, their limited numbers did not appear to point to a bacterial infection.

Bacteriological examination of that portion of the digestive system of the bee called the chyle stomach was next undertaken, especially as Dr. Malden† who continued the investigation into the bee disease in the Isle of Wight in the year 1909, isolated an organism capable of being distinguished from the other organisms present in the stomach contents. This bacillus "appears as a short round ended, thick organism with darkly staining ends and lightly staining central bands (polar staining) and closely resembles *Bacillus pestis* in general appearance." He proposed calling it *Bacillus pestiformis apis* "and as these bacilli take up the stain more deeply than most of the other organisms met with in the smears, the labour of detecting them is materially diminished."

* On a disease of bees in the Isle of Wight, Journ. Board of Agric., Eng., June, 1907; Feb., 1909.
† *British Bee Journal*, March 18, page 101.

In the smears made from the chyle stomach of the unhealthy bees no organisms resembling the above were found, although the examination revealed the presence of a mass of small oval bodies resembling the spores of a mucor, or the cells of a form of vagrant yeast. At first some significance was placed on this discovery, but when it was found that the stomach contents of the normal bees occasionally contain similar cells, it was not looked upon as being the cause of the disease; however, on finding that the samples of thin honey taken from diseased hives, forwarded to the laboratory for analysis, contained cells somewhat resembling those found in the chyle stomach of the bees, especially in a honey from the Great Western district where there had been heavy losses, it was concluded that there was possibly a connection between the cells present in the thin honey and those found in the chyle stomachs of the bees giving rise to fermentative changes which would probably account for the mortality. It will be seen from the subjoined analysis of the honey by Mr. E. R. C. Peters of this laboratory, that the thin honey, having a large amount of moisture, and a high nitrogen content, renders it a suitable medium for the growth of fungoid organisms (Mucors, Yeast, etc).



SMEAR PREPARATION FROM THE CHYLE STOMACH OF A DISEASED BEE, SHOWING SPORES × 300.

There may be something in the opinion, which is said to prevail almost without exception amongst apiarists, that the consumption by the bees of nectar from iron bark trees which are in bloom from April to October, contains something objectionable as they are entirely ignored by bees, provided other trees are in flower. The honey gathered from these eucalypts may possibly contain a higher percentage of nitrogen, thus rendering the honey derived from this source a suitable medium for the growth of fermentative organisms.

Cultures from each of the different honeys were made on agar containing 2 per cent. of glucose with the following result:—

No. 1 sample	Some yeast colonies.
,, 2 ,,	Numerous ,,
,, 3 ,,	A few yeast only.
,, 4 ,,	Nil.
,, 5 ,,	Nil.
,, 6 ,,	Nil.
,, 7 ,,	Nil.

The microscopical examination showed the presence of yeast as follows:—

No. 1 sample	...	...	...	Large yeast cells, budding.
,, 2 ,,		...	...	A mass of yeast cells.
,, 3 ,,	...	...	...	Some yeast cells only.
,, 4 ,,	...	...	...	Pollen cells, no yeast.
,, 5 ,,	...	...	...	,, ,, ,,
,, 6 ,,	...	...	..	,, ,, ,,
,, 7 ,,	..	...	...	,, ,, ,,

On the primary agar cultures prepared from the colon and contents. taken from the unhealthy bees, there developed at room temperature a mass of fungoid growths, *Penicillium glaucum*, a number of yeasts, and a few colonies of bacteria forming large wrinkled growths on the surface of the media. On sub-culture on gelatine, however, they were early recognised as belonging to the *B. subtilis* group. The cultures plated out on media from material from the healthy bees did not yield anything more than a few moulds and a mucor similar to *Mucor racemosus*.

At this period it was realized that the information gained by the microscopic and bacterioscopic examination had not revealed anything to account for the malady beyond the presence of a number of yeasts in the watery samples of honey and cells somewhat of a similar nature in the colon contents of the unhealthy bees. The presence of these cells in the honey and also in the bees gave rise to a suspicion that the disease might be caused by the bees feeding on honey in a state of fermentation. For the purpose of further investigation, two additional samples were forwarded by Mr. Beuhne, one taken from a healthy and the other from an unhealthy hive. Some thin honey was received at the same time for examination as to fermentative changes. A small number of yeast cells were present in this honey. In the meantime my attention was drawn by Mr. Beuhne to an article in the "*Leipziger Bienen-Zeitung*," October, 1909. by Dr. Enoch Zander, of Erlangen, on a disease of bees caused by an animal parasite, which he has named *Nosema apis*. This parasite, he states, is always present in bees suffering from a malady somewhat similar to that under investigation, and the oval cells described by him exactly resemble those detected previously in the chyle stomach. On an examination of the chyle stomachs from a number of bees received later, the cells previously referred to were again found to be present both in the sickly and in one instance only in a bee supposed to be normal. From Dr. Zander's description of *Nosema apis*, the cells found resemble in every particular those mentioned in his article. His description is as follows:—

The peculiarities of life and the form of *Nosema apis* are exceedingly simple. Above all, it must be emphasized that this parasite and all its relations are cell parasites, which can only thrive in living tissue, but not outside the bee's body. In this respect it differs from the silkworm parasite which thrives in all organs, while *Nosema apis* thrives only in the middle intestine.

After having devoured the intestinal cells of its victim, it envelopes itself in a membrane which protects it after the death of its host, and thus may live for a considerable time outside the body of the bee. These forms are called spores and are the only stages of development ever met with. If such a spore enters the middle intestine of a healthy bee, the membrane splits open and expels a minute elongated parasite, which immediately bores into the intestinal walls and increases to an incredible extent. Barely four days after entering the intestine it produces new spores. The Nosema spores cause a marked discolouration of the intestine. While in healthy bees it is reddish and translucent, it becomes dull and milky white in colour after infection, a true sign of the disease. The intestinal cells which are full of Nosema spores gradually die off and are excreted and thus give rise to a possibility of affecting healthy bees should the excreta come in contact with their food.

REPORT ON ANALYSIS OF HONEYS, SUBMITTED BY MR. R. BEUHNE.

No. and Description.	Moisture.	Cane Sugar.	Sugars. Levulose.	Sugars. Dextrose.	Sugars. Total.	Ratio. Dextrose.	Ratio. Levulose.	Polarization. Before Inversion.	Polarization. After Inversion.	Nitrogen (N).	Acidity as Formic Acid.
	%	%	%	%	%					%	%
1. Very thin	31.8	0.95	34.33	30.42	65.70	1	: 1.12	–8.23W	–8.54	0.004	0.087
2. Very thin — Heavy losses	35.5	0.47	35.65	23.24	59.36	1	: 1.53	–6.95	–7.39	0.010	0.169
3. Medium consistency	26.2	2.28	38.57	28.13	68.98	1	: 1.37	–7.81	–8.43	0.007	0.086
4. Medium	17.5	3.32	40.25	31.96	75.53	1	: 1.26	–7.29	–7.97	0.015	0.045
5. Ordinary consistency	15.6	3.42	47.31	26.02	76.75	1	: 1.81	–7.21	–8.70	0.011	0.053
6. Ordinary consistency	21.4	1.33	39.32	31.65	72.30	1	: 1.24	–7.65	–8.20	0.020	Insufficient sample
7. Ordinary consistency	17.7	1.44	43.72	28.74	73.90	1	: 1.5	–7.64	–8.26	0.019	0.053

The above described samples of honey were taken from the apiaries of the following bee-keepers :—

	Locality.	Source.	
1. Mr. Metcalfe ..	Great Western ..	Eucalyptus leucoxylon	
2. Mr. Freeman ..	" ..	" "	Autumn honey
3. Mr. O'Rourke ..	Dadswells ..	" "	
4. Mr. Hair	Noradjuha ..	Eucalypts and Honeysuckle	
5. Mr. Best	Great Western ..	Eucalypts and Honeysuckle	
6. Mr. Morgan ..	Dadswells ..	Eucalypts and Honeysuckle	
7. Mr. Holden ..	Black Range ..	Eucalypts and Honeysuckle	

II.—A DISEASE AFFECTING EUROPEAN AND VICTORIAN BEES.

R. Beuhne, President of the Victorian Apiarists' Association, and O. Willgerodt, Commonwealth Customs Laboratory, Victoria.

At a meeting of Apiarists* held in Weissenfels on the 9th of August last, Dr. Zander of Erlangen drew attention to a peculiar disease, which, in recent years, has created an enormous havoc amongst bees. The disease is a malignant type of dysentery, caused by the invasion of the digestive tracts of the bee by a unicellar animal parasite of oval shape, which multiplies with great rapidity and invades the intestinal cells in such numbers that practically nothing of the structure of the intestinal wall can be recognised under the microscope. Dr Zander discovered the above organism during 1907, in the intestines of bees suffering from malignant dysentery and believes that it is a member of the Nosema family, belonging to the group of Microsporidiæ. The name "malignant dysentery" is used here to distinguish this disease from a comparatively harmless malady called dysentery, well known to bee-keepers, to which bees are sometimes subject during spring time. Several Nosema species are known occurring as parasites in different animals. One of the best known is *Nosema bombycis* which invades the silk worm and produces a disease known as "Pebrine." This disease is said to have caused the French silk industry losses, amounting to more than £40,000,000 up to the year 1867. The discovery by Pasteur of a successful method of overcoming this disease has proved of inestimable value to the world's silk industry. No means are at present available to enable one to decide with certainty, whether the Nosema found in the bee is identical with any classified species. The name "*Nosema apis*" has been given to it by its discoverer in concurrence with Prof. Doflein (Munich) one of the best known investigators of this class of organism.

* *Munchener Bienen-Zeitung*, Sept., 1909. 196-204.

The different stages of development of *Nosema apis* are very simple, but it must be mentioned that this parasite, like the rest of the group to which it belongs, will only thrive in living tissue and not outside the living body of the bee. After it has exhausted the intestinal cells of the bee, it becomes surrounded with a skin, which protects it from desiccation and enables it to remain alive for a long time outside the body of the bee. These resistant forms termed spores are seen in large numbers either singly or in groups, when the intestinal contents of a bee which has succumbed to the disease are observed under the microscope.

The cells of *Nosema apis* are of oval shape, strongly refractive and measure about $\frac{1}{200}$ mm. in length and $\frac{1}{500}$ mm. in breadth. While the intestinal contents of healthy bees are reddish and transparent, they become turbid and milky when the Nosema infection is well advanced. This turbid and milky colouration of the intestinal contents of bees, which have succumbed to the disease, is an indication for diagnosing the disease even without the help of a microscope. The infection is spread to other healthy bees by the excreta of diseased bees coming in contact with the food.

This parasite is stated by Dr. Zander to be the worst enemy bee-keepers have to contend with, as many thousands of swarms are destroyed by it annually in Europe. The loss caused by it is much larger than that caused by foul-brood. From hives infected by *Nosema apis* bees may be seen to fall to the ground from the opening of the hive in large numbers; they are unable to rise from the ground again and soon die. According to the degree of infection they die either gradually or suddenly in an epidemic manner; the ground before the hives may be frequently seen thickly covered with dying bees. The ultimate fate of swarms thus infected is complete destruction, as the queen also becomes infected and perishes.

An epidemic, which presented similar symptoms to those above described, has recently caused tremendous losses amongst the bee-keepers on the Isle of Wight and also in Brazil. In the diseased bees of the Isle of Wight, Dr. Malden† discovered a bacillus which he named *Pestiformis apis*, but has so far not succeeded in proving that the bacillus is the cause of the epidemic.

Dr. Zander laid special stress upon the following measures intended to counteract the spread of the disease caused by *Nosema apis*.

1. Swarms which are only slightly infected may recover if the queen remains healthy and a good natural increase takes place.

2. The combs contaminated by the excreta of the infected bees are the main cause of the spread of the disease. It is recommended to transfer swarms infected with malignant dysentery into clean hives and start them on artificial combs. Any brood combs are placed in such a manner that they can be easily removed after the young brood has left them. When opportunity offers, a new queen is substituted, as the queens of these infected swarms frequently die in the following winter. As these hives usually swarm very late, it is best to prevent swarming.

3. The infected hives must be thoroughly cleaned with a solution of carbonate of soda in hot water. The combs should be removed and the bees given every opportunity for building new combs.

4. The renewal of the combs forms the basis for successfully combating all diseases of bees.

An organism resembling in all respects the above described *Nosema apis* has been found by one of us, acting under the direction of the Common-

† *British Bee Journal*, March 18, page 101.

wealth Analyst, in bees from colonies affected by dwindling occurring at many bee farms in Victoria. Several cages of healthy live bees and bees from affected hives were examined in October last. The intestines of the healthy bees were found to contain no parasite; in every diseased bee the intestines presented a milky appearance, their contents showing enormous numbers of an organism similar to *Nosema apis*. Experiments carried out with the object of infecting healthy bees by feeding them with honey which had been mixed with the intestinal contents of affected bees were completely successful; nearly all the bees so inoculated were found dead after two to five days, while a few succumbed in less than 24 hours after inoculation. In all of the bees which died after inoculation the specific organism was found to be present in large numbers. In many instances the major portion of the intestinal contents of these dead bees resembled a pure culture of the organism. Without the help of the microscope, the disease could be readily diagnosed by the peculiar and milky colouration of the intestinal contents.

ANSWERS TO CORRESPONDENTS.

Lime Dressings.—F.H. inquires as to quantity of lime recommended for (1) crab-holey country, and (2) loamy country (wheat-growing), where the soil is deficient in lime. He also asks when the lime should be applied.

Answer.—(1) It is not possible to name any exact amount of lime per acre for crab-holey land. From 4 to 6 cwt. of lime or up to 1 ton per acre of gypsum would be a serviceable amount to begin with. Gypsum or Copi is found in many parts of the Mallee, notably at Jeparit. It would be advisable to find out what would be the cost per ton delivered at the local railway station. (2) Loamy soils do not require the same amounts of lime as clay or sand. A modification of the above dressings would serve the purpose. (3) Lime should always be applied in the autumn or winter and at least three weeks before seed is sown. It can be rapidly and efficiently spread by sowing through an ordinary grain drill and afterwards harrowed. Never plough lime in. If time permits, fallow as early as possible, say June or July, and apply the lime or gypsum immediately after, before the land is harrowed.

Black Spot.—D.E.F. asks whether, in spraying for Black Spot, it is advisable with all varieties to wait until the first flower buds open.

Answer.—To be most effective, Bordeaux mixture should be applied in all cases when the buds are bursting and showing colour. Given the necessary heat and moisture, spores left undestroyed by a fungicide will germinate at any time.

Variegation of Foliage of Apple Tree.—F.C.G. wishes to know the cause of the leaves on Jonathan apple trees becoming variegated.

Answer.—The variegation of the foliage of Jonathan and other varieties of apple trees is due to the non-production of the green colouring matter in the cells of the leaves owing to a deficiency of available iron in the soil. This condition of the foliage is called Chlorosis. Occasional waterings with a solution of sulphate of iron in water will remedy the trouble, using the iron at the rate of half an ounce to one gallon of water. If the chlorosis be general in the orchard, fork in amongst the feeding roots from $\frac{3}{4}$ lb. to $1\frac{1}{2}$ lbs. of sulphate of iron, according to the size of the tree and the extent of discolouration.

Fencing.—J.J. asks the following questions:—(1) "Can A, who has land adjoining Crown lands, use some of the timber in erecting the divisional fence?" (2) "Must A erect the whole of the fence?"

Answer.—(1) If A desires to obtain the timber from a forest or Crown lands (protected forest) he would have to obtain a permit from the Forests Department and pay royalty. (2) Yes. The law relating to fences is dealt with in the September, 1907, issue of the *Journal*. Copies of the Fences Acts may be obtained from the Government Printer, Melbourne, for 1s. 3d.; postage 1d.

Lice on Cow.—R.H.C. asks why a white cow is more susceptible than a coloured one to lice.

Answer.—There is usually more dandruff on the skin of a white cow and at times considerable crust from what might be termed sunburn, all acting as a good harbour for vermin.

Agricultural Education in Victoria.

DOOKIE AGRICULTURAL COLLEGE.

H. PYE, Principal.

The College offers every facility to students to become competent agriculturists, vignerons, and dairymen. The work is carried out on a large commercial scale, the ploughing, drilling, manuring, harvesting, threshing, and shearing being done by students under competent instructors. Over 2,000 sheep and lambs, 150 head cattle, 50 horses, including stallion, are on the farm.

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Sessions begin first week in March and September.

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G. A. SINCLAIR, Principal.

One aim of this institution is to fill in the gap between the State School and Dookie, *i.e.*, to take students between the ages of fourteen and sixteen years.

The farm contains an area of 2,386 acres, and is admirably adapted for demonstrating what can be done in farming with irrigation. There is a large area of the farm under cultivation, and the orchard and vineyard cover an area of 30 acres.

FEES—Resident, £18 5s. per annum ; Non-resident, £5 per annum, payable half-yearly.

Sessions begin first week in March and September.

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Vol. VIII. Part 2.

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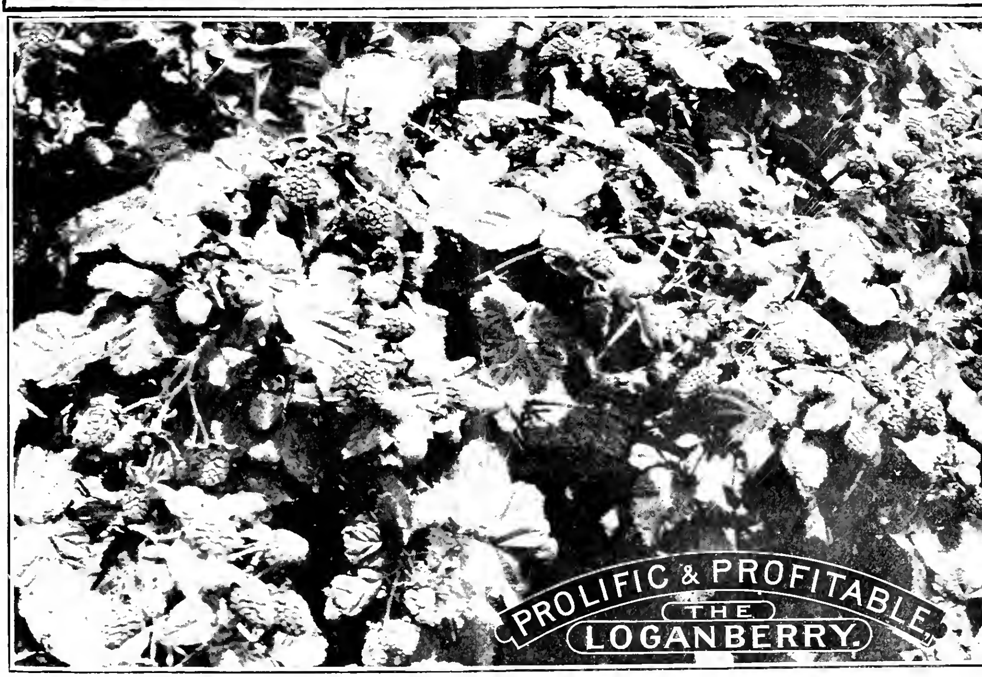

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THE DEPARTMENT OF AGRICULTURE.

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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. VIII. Part 2. 10th February, 1910.

THE WINE INDUSTRY IN SOUTHERN FRANCE.

Montpellier Revisited.

F. de Castella, Government Viticulturist.

On 30th January, 1908, I arrived at Montpellier from Llansa, my last stopping place in the extreme north-east of Spain, which I left the same morning, crossing the Franco-Spanish frontier at Culera-Cerbère.

The line crosses the border at a most picturesque spot where the Pyrenees fall rapidly away from the heights, covered in places with perpetual snows, to the Mediterranean. The lower ridges of the hills are crossed by frequent tunnels, between which forests of cork oaks are seen, for this part of France, like Cataluña, produces cork. The towers to be seen perched here and there among the hills are evidence of the turbulent times of long ago in this frontier region.

Shortly after entering France, the three railway stations of Banyuls, Port Vendres, and Collioure are passed in rapid succession. These three localities, and the limited area in their vicinity which it has been possible to plant with vines, constitute a viticultural region, which though small in extent has a marked character of its own, producing wines distinct from those of the rest of France. This extreme south-eastern corner of the department of Pyrénées-Orientales, or Rousillon, as it is perhaps more generally known, is one of the few parts of France where wines in any way resembling Port are produced. Much of what I have already written concerning the wines of the Priorato district and of Llansa in Spain (see *Journal* for June, 1909) applies also to this corner of the Rousillon.

One finds the same terraced vineyards perched in almost inaccessible situations on schistose hillsides of the same primary geological age and, above all, one finds the same variety of vine—the Grenache—producing wines which rapidly develop a pronounced Rancio character. In some vineyards, a little Carignane is also grown—rarely as much as one-fifth, but the preponderating vine is Grenache. Both the ordinary black variety, which appears to be identical with the Spanish *Garnacho*, and the pink one, known locally as *Grenache Gris*, or *Lladounet** are to be met with in these most interesting vineyards, which, owing to want of time, I was compelled to pass without breaking my journey.

After Argelès, a few miles further on, the country changes, opening out very much, for one is gradually getting into the vast viticultural region of Southern France. The Pyrenees with their slates of primary age, which remind an Australian of his native land, are no longer to be seen, limestone rocks of various formations taking their place. The line runs a little further inland. Perpignan, the capital of the Department, and Rivesaltes, celebrated for its Muscats and Picardans, are soon past and the neighbouring department of Aude is entered, the coastal portion of which is remarkable for several extensive salt lakes or lagoons; "*etangs*" as they are known in French, those of Leucate and Bages, along the banks of which the railway line runs, being the largest. Narbonne is the last important stopping place in Aude. A few miles to the north the department of Hérault is entered: Beziers and Cette are in turn passed—all these names are full of significance, for they are among the principal wine centres of the south of France, Cette in particular. This town handles enormous quantities of the "vin ordinaire" grown in its neighbourhood, of which trade abundant evidence is to be seen in the wharves encumbered with thousands of butt-shaped 120-gallon casks—*demi-muids*, as they are locally known. This is the favourite size for the handling of wine in large quantities in most wine-growing countries of southern Europe. Strange to say, in Australia, the hogshead of about half the size of the demi-muid has become the general favourite.

The town of Cette is perhaps better known as the centre of a once flourishing trade, which has of late years lost much of its importance; that in what was known as *vins d'imitation* (imitation wines). So-called Madeiras, Ports, Marsalas, Malagas, &c., were turned out by the million gallons and shipped to all parts of the world, skilful imitations, made from the juice of well-selected grapes, no doubt, but the whole business was scarcely in accordance with modern French ideas on the naming of wines, which have recently become much more strict than they were formerly. It is interesting to note that very large quantities of these wines were formerly shipped to the United States and other countries under such curious, hybrid names as "French sherries," "Burgundy ports," &c. Much of the raw material for this trade was recruited from the rancio wines of Banyuls, Collioure and other Grenache growing localities in Roussillon.

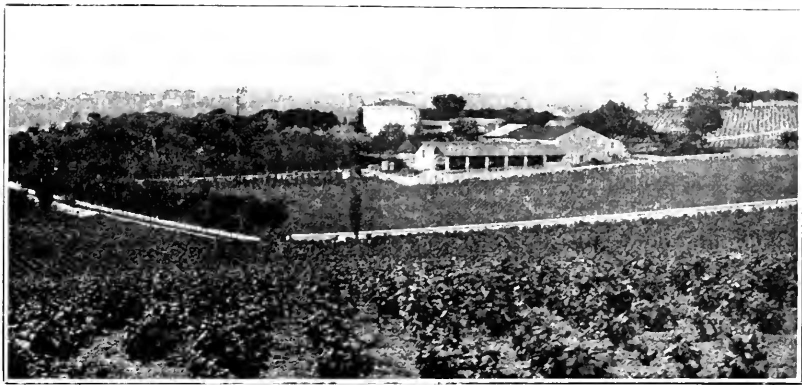
At none of these places, however, was I able to stay, and a few hours after passing the Spanish frontier I arrived at Montpellier, the capital of the department of Hérault, and as such the viticultural capital of France, if not of the whole world, for it is to Montpellier that students flock from all parts of the world in search of the latest and most scientific knowledge concerning matters viticultural.

ARRIVAL AT MONTPELLIER.

The generous hospitality extended to all comers and the unselfish way in which French viticulturists are ready to impart the knowledge they have acquired as the result of years of work—knowledge which would in most other countries be strictly guarded as trade secrets—is beyond all praise.

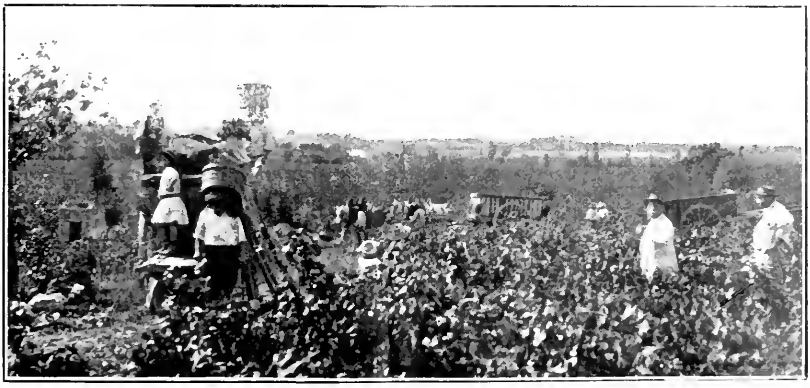
* L. Semichon, *Revue de Viticulture*, vol. xxv., p. 458.

As for myself, the reception I met with from those friends I had been fortunate enough to make during my three weeks' stay in Montpellier some six months earlier, was more than gratifying. My first visit was to M. J. Leenhardt-Pomier. Personal matters scarcely come within the scope of this report; besides, I was the recipient of generous kindness and valuable assistance from so many that space will not permit reference to each in detail. To M. Leenhardt, however, I owe so much, that I cannot refrain from here expressing the great obligation I am under to



VERCHANT HOMESTEAD AND VINEYARD.
The lower portion of this vineyard produces 3,000 gallons per acre.

this gentleman, who is one of the foremost wine men in Southern France at the present day, as may be gathered from the fact that he was President of the Wine and Grapes Committee at the Franco-British Exhibition held recently in London. He is a retired wine merchant, and owns extensive vineyards in the neighbourhood of Montpellier. His summer home at Verchant is one of the show vineyards of the district. Amongst many



GRAPE PICKING AT VERCHANT.

other interesting features it includes several experimental plots. M. Leenhardt was thus in a position to help me very materially in the work of my mission, and for his generous aid I am most deeply indebted. Thanks to his introduction, I was able to make frequent visits to the well-known Agricultural School, where I was cordially received and learnt much of deep interest. I also had many interviews with M. Richter, the well-known nurseryman, whose grafted vines are now playing so important a part in the reconstitution of our vineyards, and from whom I received much information of great value as will be seen later.

Montpellier is a fine town of 80,000 inhabitants, possessing a University in addition to its celebrated Viticultural School. It is the capital of the department of Hérault, the most important in France so far as wine production is concerned. This department, together with the adjoining ones of Aude, Gard and Pyrénées-Orientales, make up the region generally known, from a viticultural point of view especially, as *Le Midi* (The South). This region, with its million of acres under vines, produced in 1907 the enormous yield of 672,540,000 gallons, or nearly half of the total wine production of France in that year. The department of Hérault, and more particularly the district in the neighbourhood of Montpellier, may be taken as typical of the whole region known as Le Midi. Before entering on the description of viticultural conditions and methods followed in these departments, it will be well to try to give some idea of the importance of the vine industry of France and its bearing on the economic and social condition of the country.

NATIONAL IMPORTANCE OF THE FRENCH WINE INDUSTRY.

In a non wine-drinking country, such as Australia, it is hard to realize the national importance of the vine industry of France. In order to bring this vividly before the public of England, M. Leenhardt had wall sheets prepared which were displayed at the Franco-British Exhibition held in London in 1908, from these a few extracts are here made—

WINE PRODUCTION OF THE WORLD.

(Average of ten years 1897-1906.)

		Gallons.	Gallons.
Europe ...	France ...	1,073,512,000	
	Italy ...	748,682,000	
	Spain ...	436,810,000	
	Portugal ...	93,610,000	
	Austria ...	74,052,000	
	Roumania ...	67,650,000	
	Russia ...	60,214,000	
	Germany ...	52 030,000	
	Bulgaria ...	49,258,000	
	Hungary ...	41,580,000	
	Turkey ...	41,250,000	
	Greece ...	25,740,000	
	Switzerland ...	23,320,000	
	Servia ...	18,454,000	
	Azores, Madeira, Canaries	4,466,000	... 2,806,628,000
America ...	Chili ...	59,730,000	
	Argentine ...	33,528,000	
	United States ...	31,786,000	
	Peru ...	19,272,000	
	Brazil ...	7,964,000	
	Uruguay ...	2,926,000	
	Mexico ...	726,000	
	Bolivia ...	616,000	... 156,508,000
Other 3 countries producing wine	Australia ...	4,510,000	
	South Africa ...	4,290,000	
	Persia ...	616,000	... 9,416,000
26 Wine-producing countries ...		2,972,552,000 Gallons.	... 2,972,555,000 Gallons.

This table brings out several interesting facts. France has during the past ten years produced one-third of the total wine supply of the world. It can be seen that little Switzerland, a country so cold that only small patches are fit for the growth of the vine, produces seven times as much as our Commonwealth. The population of both countries is about the same. We also find that such countries as Roumania, Bulgaria, Turkey, Greece and Servia, countries seldom considered by us, produce between them the respectable total of over 200,000,000 gallons.

The above figures are average ones. Turning to those for the 1907 vintage we find that France, including Algeria, produced the enormous yield of 1,642,760,000 gallons (France 1,453,564,000 and Algeria 189,200,000), or more than half the average annual world yield of wine. When we consider this enormous volume of wine, two questions present themselves. What is this wine? What happens to it?

The first question is answered by the following table:—

Wine Vintaged in France in 1907.

Production of each Department (Quantities Officially Declared by Vine-growers.)

	Gallons.	
Gironde ...	119,660,000	Claret.
Côte d'Or ...	14,960,000	Burgundy.
Marne	6,600,000	Champagne.
Both Charentes ...	65,560,000	Cognac (wine distilled).
Hérault 294,800,000 Aude 184,800,000 Gard 93,500,000 Pyrénées-Orientales 99,440,000	672,540,000	Produce of 4 Southern Departments, known in France as Le Midi, producing Vins ordinaires. Wholesale price at the vineyard from 6d. to 1s. 6d. per gallon, according to quality and vintage.
Other 69 wine-producing Departments	574,244,000	
France ..	1,453,564,000	
Algeria ...	189,200,000	
	1,642,764,000	

Outside of France, we only know the wines she exports—a very small proportion of the annual yield. The districts producing Clarets, Burgundies, Champagnes and Brandy (the last-named estimated as wine distilled) yielded between them, in 1907, 206,780,000 gallons, whilst the Midi and the 69 other departments produced between them 1,246,784,000, or more than six times as much wine. Practically the whole of the latter quantity, as well as part of the former, consists of what is known as "vin ordinaire" (common wine), a type quite unknown to us in Australia and which will be described in detail presently.

M. Leenhardt answers the second question and shows what happened to the wine produced in France in 1907 in the following table:—

DISPOSAL OF WINE.

	Gallons.
Waste (lees, evaporation, &c.)	99,000,000
Quantity consumed in France (having paid excise duty* during 1906) (official figures)	1,034,000,000
Private requirements of individual French proprietors, quantities consumed duty free (approximate estimate)...	330,000,000
Algerian consumption	44,000,000
Exportation	66,000,000
Distillation under State supervision	66,000,000
Free distillation (*bouilleurs de cru*)†	33,000,000
	1,672,000,000

Several interesting facts are here revealed. The loss by natural waste (lees, evaporation, &c.) amounts to about 6 per cent. of the total wine handled. The quantity distilled is practically equal to this figure. It must be remembered that nearly all the wine distilled is made into brandy; the quantity of fortified wines made in France being insignificant. Algeria consumes about ten times as much wine as we produce in all Australia. The smallness of the export as compared with the total yield is very striking. In 1906, it amounted to 66,000,000 gallons, or only about 4 per cent. of the total production of the country (including Algeria). This small proportion consists almost exclusively of choice wines and forms part of the 206,000,000 gallons, we have seen to be produced in the districts of Claret, Champagne, Burgundy, &c.

But by far the most remarkable fact shown by this table, is the enormous consumption of wine within the country itself. The 1,364,000,000 gallons consumed in France in 1906 amount to very nearly 35 gallons (a large quarter-cask) for every man, woman and child of the population, and this in addition to a large quantity of cider, as well as beer and other fermented drinks, and yet the French are one of the most temperate people on earth.‡

In order to understand this seeming contradiction it is necessary to have lived for a time in France or one of the Latin countries. To most Australians it will probably appear quite incompatible with usually expressed temperance views. In France and the other Latin countries, wine is not a luxury, but one of the ordinary daily necessaries of life, as it

* The duty here referred to is what is known in France as "droit de circulation"; it must be paid before wine can be moved from one place to another. This duty varies from 1 fr. per hectolitre (less than ½d. per gallon) to 2 fr. per hectolitre (not quite 1d. per gallon) according to the department in which it is grown. This duty is only charged once.

† What is known as the privilege of ***bouilleurs de cru*** is the right given, by a French law, to vine and fruit growers to freely distill, without interference of any kind, any wine (including by-products), or fruits, grown on their own land. The resulting spirit is only liable to excise supervision and payment of duty on its removal from the farm of the grower.

‡ The following table shows the annual consumption of wine, beer, and spirits per head of population in a few typical countries. These figures are from the *Victorian Year-Book* for 1908–9. The figures for France differ somewhat from the French estimate:—

Country.	Wine.	Beer.	Spirits.
Victoria	·65	11·92	·67
Australia	·65	10·73	·73
United Kingdom	·29	28·4	·93
France	30·7	7·9	1·36
German Empire	1·45	26·1	1·55
Bavaria	—	54·5	—
Italy	25·1	·18	·26
Spain	18·5	—	—
Belgium	1·02	48·	1·35

has always been in countries warm enough for the growth of the vine since Biblical times. It figures on the table at the midday and evening meal, from the highest to the lowest in the land, in private houses and cottages as well as in hotels and restaurants, where it is no more considered an extra, or charged for as such, than bread. It is, in fact, part of the daily bill of fare, just as tea is with us. The fundamental difference between the way in which wine is consumed in France and in Australia may be summed up in a few words. Most of the wine consumed in Australia is taken between meals, whilst almost the totality of that drunk in France is taken with meals. This point has a vital bearing on the question. Frenchmen do not drink wine between meals—to do so is usually considered "bad form"—but they do not consider a meal complete unless accompanied by a glass or two of wine. As will be pointed out presently, this wine is of very low alcoholic strength, and is very usually further diluted by the addition of a little water at table. Taken regularly in this way wine is a food and not a stimulant—it forms part of the daily ration, replacing an isodynamic quantity of other carbohydrates. In other words, though consumed very generally, it is the custom of the country to take it only in strict moderation. For it to be possible for wine to occupy such a position in the daily life of the nation, two things are necessary. The wine must be of low alcoholic strength, and it must be available at such a reasonable price as will place it within the reach of all. Both these requirements are met in the common French wine universally known as "*Vin Ordinaire*," and frequently referred to in France as *Vin de Consommation Courante* (Current Consumption).

Vin Ordinaire.

There is perhaps no type of wine which is so completely an unknown quantity to the average Australian or Englishman, who has not travelled in France, as the "vin ordinaire" of that country, and yet this is the type produced and consumed to the practical exclusion of all others, not only in France, but in all countries which produce wine in large quantities. It is the every-day drink of the wealthy classes, as well as of the artisan and labourer. Other wines are placed on the table occasionally; but it is "vin ordinaire," often mixed with water, which is the usual beverage of France. The total consumption of choice wines in France would not greatly exceed the export trade, and this we have seen to only constitute about 4 per cent. of the total production of the country.

As regards alcoholic strength, statistics show clearly the low alcoholic strength of the great bulk of this wine. The 1,453,564,000 gallons produced in France (Algeria excepted) in 1907 have been classified as follows:—

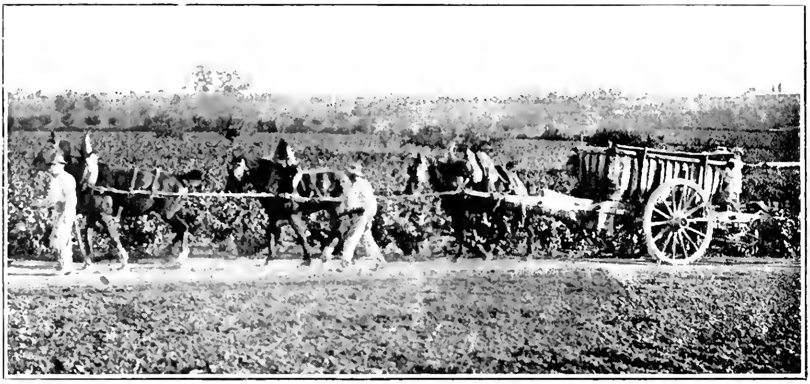
	Gallons.
Wine of less than 19½ per cent. proof (11° French)	1,296,372,000
Wine of 19½ per cent. proof "	116,999,000
Wine of more than 19½ per cent. proof "	40,183,000

These figures render further comment almost unnecessary; it is interesting, however, to note that the quantity of sweet wine made in France in 1907 only amounted to 712,030 gallons, probably less than we produce in Australia.

Turning to the price at which the bulk of this wine is sold, we find figures which appear at first sight rather disconcerting. The yield of 1907 vintage (1,453,564,000 gallons) was officially estimated to be worth 1,117,343,626 francs (£44,693,745 0s. 6d.), or rather less than 7½d. per gallon. These figures were based on actual sales, which are usually effected throughout France, very shortly after vintage.*

Two facts render it possible to sell wine as cheap as this at a profit.

1. *Heavy Yields.*—Statistics show that the 4,136,915 acres under vines in France produced in 1907 1,453,500,000 gallons, or an average of a little over 360 gallons per acre. If we turn to the four departments known as Le Midi, with its 1,000,000 acres of vines, the average yield per acre increases to over 600 gallons. It is in the Midi that the greater part of the "vin ordinaire" of France is produced. Still further limiting our area and only taking into consideration the department of Hérault, with its 447,320 acres of vines, we find the average in 1907 to have been nearly 660 gallons per acre, a high figure when one considers that young vineyards, as well as unsatisfactory ones, of which large areas still exist, are included in the average. Statistics fail to give an adequate idea of the heavy yields of vast numbers of these vineyards, for the vine lands of Hérault belong to two distinct categories—stony uplands, unfit for almost any other culture than the vine—and ordinary agricultural land, level or



CARTING IN THE GRAPES.

undulating. Large areas of the former reduce the average considerably. In the latter the yield is seldom below 1,000 gallons per acre, whilst 3,000 is frequently exceeded. It is in parts of this department that the highest yields on record are probably obtained, as we shall see when describing in detail the viticultural methods in vogue.

2. *Rapid Maturation.*—The very cheap price mentioned above renders lengthy maturation impossible. It is one of the peculiarities of "vin ordinaire" that it is fit for use at a very early age. It may come as a surprise to many unacquainted with this type of wine to know that it is at its best at from 12 to 18 months old, and quite fit to drink at six months or even less. After it is 12 months old, it does not improve on keeping and does not increase in value.

There is perhaps no subject connected with viticulture concerning which greater misconceptions exist than the age of wine, especially with the general public. Many of those who look upon themselves as well informed, and are so ready to give advice, are in the habit of telling one that "the great fault of Australian wines is that they are not properly matured," "that they are put on the market too young," &c. No doubt, in some

* A very satisfactory improvement has quite recently taken place in the price of wine in France. According to latest advices this has hardened to nearly 20 francs per hectolitre—almost 9d. per gallon—a price which has not been obtained for this type of wine for a good many years.

cases, this is so, but in others the reverse is the case. The truth of the matter is that different wines vary very considerably in the time which it takes them to arrive at maturity, or, in other words, to develop all their qualities. In marked contrast to the rapidly-maturing "vin ordinaire" are the high-class wines of the "Medoc," near Bordeaux, which we know as clarets. These, as a rule, are scarcely fit to bottle until they have undergone five years' maturation in wood, and continue to improve in bottle for many years; during their first few years they are decidedly unpalatable. Choice wines take a varying time, both in wood and in bottle, to acquire the maximum of quality they are capable of. As a rule, the choicer the wine the more slowly does it mature, and the more unfit is it for consumption when quite young, whereas, on the other hand, the "vin ordinaire" which constitutes the bulk of the wine of France, is almost immediately fit for consumption, and does not improve on keeping.

IN THE VINEYARD.

Messrs. J. Leenhardt-Pomier and F. Richter examining a vine of "Grand noir de La Calmette." The closeness of plantation and absence of summer pruning are here illustrated.

As regards wholesomeness, "vin ordinaire" gives a rude blow to one of the cherished errors so often and so freely expressed by would-be critics of Australian wines.

We often hear it stated that young wine is injurious, that much of the wine retailed in Victoria is little better than poison, because it is not sufficiently matured, &c. Now, the greater part of the wine produced in France is drunk before it is eighteen months old. Exact figures on the subject are difficult to obtain, but from a careful examination of it, and of statistics bearing on it, there can be no doubt that at least 60 per cent. of the 1,364 millions of gallons consumed in France is under twelve months old, whilst fully 90 per cent. of it is less than two years old. Yet this young wine has no injurious effect on the average health of the French people, which is certainly not inferior to that of neighbouring countries where wine is only an occasional luxury.

Apart from this view of the question, however, is it not surely illogical to think that the somewhat recently fermented juice of fresh fruit should be wholesome in the case of the apple yet injurious in that of the grape? For cider is, in Southern England, mostly consumed before it is twelve months old.

The wholesomeness, or otherwise, of food products concerns medical men rather than agriculturists, but it is time that attention was drawn to these mischievous errors concerning the age of wine which are the result of ignorance and prejudice.

These two facts enable it to be sold profitably at a price which places it within the reach of all, a price which fluctuates very considerably, but which is such that sound, well-made, wholesome wine seldom costs the consumer who procures it in bulk, more than 11d. per gallon (rather less than 2d. per bottle). Of late years, perhaps, no agricultural produce has undergone more violent fluctuations than this very type of wine, owing to the altered conditions of supply and demand arising from the ravages of phylloxera in the first place, and the ultimate solution of the difficulty by means of reconstitution on American stocks. Prices have been exceedingly profitable in some seasons, whilst in others they have fallen to considerably less than the value of the casks required to store the wine in. The viticultural crisis of 1907, which led to grave trouble in Southern France, was the result of an acute fall in the price of wine, and it is satisfactory to note that at the present time the outlook has very considerably improved. In a general way, it may be stated that with the price of the wine, at the vineyard, at 4½d. to 5d. cost of production is barely covered; at 6½d. a fair profit, and at 8½d. to 9d. a very handsome profit is realized.

"Vin ordinaire" is either red or white; formerly little else than red wine was made, but of late years white wine has increased very considerably in public favour and has therefore been much more largely produced. A considerable quantity of it is now made annually from red grapes, which preponderate in the vineyards of France. Both types have much in common, though they differ, of course, in colour, tannin contents, and flavour. They are light and agreeable and strike an Australian by their acidity, which is considerably higher than that of our wines. This acidity is entirely due to the grape and must not be confounded with that resulting from defective fermentation. This high acidity is one of the valuable features of these wines, for it enables them to be mixed with a good deal of water without their flavour undergoing very marked modification. Frenchmen distinguish between wines which stand watering and those which do not; the common wines of the country belong to the former category in a very decided manner. Though possessing but little bouquet, they have a briskness and freshness which renders them attractive to the regular consumer. They are thirst quenching in a very high degree, especially when mixed with water. These wines are, as a very general rule, faultlessly made and in excellent condition. With the keen competition of the present day, a defective wine would be quite unsaleable.

A remarkable feature of these wines is their evenness. The chief variation is in the alcoholic strength, which ranges between 8 degrees and 11 degrees French standard (14 per cent. and 19 per cent. proof spirit), so much so that it is very generally sold *au degrée* (by the degree), the price being determined according to the alcoholic strength.

The following analyses of four typical samples of "vin ordinaire" selected in France by the writer show the usual composition of this wine. They were analyzed by Mr. W. Percy Wilkinson, Federal Analyst, before his transfer to the Federal service, and whilst he was State Government Analyst:—

ANALYSES OF "VIN ORDINAIRE" FROM THE SOUTH OF FRANCE.

Samples collected by François de Castella.

Mark No.	Alcohol per cent. by Volume.	Proof Spirit per cent.	Total Acidity calculated as Tartaric Acid; grammes per 100 cc.	Total Extract; grammes per 100 cc.	Sugar calculated as Invert Sugar; grammes per 100 cc.	Sugar Free Extract; grammes per 100 cc.	Ash; grammes per 100 cc.	Sulphuric Acid calculated as K_2SO_4; grammes per litre.	Volatile Acidity calculated as Acetic Acid; grammes per 100 cc.	Sulphurous Acid calculated as SO_2; milligrammes per litre. Free.	Combined.	Total.
36	10.2	17.8	0.66	2.15	0.13	2.02	0.20	0.46	0.10	3	..	3
37	8.3	14.5	0.54	1.84	0.07	1.77	0.23	0.64	0.12	3	3	6
45	9.9	17.3	0.80	1.79	0.05	1.74	0.21	1.40	0.09	2	78	80
46	8.5	14.9	0.73	1.63	0.04	1.59	0.19	0.78	0.05	2	56	58

The four samples, designated above by numbers, are briefly described in the following notes:—The words in italics are the names under which they figured in the invoice of Messrs. Paul Bret & Leenhardt, of Montpellier, from whom the wines were purchased.

Sample No. 36.—*Languedoc rouge* (red) 10°.—Languedoc is the name of the province of which the department of Hérault formerly formed part: a name very frequently given to wines of the region in commercial circles. This wine, which is somewhat fuller than the average "vin ordinaire," is chiefly made from the Carignane grape. It is typical of much of the wine grown on the uplands, although the strength of this particular sample is sometimes exceeded.

Sample No. 37.—*Languedoc rouge* 8°.—A lighter red wine made from the Aramon grape and typical of the bulk of the wine grown on the richer undulating land as distinguished from the uplands.

Sample No. 45.—*Picpoul* 10°.—*Blanc de Blanc* (white from white grapes).—This white wine is made from the Picpoul grape. It is a rather fuller wine than the average, though typical of much of the better class white wine produced in the district. A notable feature is its relatively high proportion of sulphurous acid, as compared with the red wines. This is somewhat extensively used in the making of white wine in Southern France. The quantity contained by this sample is, however, less than half the limit allowed by our own Pure Wine Act.

Sample No. 46.—*Aramon en Blanc* 8½°.—*Blanc de Rouge* (white from red grapes).—A white wine made from the red Aramon grape, typical of the bulk of the white wine made in the richer lowlands.

These wines may be taken as typical of the "vin ordinaire" of France. Samples 36 and 45 are a little above, and samples 37 and 46 are a little below, the average alcoholic strength, which M. Roos considers to be 9° (15.8° proof). These wines stood the voyage perfectly and, when opened, were in excellent condition and absolutely sound.

Such is the "vin ordinaire" of France. If I have dealt at some length with it, it is because it would be hopeless to endeavour to describe the viticulture of the region in which it is most abundantly produced before explaining its nature and the important part it plays in the every-day life of the average Frenchman. Outside of France, the wines of that country are known by the Clarets, Burgundies, Champagnes, and a few other types which seldom find their way to Australia. These choice wines, by reason of their high cost of production increased by lengthy maturation, could not possibly become really popular beverages, and yet they are the wines which, no doubt, in the minds of most Australians represent the wines of France.

LIGHT WINE AND TEMPERANCE.

The bearing of the character of the wine made, on the habits and general sobriety of the population of Southern France, as well as of other wine-producing countries, is so striking that viticulture in the region cannot be described without reference to it. The French, in common with the other Latin races, have long been noted for their sobriety. No doubt, alcoholism has increased in the country—so much so as to give cause for grave anxiety, but this is only of recent years, and has nothing to do with the industry. On the contrary, it is significant that this deplorable change corresponded with the Phylloxera crisis and the consequent scarcity and rise in the price of vin ordinaire, which led to its substitution by other beverages. Alcoholism is on the increase in Northern France, where the large beetroot distilleries are situated. It is practically unknown in the Southern departments, the region of abundant light wine.*

In this part of the country, those who devote themselves to the promotion of the temperance cause found their hopes on "*Le vin contre l'alcool*" (wine against alcohol). I cannot illustrate this attitude better than by giving a few extracts from a letter I received a couple of mails ago from M. Leenhardt. This gentleman, as founder and president of the *Ligue Antialcoolique de l'Hérault* (the anti-alcoholic league of Hérault), is one of the foremost temperance advocates in Southern France. In replying to requests for his criticism of my reports on Spanish Viticulture, copies of which I had sent him, he expressed surprise at my having devoted so much attention to the strong wines of Spain and Portugal before dealing with the light vin ordinaire of his part of France. In reply, I endeavoured to explain Victorian conditions and our exceedingly small wine consumption. I received an answer from which I translate the following extracts:—

"It is not that you have succeeded in modifying my feelings on the wine question. On the contrary, what you write me . . . . convinces me more and more of what I see in all countries privileged to produce those two foods, bread and wine, one solid, the other liquid; there is nothing preferable for man, especially the latter, always ready for immediate use (without recourse being necessary to boiling water, to infusions which only make an anodyne and not a nourishing drink†). Wine is the most wholesome food, the most hygienic, the most nourishing and fortifying. With these two foods alone, in Spain, Italy, France, and elsewhere, man undertakes the hardest work . . . . working as long as it is daylight and is never an alcoholic, if he does not drink fortified wine, such as are Sherry, Port, and other wines, too alcoholic by themselves. You were better placed than any one, after your long, serious and complete study of vine regions and their populations, to bring about this great and happy change, necessary and useful, in the conception of the part played by wine, in regions where it is not produced and

* Absinthe, the increase in the consumption of which is causing so much anxiety among thinking people in France, cannot be considered here. Its use is really a drug habit.

† Tea is almost unknown in France by the bulk of the masses, though afternoon tea is very usually taken by ladies of the upper classes.

where it is not, or imperfectly known. Formerly, England, without vines or colonies producing (wine) sought, for her wealthy classes . . . those not wishing to take to whisky . . . the fortified wines of Spain and Portugal. Later on, Clarets, Burgundy, Beaujolais, Hermitage, were more and more appreciated; but these are all superior wines—expensive beverages *de luxe*—and only accessible to rich people. But, to-day, England has her colony Australia which can, and ought, to produce for her (if she wishes it) popular wine, wine for the masses, the most natural liquid form of food, preferable in every way to all others. . . . And if she wished it, Australia could, at a profit, as well as we can (and better) offer to her own population and afterwards to all English speaking people on the surface of the earth, good wine . . . of from 9 deg. to 10 deg. (15.8 to 17.5 per cent. proof) at 30 fr. the hecto of 22 gallons . . . say 2d. per bottle; since we sell it here, at 15 fr. the hecto, with profit to the producer at the present moment."

It will be seen that the point of view, from which the whole wine question is regarded in France, differs radically from that from which it is usually, or perhaps more correctly, often considered in Australia, but it must be repeated that the above only applies to very light wine which, as is frequently said in French, *ne fatigue ni la tête ni l'estomac* (fatigues neither the head nor the stomach) wine varying from 14 per cent. to 17½. of proof spirit, and taken with meals.

The French view of the question has been very clearly stated in the valuable paper read by M. L. Roos, director of the Œnological Station of Hérault before the International Congress of Applied Chemistry held in London, in 1909, entitled, *Le Vin Dans L'Alimentation* (wine as food).

* * * * *

Would the production of such wine be possible in Victoria? Would it pay? These are questions which will doubtless be asked. To the first, the answer is decidedly in the affirmative. All that is necessary is to grow the Southern French varieties—we have them here now (several for many years)—on suitable soil and to train them, and treat their fruit as is done in their native Midi.

As regards the second question, there is less certainty, for we are not a wine drinking people, and any change in the habits of a country must come gradually. This much, however, may be confidently affirmed—that *Australians can never become large consumers of wine until some such light type is placed within their reach at a low price.* In Spain, Portugal, and Italy we find the same state of affairs as in France. It is only very light, rapidly maturing wines which can possibly become the every-day drink of a people, and this for the two reasons of wholesomeness and low cost. There is no reason to fear that the consumption on a large scale, of wine of this type, would interfere in any way with our present wine industry. The high class wines we now produce are something quite apart from vin ordinaire. They are partaken of only on rare occasions, seeing that our average consumption per head is little more than ½ gallon per year. With a light common wine in much more general use, the occasions on which something better would be required would become more frequent, and the demands for the types we now produce would correspondingly increase—wines, many of which have been abundantly proved to be of a high order of merit.

The difficulty of handling wine of this type must not be lost sight of; its low alcoholic strength renders it very liable to acetification, and trouble will doubtless be experienced at first, especially in connexion with retailing from bulk. Even now, dry wines containing at least ¼ more alcohol, often suffer from ignorance and carelessness of retailers, which result in the wine going "off." There is no doubt, however, that this difficulty can be overcome, and with careful handling wines of under 15 per cent. proof can be placed before the public in faultless order in Australia as well as in France.

* * * * *

The vine region of the Midi is, taken on the whole, one of the most interesting in Europe. It is here that the heaviest yields are obtained and that the most recent scientific knowledge has been brought to bear on both vine growing and wine making, in short, that the intense culture of the vine is brought to its highest state of perfection. In Australia, where the common fault of our viticulture, as well of as our agriculture generally, is that it does not constitute intense culture, we have much to learn from this region. The salient features of its viticulture will be dealt with in next article.

The photographs reproduced in this issue are illustrative of usual viticultural operations in the vineyards, near Montpellier, and do not at this stage require detailed description.

THE WONDERBERRY.

E. E. Pescott, Principal, School of Horticulture, Burnley.

A considerable amount of attention is at present being devoted in the columns of various horticultural papers to one of Luther Burbank's so-called innovations—the Wonderberry. This plant is catalogued and sold by various seedsmen and nurserymen as one of the "latest creations" of the "Wizard of America"; and as it is now being grown in Victoria, it is well to know somewhat of its history. It is an annual, and requires to be propagated from seed in the springtime. Burbank hybridised two varieties of *Solanum nigrum*, the Black Nightshade, which is so very common all over this State, and, as a result, produced the Wonderberry. Of it, he says—

> This new species bears the most delicious, wholesome, and healthful berries in the utmost profusion, and always comes exactly true from seed.

Prominent British horticulturalists had their doubts about this berry, and plants were grown side by side with several forms of *Solanum nigrum* to test its value. The berries when ripe were forwarded to Dr. Greshoff, of Haarlem, one of the best known authorities on vegetable poisons. His report appears in the issue of the *Gardeners' Chronicle*, of 30th October, 1909; and he says that he

> cannot recommend the use of these fruits as food; because, although they may differ in the amount of poison they contain, according to the traditions under which they were grown, it will always be dangerous to eat them, and especially so for feeble children.

Dr. Greshoff also says that the poison contained in the fruit is that known as Solanin; and of the varieties analysed, the most poisonous was the Wonderberry! So that the Wonderberry is nothing more or less than a slightly variable form of a plant reputed to be poisonous, certainly dangerous at various stages, while harmless at others, which has been growing in profusion for years past on our rubbish heaps and other places where weeds abound. In any case there are dozens of other and better and more useful fruits for human consumption without having recourse to such a plant as the Wonderberry. Plants of it are now being grown at the Burnley Gardens for experimental purposes. Up to the time of writing no fruit has yet appeared on them; but the plant itself appears to be identical with the common Black Nightshade, both in habit of growth, in foliage, and in flowers.

THE LOGANBERRY.

E. E. Pescott, Principal, School of Horticulture, Burnley.

Among fruits of the berry class, the blackberry and the raspberry have long been popular favourites. Both fruits are easily cultivated, and both are enjoyed as luscious and delicately flavoured fruit. They readily lend themselves to cross fertilization, and quite a number of new varieties of small fruits have been introduced to cultivation and are now in prominence as a result of this hybridization. Chief among these blackberry-raspberry hybrids are the Dewberry, the Phenomenal, the Mammoth, the Primus, and the Loganberry. These fruits are all of American origin; the Dewberry being an improved variety of the American trailing blackberry; Phenomenal and Primus being two hybrids produced by the world-famous plant originator, Luther Burbank; while the Mammoth and the Loganberry were raised by Judge Logan, of Santa Cruz, California.

MR. T. GRANT'S LOGANBERRY PLANTATION, RINGWOOD.

The Mammoth was the successful result of cross fertilizing the native American blackberry with one of the early raspberries; but the Loganberry was a chance hybrid, being the result of natural cross pollination, also between the native blackberry and one of the cultivated raspberries. The seeds of the native fruit were sown by Judge Logan for experimental purposes, with the result that one of the finest of berry fruits was produced and perpetuated. Most of these fruits are on sale at various Victorian nurseries, but the one that has come more prominently into favour than any other is the Loganberry. This fruit first originated in 1881, and was introduced into Victoria some years later.

The Loganberry is of a robust hardy nature, and the plant partakes more of the parental characteristics of the blackberry than the raspberry. Its strong rambling nature makes it a plant easy to establish, and if grown on trellis, or on fences, it is easy to control, and is far less likely to become a pest than is its parent the blackberry. As an ornamental plant it will become very useful, as its handsome foliage makes it a striking object when used either to cover old logs or fences, or as a plant for pillar climbing.

In the southern parts of Victoria, it seems to thrive equally in sheltered and exposed positions. A fence at Ivanhoe, near Melbourne, covered with this plant, is thriving and producing good fruit in a fully exposed position to the north winds, and to the hot sun all day long. The photographs reproduced in this article were taken at Mr. Thomas Grant's Loganberry plantation at Ringwood. The fruit is larger than that of the raspberry, more resembling the blackberry in shape, dark red in colour, and with a flavour suggestive of both fruits. The flavour is more piquant and acid than that of the raspberry; and the berry does

A GOOD CROP.

not possess at all that peculiar flavour that is so distinctive to the raspberry. For this reason it is frequently preferred, and there is no doubt that as the Loganberry becomes more known, it will become a serious rival to the popularity of the raspberry. The individual fruits are generally about 1 inch long, and very frequently they are found $1\frac{1}{4}$ inches in length. The bunches are numerous, and produce a good quantity of berries. Its strong sturdy nature and vigorous growth are points in its favour, and against the raspberry, as it, so far, does not seem to be at all liable to attacks of the root-rot fungus, *Armillaria mellea*, which is so destructive to raspberry plantations.

This plant will thrive successfully wherever either of its parents are grown, a deep alluvial soil, well-worked, to allow a cool root run in summer, and a sheltered position being most suited to its requirements. A fair amount of irrigation will cause the plant to yield a generous crop of an excellent sample of fruit. Being of a vigorous habit, and producing canes at the same time as it produces its fruit, the plant naturally requires a good amount of moisture in the soil; the drier the soil, and the more exposed the situation, the more water it will need.

The Loganberry may be propagated either by root division or by layering. The growing canes may be layered by simply bending the canes down to the ground, fastening them with a forked stick to keep them in position, and covering loosely with a mulch of soil, which should be kept moist. The cane will produce roots freely and readily from each leaf joint under the soil. Each winter the old and straggling canes should be removed so as to allow the new growths to become strong and produce good fruit. In spring or early summer the strong growing shoots should be pinched back so as to strengthen the cane and produce a good quantity of fruiting laterals.

The Loganberry is mentioned in some American horticultural magazines as a honey plant, owing to the fact that the bees cluster around the flowers in considerable numbers. Still it would not be advisable to plant it for that purpose, as there are many other plants more suitable as "bee-plants," which flower simultaneously with the Loganberry.

Having made so marked a success in the production of the Loganberry, horticulturists have utilized this plant for further hybridizing purposes; and as a result two new berries have been placed on the market. These are the Laxtonberry and the Lowberry. The Lowberry is the finest of these two, and is a cross between the Loganberry and the blackberry. It produces remarkably large berries, black in colour, and very juicy, the berries being sometimes 1½ inches in length.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

Fumigate for red and other scales.
Cultivate the soil frequently.
Continue budding and summer pruning.
Spray for codlin moth, bryobia, and woolly aphis.

FRUIT GATHERING AND PACKING.

Orchardists will be busy during February with the gathering and marketing of fruit. In gathering fruit, every care should be taken to see that it is not in any way bruised or crushed. This is often the cause of fruit decaying so rapidly, and of the deterioration of fruit in the fruit room. All fruit should be handled as lightly as possible.

Another point to be observed is the necessity for grading fruit for the market. Grading pays, and it pays handsomely. A buyer will never offer a good price for mixed grades; more especially as he will probably require to regrade it, if he wishes to resell it. A good price will always be obtained for first grade fruit; while the low price offered for fruit of mixed grades can generally be secured for the lowest grade as well. The more exact the grading, the more profit for the fruit-grower; the more care in packing, the more returns for the producer; and so the greater care and exactness, the better it pays to grow fruit.

Still another point to be observed is the packing of fruit when quite dry. Wet fruit should never be packed in the cases. If fruit is picked in early morning with the rain or dew still on it, it should be thoroughly air dried before packing.

Orchard Operations.

The copious rains of mid-January were very beneficial to plant growth, and many varieties of fruit received a great impetus thereby. A few varieties of soft fruits that were ripening at the time of the rainfall, cracked; but the benefits to the orchard were far greater than the loss of fruit. Windstorms have been fairly general, and in some places great damage has occurred. The rains gave a great stimulus to the trees and fruit; and cultivating work was made much easier.

Cultivation should still be proceeded with, and the soil kept in a continual condition of surface friability. This is especially necessary at this time of the year. Now that a good supply of rain is in the soil, it should be well conserved, so that the growing period of the trees may be continued until early autumn, when the trees should be allowed to ripen their wood.

Budding may be continued; and if an early start were made, the buds may be allowed to push their way out into growth, so that this may harden and be ready for pruning in the proper season. Buds that are placed in in late season, should be left dormant until the springtime. Summer pruning also may be continued, and all superfluous terminal lateral growths removed, so as to strengthen the remaining buds and also to force out fruit buds for next season.

Fumigation.

February is the best month for fumigating evergreen trees, notably trees of the Citrus species that are infested with any variety of scale. The trees should be closely enveloped in a fairly air-impervious sheet or tent, and hydro-cyanic acid gas should be generated inside. The fumes of this gas are extremely dangerous, and the process should be carried out with great care. A fairly safe charge for an average tree, that is, a tree about 12 feet high and of about 10 feet in diameter, would be 4 ounces of cyanide of potassium, 4 fluid ounces of sulphuric acid, and 12 ounces of water. An earthenware, wooden, or enamel vessel should be used, and the acid should be measured into this first; then pour the water on to the acid, and when all is ready, the vessel being inside the tent, the cyanide should be dropped quickly into the liquid, and the tent closed down. Approximately, three quarters of an hour is all the time necessary to fumigate the tree.

Fumigation is a dangerous operation in strong sunshine; the result of fumigating at such a time would be that the tree would probably be killed. Many growers, for safety sake, prefer to fumigate at night time. If done in the daytime, a cloudy day should be selected. Fumigation is the easiest and the surest method of completely eradicating red scale on Citrus trees; and it has been performed with great success on both sides of the Dividing Range in Victoria.

Spraying.

The cold and wet weather of January has had the effect of somewhat retarding the operations of the second brood of the codlin moth. Very few eggs were observed up to the time of writing, 19th January. With the return of the warmer weather, this pest will be on the wing; and the whole of the apple and pear trees should be again sprayed and kept covered with spray to the end of the season. All fruit infested with larvæ should be collected and destroyed, and a more rigorous search than ever should be made for all forms of the moth. The more insects that a grower can destroy at this time of the year, the less he will have for next year; and so he is reducing to a minimum each year the attacks of this pest.

The bryobia mite, wrongly called the red spider, has increased considerably with the cold weather, and for this the tobacco spray should be used at once. Where the mite has obtained any hold on the trees, growers should decide to give their trees a thorough dressing with red oil next winter. The same remarks also apply to the woolly aphis.

Vegetable Garden.

The vegetable garden will require abundant water at this time of the year; liberal dressings and mulchings of manure will also be needed. These conditions, together with hoeing and soil stirring where necessary, are needed to produce succulent summer and autumn vegetables. All vacant plots should be well manured and dug deeply over in anticipation of the planting of winter and spring vegetables, the manure being worked in as deeply as possible. All vegetable and animal manures should be well rotted before being used for the garden.

Seeds of leek, Brussell's sprouts, summer cabbage and cauliflower, carrot, turnip, parsnip, silver and red beet, peas and French beans may still be sown. Celery plants should be planted out into rows, and celery seed may also be sown for successive crops.

Celery is a very popular winter vegetable, and it could be much more grown, if it were thoroughly understood. A bed of celery should be in every garden, and it is certainly very easy to produce. It is valuable as a salad, a boiled vegetable, and for flavouring soups; it is also a reputed reliever of rheumatic pains and affections. The seed should be sown from December to February, according to locality. It is best to sow the seeds in boxes or seed pans, covering them with glass to induce quick germination. The soil should be very fine and friable. When the young plants are from 1½ to 2 inches high, they should be planted out in boxes or in sheltered beds; and as they grow and become stronger, they should be planted out in their place in the garden. Rich, cool and moist pulverised soil, well worked, and kept free from weeds, and careful attention, are all the requirements of the celery bed. The celery plants are generally planted out in trenches; and as they grow, earth is heaped up around the plant so as to thoroughly blanch the stems. An American method of blanching is to place a board on each side of the rows of celery plants, and secure them closely in position, so that as much light as possible is excluded. It is claimed for this method that it is a far cleaner way than the earth blanching; but the latter system produces a better quality of celery. There is a variety of celery known as self-blanching, being naturally of a whitish growth. It is not to be compared to the varieties which are blanched by forcing, but it is very useful for soups and for flavouring.

Flower Garden.

In the flower garden, the most popular and showy flowers this month will be the Canna, the Zinnia, and the Salvia. Of the former, the most favourable types for gardens are the orchid and the gladiolus flowered varieties. Flower lovers should at this time visit gardens where the various varieties are labelled, and take a note of fresh varieties for next season.

Cannas are very easily grown, and as they require very little attention, they should succeed in almost any garden. They seem to succeed, better than any other plant, in an undrained soil. Their bold and decorative appearance enhances the landscape of any garden where they may be grown. Plenty of water and plenty of manure are the conditions that Cannas love. The flower trusses should be removed as soon as their beauty has passed, to make room for other heads on the stem; and as soon as a flowering stem has developed all its flowers, it should be removed from the base. Cannas are not often used for house decorations; but two or three spikes, in a fairly large vase, make an attractive enhancement to any room. Austria, Suevia, Alemannia, Kate Grey, Florence Vaughan, Philadelphia, Wyoming, and Queen Charlotte, would be a good selection for a garden.

The Zinnia is a most popular hardy annual, of a showy nature, and valuable either for massing in groups or as a single specimen plant. If grown as a specimen, as many flowers as possible should be encouraged and left on the plant, as if only a few flowers are left, they tend to become very gross and coarse. A number of varieties, among these the twisted or curled, and the zebra or striped, have been introduced into cultivation; but the old type of *Zinnia elegans*, and its improved and enlarged edition, grandiflora, still hold sway in the garden.

The Salvia family are now in full bloom, and the "Bonfire" Salvia and its allied varieties are adding largely to the attractiveness of the garden. The seed of the various Salvias should be saved as it ripens, as it is comparatively easy to raise them from seed, if the young plants are protected until the frosts are over. Salvias Bonfire, Gloire de Studgardt, and Tom Thumb, are the best of the scarlets, the latter being of dwarf habit. *Salvia patens* is perhaps the finest blue flower grown; it is easily grown from root division or seed, and requires a shaded position to be most successful. *S. azurea* is a paler blue than patens, and is of a far more hardy type. An uncommon salvia, and one that is very suitable for rockwork, is *S. argentia.* Its extremely large spreading leaves, covered with thick silvery hairs, are an effective setting for its spreading spikes of pure white flowers. A clump of this salvia would be beautiful in any garden.

Flowering trees and shrubs such as *Acacia elata*, the most handsome of all acacias, Oleander, Poinciana, and *Virgilia capensis* are now attracting attention; and these should be noted for future reference, as they are very useful and attractive as summer flowering shrubs.

Cultural operations and watering should occupy considerable time this month. The rains of January have soaked well into the ground and where gardens have been mulched, the water may now be used very sparingly. Unmulched beds should be frequently stirred with the hoe, to loosen the surface, and to destroy all foreign growths.

Delphiniums should be well looked after for autumn blooms; the old stems should be cut down, and the crown liberally mulched and watered.

Carnation layers must be attended to, the soil being kept cool and moist, so as to allow easy rooting.

Any perennial or hardy annual seeds may now be sown, and cuttings of Zonale pelargoniums, or what are commonly known as geraniums, may be planted.

A few spring flowering bulbs may be planted for early blooms, and the soil and beds well worked in anticipation of planting the main crop in March and April.

Dahlias, Chrysanthemums and Roses will require a great deal of attention this month. Dahlias should be well staked, watered, and all unnecessary laterals removed.

Chrysanthemums should be thinned out, and staked, if this has not previously been done. The floral buds should be selected, and all others pinched out; and the plants should then be well fed wherever necessary.

All old flower heads should be removed from the rose bushes. In March the plants may be thinned out, manured, and generally prepared in anticipation of the crop of autumn blooms.

All shrubs and trees that have bloomed should have their old flowering stems and shoots thinned out, so as to start fresh growths for filling in spaces, and for next year's blooms.

PRODUCTION AND MARKETING OF BEESWAX.

(*Continued from page 774, Vol. VII.*)

R. Beuhne, President, Victorian Apiarists' Association.

When an apiary has been in existence for a number of years it becomes necessary to replace some of the old black brood combs. This should be done every season—whenever an opportunity offers to withdraw them from the brood-chamber. They should then be replaced with new ones.

There are also occasional cases of foul brood necessitating the removal of all the combs of infected hives. Although burning of combs and frames is frequently recommended to rid an apiary of disease, there is no necessity whatever for the destruction of the wax contained in the infected combs; all that is needed is to carefully put them away indoors, out of the reach of bees, until they can be boiled down, which should be done as soon after as possible.

A Langstroth comb, if built on a full sheet of foundation, contains about 2 ounces of wax when new, but somewhat more after it has been in use for some years, as the bees add wax after the foundation is first drawn out. When very old combs are boiled down for wax, not more than eight should be put into each tin with three gallons of water, otherwise the mass becomes too stiff and difficult to press clean of wax. Sometimes, hundreds of combs have to be cut out and boiled down and a great number of vessels would be required to hold the water and liquid wax coming from the press until the wax is set, unless it is skimmed off while hot which is tedious work.

By the use of a separating tank, wax and water can be separated automatically, the wax being retained in the tank while the waste water, if not too thick and black, can be used for boiling down more combs or else at once disposed of. Waste water from boiling down combs or water containing honey should not be thrown out so that bees have access to it, but should be buried; apart from any risk of spreading disease it may start robbing or stinging.

This separating device (Fig. 1) consists of a plain box lined with tin. One corner of the lining is covered by an L-shaped piece of tin soldered to the side and end, open on top and reaching only to within half an inch of the bottom, with an outlet stud through the end board of the case about four inches from the top. At the opposite corner of the case is another outlet stud two inches from the top.

Before allowing the wax to run into the tank from the press, sufficient hot water should be poured in to cover the end of the enclosed corner so as to prevent the wax escaping into it. After several lots of boiled comb have been put through the press, the wax and water will have risen in the tank to the level of the outlet tube A, and from now an amount of water, equal in weight to the water and wax coming from the press, will run over by tube A.

As wax is considerably lighter than water, it does not displace water by its own volume, and therefore rises in the main body of the tank as it accumulates until it reaches the wax outlet tube B. This is best kept corked till it is desired to draw the wax into moulds or a cooling vessel, when by opening the wax tube B and closing the water outlet A the whole of the accumulated wax flows over when more liquids run into the tank from the press or sufficient hot water is poured into it.

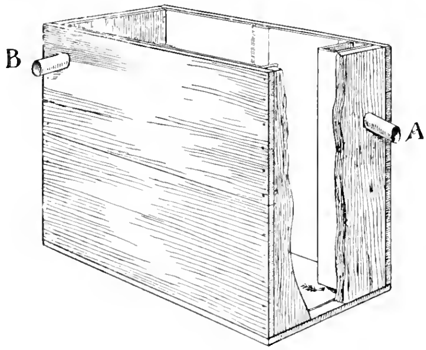


FIG. 1

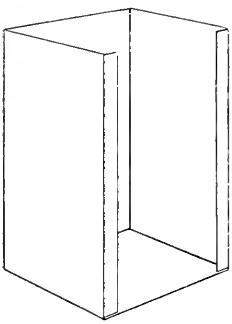


FIG. 2

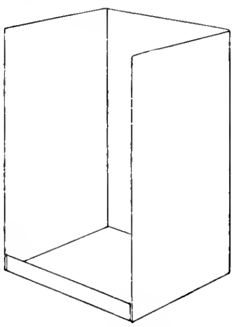


FIG. 3

SEPARATING TANK.

A serviceable tank of this description can be made out of a kerosene case and two tins by any one able to use a soldering iron. Cut the tops out of the kerosene tins, close to the rim, and hammer back the cut edges. Then cut the side out of one tin, as shown in Fig. 2, and the other as in Fig. 3; put the tins into the case, straighten out the pieces left for lapping over in Fig. 2 and the bottom piece in Fig. 3; then solder together. Withdraw the lining from the case, cut the holes for outlets A and B into lining and case, reinsert the lining and solder on the studs (which should be at least one inch in diameter) and the angle piece covering A. The work is then completed.

This receptacle, if emptied and wiped dry after use, will last for many years, as wax has a protecting influence on tin It will save a great deal of labour by dispensing with skimming and remelting; water will also be economized, an important consideration to beekeepers who are located in dry districts.

THE POTATO EEL-WORM.

SOME PRELIMINARY OBSERVATIONS SHOWING HOW IT DIFFERS FROM THE ONION EEL-WORM.

W. Laidlaw, B.Sc., Micro-Biologist.

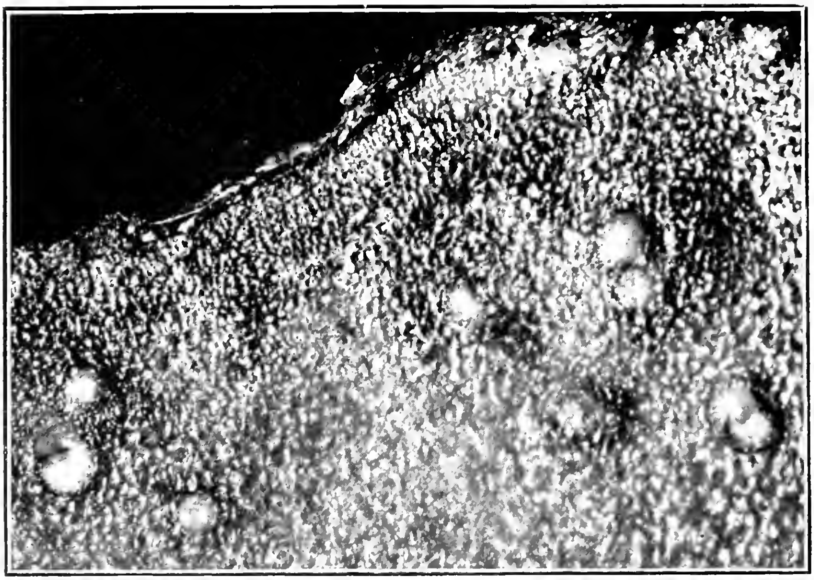
In nearly all descriptions of the Potato Eel-worm it is assumed that it and the worm attacking the onion are one and the same. They both belong to the Nematoda which forms a large and important sub-order of the Nemathelminthes. There are a great number of species in this sub-order and, although the conditions under which they live are of the most varied kind, the structural differences are so slight that the determination of the species is attended with great difficulty and may account for the confusion that has arisen.

Minute nematodes abound in all moist soil and around the roots of plants. The great majority of these worms do not attack living plants but live in decaying organic matter in the soil. The part played by them in the soil is not thoroughly understood. Sometimes they are in such great numbers, that, although not distinctly parasitic, they probably do damage. Many species are free living and have received distinct specific names. These, as Linstow has pointed out, may not be separate species at all, but merely stages in the life history of some of the parasitic species.

The eel-worms attacking plants belong mainly to the following genera of the family Anguillulidæ:—*Tylenchus*, *Aphelenchus*, and *Heterodera*. They are of small size and are provided with a spine or spear which works to and fro through the mouth, and by which the worm bores into the tissues of a plant. The onion worm is larger than the potato worm, averaging one-twentieth of an inch in length, while the potato worm averages only one-fiftieth of an inch. The reverse is the case with the newly-escaped embryo, that of the potato worm being the longer. The eggs, also, of the potato worm are larger than those of the onion worm.

If we take a potato that is affected with eel-worm, we will find rounded swellings on the surface; these may occur all over the potato or in patches. The swellings vary in size and are often confused with scab. (Eel-worms are frequently found in scabby potatoes, there being a double infection.) If we take a potato showing these swellings and cut it into thin slices at right angles to the surface, we will see under the skin at distances varying from 1-32 to $\frac{1}{8}$ of an inch, rarely deeper, little round cysts which are visible to the naked eye, being about the size of the head of a very small pin; these are the female worms which have become distended with eggs. In a potato that is newly dug, the little cysts are transparent and very difficult to make out with the naked eye, but in one that has been kept for some time they are more easily seen as the cyst becomes opaque and nearly white in appearance, and by-and-bye the starch cells in the neighbourhood become brownish through degeneration. This is analogous, no doubt, to the degeneration which takes place around the cystic form of some of the nematodes affecting animals. After the female has assumed the rounded form it dies. In the case of a worm that has only recently assumed this rounded or cystic form, on expressing the contents and examining under a low power, we find the cyst contains only a mass of germinal cells, while in an older cyst these are contained in a limiting tube-like membrane, probably the wall of the uterus itself which has become tougher and not so easily ruptured. In the still older cysts these germinal cells become aggregated into oval clumps within the tube, acquire an envelope, and later on become perfect eggs.

In the older potatoes the cyst is easily removed for the purpose of observation, the wall of the cyst which is really the epidermis of the dead worm becoming tougher as the potato dries. If a piece of dried potato containing the cystic form of the worm be placed in water, the wall swells slightly, becomes softer, and is more easily ruptured. On placing individual cysts in water they swell up by osmosis, a portion of the contents usually being expressed. From the contained eggs living worms are hatched out in eight days; this, no doubt, is much slower than it will be in natural



SECTION OF POTATO SHOWING NEMATODE CYSTS × 10.

conditions owing to the difficulty of keeping the eggs with just the requisite amount of moisture. Some cysts show no development of eggs, only containing the germinal cells before spoken of; these may be non-impregnated females, but more probably the non-development is due to the artificial conditions under which the observations were necessarily conducted.

THE EGG.

The envelope of the egg is chitinous and is very resistant to chemicals, drying, or moisture. It is provided with a process which enables the embryo to escape, one end coming off like a little lid or cap. The movement of the embryo within the egg is very slow, observations having frequently to be conducted for hours before any movement can be detected. This differs markedly from the embryo of the onion worm which is very active inside the egg and ruptures the envelope by its own activity. The eggs differ greatly in their rate of development, karyokinesis going on more rapidly in some than in others; this to a great extent is probably due to the artificial conditions under which the observations are carried out. In many of the Nematoda, division of the embryo occurs very rapidly. If eggs are dried for weeks and then moistened, the embryos show movements in the egg within 48 hours.

WORMS.

No living worms were seen in over 100 sections of mature potatoes examined, though in all there were female worms in the bladder-like or cystic form containing eggs in various stages of development, some containing embryos fully formed and ready to escape. If the eggs are obtained by scraping an infected potato, some active worms are sure to be found, the scraping having ruptured the cyst and some of the eggs and set the young worms free. Drying for 24 hours kills the young worms; this, again, differs from the onion worm which retains its vitality at all ages and begins to move actively when moisture is added after being kept in the dried condition for over two years.

In the onion worm the cardiac bulb can be seen beating rhythmically; I have not been able to demonstrate this in the potato worm. The onion worm is viviparous and oviparous, thus further differing from the potato worm which, as stated above, forms a cyst, the development of the eggs going on after the parent worm has died.

The whole life history of the onion worm is quite simple, and can be watched from the egg till the worms are fully grown and reproducing their kind. If a fresh piece of onion be placed in a dish containing onion worms, in a few hours the worms are attacking it vigorously. No such thing occurs on adding a piece of onion to a dish containing young potato worms, nor do pieces of potato pulp or scrapings attract them; in infested soil the adult worms are feebly attracted if a piece of potato is added

So far as my observations go, the potato eel-worm is lower in the scale of being and more passive than the onion worm. It resembles to a certain extent *Heterodera schachtii*, which, according to Strubell, "forms the galls or swellings on the roots of many plants especially tomatoes and cucumbers. The free larvæ of this form live in the earth and make their way into the smaller rootlets; here the female larvæ shed their skin, loose their characteristic nematode form, and become citron shaped. The embryos develop within the body of the mother, and, escaping through the uterus, ultimately cause her death."

SOIL.

In a specimen of soil brought by the Potato Expert, Mr. Seymour, from Killarney, three distinct species of nematodes were found, one of the species identical with the potato worm being found in 60 per cent. of the slides examined. In soil obtained by Mr. Price from the onion district of Portarlington, no worms were found; though in a potato (Carmen, No. 1) from the same land I found many worms in the rootlets, including a female with an area of germinal cells similar to those found in the encysted or bladder form. Many worms were also found in the young shoots. This potato was no doubt infected when planted.

In a self-sown sample from the Agricultural High School, Warrnambool, supplied by Mr. Seymour, empty egg envelopes were seen; a number of worms were found in the potato, many in the rootlets and a few in the shoots. Many worms were also found in the sample of soil handed to me at the same time.

SPECIFIC GRAVITY.

The worms float for a little while in a 5 per cent. solution of sodium chloride, but very soon sink as the salt is taken up by osmosis. The eggs have a slightly higher specific gravity than the worms, probably because there is more protoplasm in proportion to the superficies.

From the foregoing it will be seen how necessary it is to plant seed entirely free from infection. One single cyst contains many eggs and will produce enough worms to infect the ground around. The blisters, unless numerous, easily escape observation, hence a cursory examination is not sufficient before planting. The potato worm not being nearly so active as the onion worm, I should think ploughing so that the surface soil is buried deeply would be beneficial for a time at least. The ordinary earth worm of course plays a large part in again bringing the eggs of the nematode to the surface.

My thanks are due to Mr. Price for the samples of soil and potatoes, and for kindly giving me his notes on the onion worm ; and to Mr. Seymour for the samples of soil and potatoes supplied on different occasions.

(*To be continued.*)

A NEW PASTURE PLANT FOR VICTORIA.

Birdsfoot Trigonel (*Trigonella ornithopodioides*, L.).

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in the Melbourne University.

In the *Proceedings of the Royal Society of Victoria*, Volume XX., p. 87, 1907, it was recorded that the Birdsfoot Trigonel (*Trigonella ornithopodioides*, L.) had established itself in Victoria as a naturalized alien. The plant is a member of the *Leguminosæ*, closely allied to the smaller clovers, but differing in the flowers which occur in twos or threes usually, instead of in heads as in the true clovers. The pod is also longer, projecting beyond the calyx and opening at the end on one side when ripe, so as to resemble a scoop.

The plant is a native of Western and Southern Europe, although it extends as far north as Denmark. It grows usually in dry, sandy pastures, especially near the sea, and flowers early in summer. In Europe, it grows as an annual with thickly matted spreading stems rarely more than two or three inches long. In Victoria, especially in some parts of Gippsland where it has recently spread, it seems to grow larger, sometimes attaining a foot in height and the tufts often being five to six inches in height and breadth. A single plant may weigh one-half to one ounce when fresh, though usually less than this. It is, therefore, quite equal to some of the medium sized clovers.

When grazed, the root appears to last for more than a year if the ground is not too dry. If not too closely cropped, it seeds freely and dies down in January. Up till that time it yields a fair amount of feed for stock. It has no injurious or objectionable qualities, and its spread is to be encouraged on all dry, sandy or unimproved natural pastures. It is doubtful, however, whether it would repay cultivation, and it is certainly inferior to lucerne, sainfoin and the larger clovers as regards yield per acre and permanence as a pasture plant. It is, however, worth noting as one of the few naturalized aliens whose "accidental" entry into Victoria appears likely to do more good than harm. The fact that it is often found growing among Strawberry Clover suggests that its seed originally came in mixed with imported clover seed. Its larger size and luxuriance in Victoria is the result of our favourable climate and rich soils.

FARM AND CROP COMPETITIONS, 1909.

RESULTS OF COMPETITIONS HELD UNDER THE AUSPICES OF AGRICULTURAL SOCIETIES DURING 1909.

F. E. Lee, Agricultural Superintendent.

The regulations relating to the allotment of the Government subsidy to Agricultural Societies requires that "the Society shall provide and offer a substantial prize (not less than £5) for improvements in farm practice and management, or the cultivation of special crops in the district."

Numerous Societies, in compliance with the foregoing, have offered prizes for either farms or crops.

The schedule of points under which these competitions were carried out was published in the December *Journal*. The competitions mentioned here have, in all cases, been judged by officers of the Department, at the request of the Society concerned :—

FARM COMPETITIONS.

Competitor's Name.	Address.	Name of Agricultural Society giving Prize.	1*	2*	3*	4*	5*	6*	7*	8*	9*	10*	Total Points.
Harding, E. ..	Rigg's Creek ..	Euroa ..	10	13	15	18	9	10	14	16	12	8	125
Sargood, F. ..	Mansfield-road ..	,, ..	6	14	14	16	6	9	14	18	14	9	120
Gooding, T. ..	Rigg's Creek ..	,, ..	7	12	17	22	5	9	12	16	10	9	119
Schultz, F. W. ..	Glenlee ..	Jeparit ..	7	13	17	16	6	7	14	15	12	4	111
Jensz, H. ..	Tarranyurk ..	,, ..	7	13	15	14	7	8	12	15	14	4	109
Olsen, C. ..	Jeparit ..	,, ..	6	11	16	15	8	7	9	17	12	4	105
Anderson, P. J.	Ellam ..	,, ..	7	12	15	15	4	5	5	13	10	4	90
Ross Bros. ..	Gowar East ..	St. Arnaud	8	12	17	4	10	10	14	18	15	6	114
Bath, E. G. ..	Swanwater West	,,	8	11	16	10	8	10	12	17	13	7	112
Telford Bros. ..	Slaty Creek ..	,,	9	9	18	6	7	8	12	10	12	6	97
McLean, L. ..	Carapooee ..	,,	8	10	15	12	5	5	10	16	10	4	95
McLean, D. ..	,, ..	,,	8	12	10	4	5	6	9	17	5	4	80
Hermiston, W. ..	Mansfield ..	Mansfield ..	8	14	10	18	9	10	13	18	12	8	120
McMullen, A. ..	,, ..	,, ..	8	12	15	15	8	8	10	15	12	8	111
Greenaway, J. ..	,, ..	,, ..	7	10	12	20	6	7	8	15	10	7	102

* See details in next Table.

ANALYSIS OF THE AWARDS.

It is highly interesting, both as a measure of the average attention shown by farmers towards the specific details of farm management in each locality, as well as an index of the general farm practice throughout the State, to note how the above awards appear when compared with one another.

The total percentage of maximum points awarded for all sections of the competition is as under :—

Euroa, 80.6 ; Mansfield, 74 ; Jeparit, 60.9 ; and St. Arnaud, 60.6.

The points which the following analysis makes evident are—

(*a*) A want of appreciation of the benefits of fodder provision in one form or another.

(*b*) Some further attention to the efficiency and maintenance of out-buildings.

(*c*) The necessity for an adequate and easily accessible water supply for stock.

—	Maximum Points.	District Averages.			
		Euroa.	Jeparit.	St. Arnaud.	Mansfield.
1. Best subdivision according to methods of farming adopted ..	10	7.6	6.7	8.2	7.6
2. The number of stock of all kinds on the farm	15	13.0	12.2	10.8	12.0
3. The area under cultivation and the class of crops grown ..	20	15.3	15.7	15.2	12.3
4. The best provision for fodder conservation in the shape of silos, hay and straw stacks, and root crops	25	18.6	15.0	7.2	17.6
5. The condition of fences, gates, yards, bails, pigstyes, barns, and stables	10	6.6	6.2	7.0	7.6
6. The farm homestead and arrangement and convenience to outbuildings	10	9.3	6.7	7.8	8.3
7. The best provision for water supply for stock	15	13.3	13.3	11.4	10.3
8. The quality of stock kept on the farm	20	16.6	15.0	15.6	16.0
9. Number and variety of farm implements and their shed accommodation	15	12.0	12.0	11.0	11.3
10. The best provision for tree planting, or shelter belts of any kind for stock	10	8.6	4.0	5.4	7.6

Crop Competitions.

The conditions under this heading provide for the best 30 to 100 acres of wheat grown within the district. As might be expected, the crops shown by competitors are amongst the best in each district, and the somewhat optimistic estimates of yields given are being well sustained by actual harvesting results.

Competitor's Name.	Address.	Name of Agricultural Society giving Prize.	Variety of Wheat.	1	2	3	4	Total.
Cassidy, James ..	Murchison East	Murchison ..	Federation	10	9	10	40	69
Ewart, M.	Dargalong ..	" ..	" ..	10	9	10	38	67
Cahill, J.	Murchison East	" ..	Dart's Imperial ..	10	9	10	37	66
McMillan, R. N. ..	Murchison ..	" ..	" " ..	10	9	10	35	64
Cahill, J... ..	Murchison East	" ..	Federation	9	9	9	36	63
Day, J.	Murchison .	" ..	Steer's Early Purple Straw	10	10	10	33	63
Bidstrup, C. ..	" ..	" ..	Dart's Imperial ..	8	10	10	35	63
Anderson, E. ..	" ..	" ..	" " ..	8	10	10	34	62
Cassidy, E., jun. ..	Murchison East	" ..	" " ..	7	10	10	35	62
Mackie, J. ..	Wahring ..	" ..	Steinwedel	10	10	9	32	61
Metcalfe, J. ..	Murchison ..	" ..	Dart's Imperial ..	6	9	10	30	55
McAllister, K. ..	Lake Boga ..	Swan Hill	Dart's Imperial and Federation	10	9	9	16	44
Williams, W. ..	Kunat ..	"	" " "	9	9	9	15	42
Greenham, P. (1) ..	Goschen ..	"	Dart's Imperial and Yama	9	9	9	14	41
Greenham, P. (2) ..	" ..	"	" " "	9	9	9	14	41
Chisholm, J. ..	Swan Hill ..	"	Dart's Imperial and Federation	9	9	9	14	41
Watt, T.	" ..	"	" " "	9	9	8	14	40
Hayes, M. J. ..	Tyntynder West	"	" " "	9	9	9	13	40
Stewart, T. C. ..	Swan Hill ..	"	Dart's Imperial and Jubilee	9	9	9	12	39
Roberts, J., jun. ..	Kunat ..	"	Steinwedel and Federation	9	9	8	13	39
Holland, L. (Mrs.)..	" ..	"	Dart's Imperial and Federation	9	7	9	14	39
Holland, W. ..	" ..	"	" " "	8	9	8	13	38

Crop Competitions—*continued.*

Competitor's Name.	Address.	Name of Agricultural Society giving Prize.	Variety of Wheat.	1	2	3	4	Total.
McCullough, J. (1)	Bamawm	Rochester	Federation	9	9	10	34	62
Belt, R.	Nanneella	,,	,,	8	9	10	35	62
Wallace, G. H. (1)	Warragamba	,,	,,	8	9	10	34	61
Wallace, G. H. (2)	,,	,,	Dart's Imperial	9	9	10	29	57
McCullough, J. (2)	Bamawm	,,	,, ,,	9	9	10	29	57
Walters, J.	Diggora	,,	,, ,,	7	8	10	30	55
Stewart, W. G.	Kyabram	,,	Federation	6	9	10	30	55
Wilson, J.	Rochester	,,	,,	6	9	10	30	55
Kerlin, E.	Timmering	,,	Dart's Imperial	9	9	10	26	54
Fulton, J.	Nanneella	,,	,, ,,	6	9	10	26	51
Boyd, J.	Elmore	Elmore	Turvey	9	10	10	36	65
McKay Bros. (1)	Warragamba	,,	Federation	10	9	10	34	63
McNaught Bros.	Diggora	,,	Turvey	9	9	10	34	62
Green, J. (1)	Warragamba	,,	Federation	8	9	10	35	62
McKenzie, G. (1)	Corop West	,,	,,	10	9	10	33	62
Clark, J. (1)	Wanalta	,,	,,	8	9	10	34	61
Hayes, T.	Corop West	,,	Purple Straw	9	9	10	33	61
Anderson, R. M.	Elmore	,,	Steer's Early Purple Straw	9	9	10	32	60
McKay Bros. (2)	Warragamba	,,	,, ,, ,,	10	9	10	31	60
McKay Bros. (3)	,,	,,	Dart's Imperial	10	9	10	31	60
Adams, D. H.	Elmore	,,	Federation	8	7	9	35	59
Dale, J. (1)	Runnymede	,,	,,	10	9	10	30	59
Dale, J. (2)	,,	,,	Dart's Imperial	10	9	9	30	58
McKenzie, G. (2)	Corop West	,,	,, ,,	9	9	10	30	58
Clark, J. (2)	Wanalta	,,	,, ,,	7	9	10	31	57
Green, J. (2)	Warragamba	,,	,, ,,	8	9	10	30	57
Cleary, P.	South Elmore	,,	Federation	8	8	10	30	56
Murphy, D. J.	Runnymede	,,	,,	7	9	10	30	56
Kortum, H.	Elmore	,,	,,	6	4	10	30	50
Gallivan, M.	Burramine	Tungamah	Wallace	10	10	10	26	56
Nailon, J. (1)	Pelluebla	,,	Federation	9	9	10	27	55
Stevenson, J. (1)	Tharanbegga	,,	,,	9	8	10	27	54
Payne, W.	,,	,,	Purple Straw	10	10	10	24	54
Mulquiny, A.	,,	,,	Federation	8	9	10	27	54
Ellis, P. (1)	Youanmite	,,	,,	8	9	10	27	54
O'Brien, J.	Burramine	,,	Red Straw	9	10	10	24	53
Dickie, J.	Tharanbegga	,,	Federation	9	7	10	26	52
Condie, D. (1)	,,	,,	Purple Straw	10	9	10	22	51
Condie, D. (2)	,,	,,	Federation	8	8	10	25	51
McCarthy, J.	Pelluebla	,,	Red Straw	9	10	10	22	51
Nailon, J. (2)	,,	,,	Hudson's Early Purple Straw	9	10	10	22	51
Hopkins, T. (1)	Boosey	Pelluebla	Steinwedel	10	10	10	21	51
Walsh, E. (1)	Youarang	,,	Purple Straw	9	10	9	22	50
Hopkins, T. (2)	Boosey	,,	,,	8	9	10	23	50
Ellis, T. (2)	Youanmite	,,	,,	8	9	10	23	50
Harrington, J. (1)	Youarang	,,	Dart's Imperial	10	9	10	21	50
Harrington, J. (2)	,,	,,	,, ,,	10	9	9	22	50
Stevenson, J. (2)	Tharanbegga	,,	Purple Straw	9	9	10	22	50
Lawrence, J.	Youarang	,,	Federation	7	8	10	24	49
Condie, D. (2)	Tharanbegga	,,	Red Straw	9	9	9	22	49
Lee, W.	Youarang	,,	Federation	8	9	10	22	49
Walsh, E. (2)	,,	,,	Purple Straw	8	9	10	22	49

Competitor's Name.	Address.	Name of Agricultural Society giving Prize.	Class of Land.	1	2	3	4	Total.
Schwartz, J. F.	Katyil	Dimboola	Mallee	7	9	9	30	55
Glatz, J.	Dimboola	,,	,,	9	9	9	20	47
Preuss, R.	Katyil West	,,	,,	9	9	8	20	46
Klinge, G. H.	Gerang	,,	,,	8	9	9	18	44
Schaefer, E.	Dimboola	,,	,,	8	9	8	18	43
Sallmann, F. W. (1)	Kornheim	,,	Not Mallee	10	9	10	34	63
Fechner, W.	Dart Dart	,,	,,	8	8	10	36	62
Walsgott, C. G.	,,	,,	,,	8	9	8	36	61
Fechner Bros.	Dimboola	,,	,,	8	9	10	34	61
Barber, John	Wail	,,	,,	8	9	9	35	61
Harders, G.	Kornheim	,,	,,	9	9	10	33	61
Mibus, A.	Katyil	,,	,,	9	9	8	35	61
Sallmann, F. W. (2)	Kornheim	,,	,,	9	9	9	33	60
Fechner, C. E.	Dimboola	,,	,,	9	9	8	34	60

A prominent feature of the crop competition is the number of different varieties of wheat grown. It is only possible to make comparisons between the yields of varieties in the Murchison, Rochester, Elmore, and Tungamah districts, where the competitive crops consisted of one variety only. In the districts named the number of crops and average estimated yields were as follow:—

	Crops.	Average Yield per Acre.
Turvey	2 ..	35.0 bushels
Steer's Early Purple Straw ..	3 ..	32.0 ,,
Federation	25 ..	30.9 ,,
Dart's Imperial	18 ..	30.0 ,,
Steinwedel	2 ..	26.5 ,,
Wallace	1 ..	26.0 ,,
Purple Straw	8 ..	24.1 ,,
Red Straw	3 ..	22.6 ,,
Hudson's Early Purple Straw	1 ..	22.0 ,,

SUITABILITY OF WHEAT VARIETY TO VARIOUS DISTRICTS.

It is interesting to note the following order of preference shown by the crops under review to each district.

Variety.	Murchison.	Rochester.	Elmore.	Tungamah.
Federation	1st	1st	3rd	2nd
Dart's Imperial	2nd	2nd	5th	5th
Steer's Early Purple Straw ..	3rd	..	4th	..
Steinwedel	4th	..	..	7th
Turvey	..	..	1st	..
Purple Straw	..	..	2nd	3rd
Wallace	..	..	..	1st
Red Straw	..	..	..	4th
Hudson's Early Purple Straw ..	..	..	..	6th

The Federation emerges from the above analysis with considerable credit, and may fairly be claimed to be the most prolific yielding variety grown at present in Victoria. It is gratifying to know that the Field Branch of the Department of Agriculture was the means of introducing and widely distributing this variety by means of experimental fields which afforded comparison between some 40 varieties, the great majority of which have now been discarded in favour of Federation. The Commonwealth of Australia owes an undying debt of gratitude to the late William Farrer for this fine example of the application of science to the breeding and selection of wheats.

It is to be hoped that the farmers throughout Victoria will appreciate the advantages that are to be gained by entering their crops for these competitions, and that the number of competitors will be trebled next season.

DAIRY HERD COMPETITIONS, 1909.

A. V. Becher, Dairy Supervisor.

Numurkah.

It is a pity there were not more entries, but if the competition were held earlier, say in October, I think there would be greater interest taken. Mr. W. Hodgson comes first with 75 points, and Mr. J. J. Darbyshire next with 72 points.

Mr. Hodgson is to be congratulated on the way he has kept his herd milking all the year round, with the aid of his silo which he has filled again this year for the coming winter. He keeps his farm and buildings in good order. If he could manage to weigh the milk daily and test more often he would find the advantage in being able to cull his herd more quickly. When using milking machines it is not so easy to keep daily records of the yields of the individual cows.

Mr. Darbyshire has very complete records of both yields and tests, but as he makes no provision whatever for winter feed his herd suffers in this respect, being practically only six months in milk, which is very unprofitable dairying. With the Ayrshires he possesses, it is hard to understand why he has not yet gone in for a silo in order to keep his herd milking all the year round.

The following are the detailed points gained by each competitor in the different sections:—

Sections— (Maximum points, 25 in each section.)	W. Hodgson.	J. J. Darbyshire.
Cleanliness, construction and arrangement of yards and buildings.	18	15
Management of farm from a dairying stand-point ...	22	13
Methods of recording yield and test	15	23
Other features, such as quality and type of herd, breeding, &c.	20	21
	75	72

Nathalia.

There was only one farm worthy of inspection; the other farm entered was altogether below standard as regards sanitation, general management and the like, to be entered for a competition.

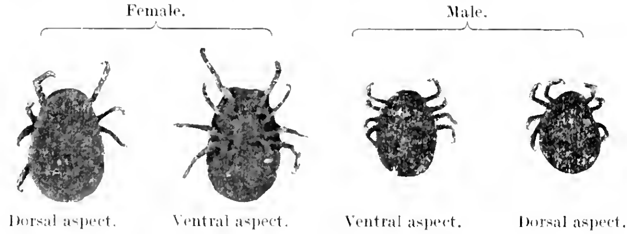
Mr. A. H. King, the successful competitor, is methodical and tidy in the management of his farm; and although his buildings are very primitive in their construction, they are kept clean. He also shows some forethought in providing winter feed for his cows, having a large stack of silage made from a paddock of wild oats. From the results obtained from a plot of lucerne in his garden, I should think it well worth his while to put in two or three acres by the side of the billabong.

I would strongly advise the daily weighing of the milk and the purchase of a Babcock tester in order to cull out the wasters in the herd, and to get a better quality of dairy type than there is at present.

TICK FEVER IN FOWLS.

A. A. Brown, M.B., B.S., Inspector of Foods for Export.

A disease that is the cause of considerable mortality in fowls, and consequently of great losses to poultry breeders, prevails over a large extent of Australia. It would be difficult to estimate the losses annually inflicted on the poultry industry in the Commonwealth by the depredations occasioned by the fowl tick (*Argas americanus*) that is the primary factor in the dissemination of the infective agent. The infective agent is a micro-organism which belongs to the protozoa, or lowest division of the animal kingdom. It is harboured in the bodies of Argasides or fowl ticks, and the ticks by biting fowls introduce it into their bodies.



(Two and three-quarter times natural size.)

FOWL TICK. (*Argas americanus.*)

Tick fever is a disease of the blood in which hæmolysis, or destruction of the red blood corpuscles, is a characteristic feature, and this hæmolysis is produced by the vital activities of the micro-parasite.

Fowl tick does not mature on the bodies of horses, cattle, sheep, pigs, dogs, ducks, or geese, although ticks may occasionally perhaps be observed on them. The special micro-organism prevailing in the *Argas americanus* that causes the fever in fowls has not, moreover, ever yet been detected in the blood of any animal or bird in the orders mentioned.

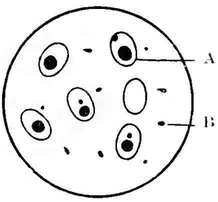
Ticks attack birds belonging to the pigeon and fowl tribes and young ticks attach themselves to their bodies, and there they may remain until they undergo certain transformations incidental to their development.

There is as yet no direct evidence to prove that chickens hatched from the eggs of fowls that had suffered, and yet recovered from tick fever, are hereditarily immune. Young chickens in the infested areas are probably often attacked and inoculated by ticks so that by the time they have reached the adult stage of existence, provided they have survived the inoculations, they have acquired immunity to the specific micro-organisms. Ticks are the carriers of the infection, but all ticks may not contain the specific organism in their bodies. Ticks can be kept in receptacles that admit air without food for twelve months without losing their vitality.

The micro-parasite, the *Piroplasma gallinæ*, which is the actual cause of the fever in fowls suffering from tick fever, is a particularly small motile organism belonging to the animal kingdom. The organisms exist both in the blood-cells (intra-corpuscular forms) and in the blood serum (extra-corpuscular forms). The extra-corpuscular forms are far more numerous and larger than the intra-corpuscular forms. In preparations made from the blood of the heart and large vessels only a few organisms are at any time detectible, but in preparations made from the blood of capilliaries of internal organs, particularly the kidneys, many of the protozoans may readily be seen. The red blood cells of the fowl are about 1-2500th of an inch in length, and the piroplasma is from 1-15th to 1-20th the size of a red corpuscle. The intra-cellular forms are very small and may be observed as minute spherical bodies resting near the edge of the blood corpuscle. Not many intra-cellular forms may be detected in the cover slip preparations, hence the difficulty experienced in determining the exact causation of the mortality in tick infestation. The extra-cellular forms are larger and more numerous than the intra-cellular forms, and in preparations of blood from fowls freshly killed they are readily enough observable to the trained observer.

The body temperature of affected fowls rises several degrees. The normal temperature of a fowl is 107°, but elevations of the temperature to 110° and even 112° are not uncommon in the course of tick fever infection. The fowls become weak, emaciated, and lose the power of their legs. The red blood corpuscles are broken up and this condition is one of the essential factors in the course of the disorder. Since the organisms belong to the protozoa they are incapable of being cultivated outside the bodies of fowls.

The organisms, besides varying in size vary also in form. Some are spherical, some pear shaped, some oblong and some possess irregular shapes. They are highly refractive and do not satisfactorily absorb stains. However, they can be stained by special methods and I possess some very good slides. It is some time since that I reported the existence of the *Piroplasma gallinæ* in the blood of fowls and its connection with the tick fever disease. Quite recently again, for further investigation, I sent two young fowls to Swan Hill to be placed in a situation where they might become tick infested and so infected with the specific micro-parasite. The result was positive in both cases and the fowls were returned to me for special examination. The average number of red corpuscles in a healthy fowl is 4,000,000 per cubic millimetre and the average amount of hæmoglobin 68 per cent. In the fowls that contracted tick fever, investigations disclosed that the number of corpuscles had sunk to 2,800,000 per cubic millimetre and the hæmoglobin to 44 per cent.



TICK FEVER ORGANISMS.

A.—Red blood cells showing piroplasmæ in them (intra-corpuscular forms).

B.—Piroplasmæ free in blood serum (extra-corpuscular forms).

Some years have elapsed since I identified the parasite (*Argas americanus*) when it first commenced to make its influence felt in Victoria, and the course of action that has been since followed to check its spread has proved eminently successful in confining it to the areas in which it was first discovered. A great deal of work has been done in the direction of securing its eradication from the poultry runs of the State, and it is hoped that when the Poultry Diseases Bill which has been drafted has been placed upon the statute-book, there will be provided ample power to take such action as will lead to the complete extirpation of the pest from Victoria.

TESTS WITH CULTURES OF ROOT-TUBERCLE BACTERIA.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in the Melbourne University.

Since the article on this subject was published in the January 1909 number of the *Journal*, a series of tests have been carried out at the Burnley Horticultural Gardens and at the University, with a view to investigating the practical utility of cultures of root tubercle bacteria, such as are sold under the names of "Nitragin," "Nitro-culture," &c.

The necessity for such tests is clearly shown by the remarkably divergent results obtained in different countries and in the same country by different investigators, as well as by the fact that recently pamphlets have been widely distributed in this State making various extravagant or untrue claims on behalf of these cultures. It is claimed, for instance, that the cultures benefit the growth of leguminous plants (peas, beans, lucerne, lupins, clover, &c.) on *all* soils, and that they may be directly used to improve the growth of cereals (barley, wheat, oats, &c.). The latter statement, in particular, is quite untrue. Cereals have no tubercles on their roots; they do not assimilate the free nitrogen of the air, and therefore cannot possibly be directly benefited by inoculation by root-tubercle bacteria. Any person led by such a statement to purchase bacterial cultures for inoculating a cereal crop, would have just cause for a legal action against the agent or company responsible for obtaining his money by false pretences. The point cannot be too strongly emphasized that even if the cultures of root-tubercle bacteria did all that was claimed for them, they could only be expected to benefit leguminous crops grown in soils in which root-tubercle bacteria are deficient or absent, and there are other and more efficient ways of adding bacteria to such soils than by the use of expensive and uncertain cultures.

It cannot be denied that, in the hands of various scientific experimenters at different research stations in Germany, the proper use of the cultures has enabled particular leguminous crops (lupins, peas, &c.) to grow well in soils where, owing to the deficiency of the appropriate root-nodule bacteria, growth was otherwise deficient or very poor. At the Tharand Experiment Station, the relative merits of commercial preparations of root-tubercle bacteria, such as Nitragin, Nitro-culture, &c., have been investigated. Experiments have been also conducted in Scotland. In some cases, the crops were apparently benefited, but in others their use appeared to be inimical to the crop instead of advantageous. This was possibly due to the experiments having been tried on land in which the requisite root-tubercle bacteria were already abundantly present, and to the fact that the treatment of the seeds before planting may in some cases weaken their germinative power; or it may have been due to insufficient attention being paid to the unavoidable fluctuations occurring in all field experiments.

The German results are, however, more uniformly favourable, possibly owing to the more judicious use of the cultures and the restriction of the experiments to soils where good results were likely to be obtained. Vogel, for instance, in the *Illustrierte Landwirthschaftlche Zeitung* for 1907, page 5, sums up generally in favour of the improved Hiltner cultures for practical use with the improved methods of inoculation. For instance, out of 62 tests of pure cultures for Serradella, 85 per cent. gave beneficial results, and good results are also reported from the use of pure cultures for lupins, peas, vetches and beans.

We may therefore conclude from European experiments that the *scientific* use of suitable cultures on a limited scale, will be beneficial in enabling legumes to grow in otherwise unsuitable soils, so far as European conditions are concerned, and presumably also in a few sterile Victorian soils. A point worthy of consideration is, however, as to how cultures made in Europe stand transport to Victoria and how long vitality is retained under the usual conditions of storage.

Ordinary bacterium cultures at suitable temperatures attain their maximum development in a few days. After that they are on the down grade, more and more dead forms being present in the culture, although if kept cool living forms may still be present, in many cases for years, in properly kept cultures without any renewals. No data appear to be available as to the exact length of time a "nitragin culture" or "nitro-culture" retains its efficacy. To determine this, experiments were necessary.

Sufficient evidence of the difficulties which hedge about this question is given by the results of Harding and Wilson (New York Experiment Station, Bulletin No. 300, page 137), who have experimented on the inoculation of lucerne on 67 farms in 33 counties of the State. Only one-third of these farms already contained the root-tubercle bacterium of lucerne in sufficient amount, and on the remaining two-thirds inoculation of the seeds with bacterial cultures failed to give satisfactory results. Complete success was, however, obtained by inoculating these fields with soil from old lucerne fields at the rate of 150 lbs. to 300 lbs. per acre. This is, of course, the natural method of inoculation, since as the old tubercles die the bacteria are set free and continue to live in the soil for some time, reinfecting each new crop of the same kind.

Some local investigation of the questions outlined above was evidently necessary, and also tests were advisable of the bacterial cultures which have been for some time on the market in Victoria, and have been extensively advertised by means of agents and printed circulars. The cultures were obtained in the usual way by purchase, one being guaranteed to contain bacteria for the inoculation of field peas, the other for the inoculation of alsike clover. The tests were carried out at the University and at the Burnley Gardens.

UNIVERSITY TESTS.

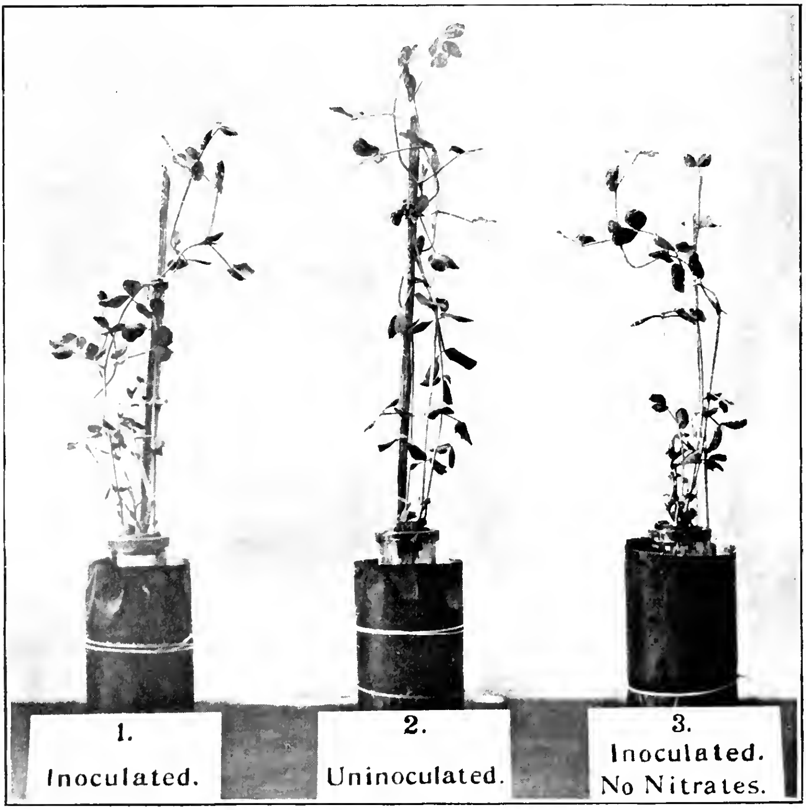
The cultures were tested in the first instance by using peas grown in sterilized artificial nutrient solutions, three peas being grown in each bottle. No. 1 was inoculated, No. 2 was uninoculated, and No. 3 was inoculated, but the nutrient solution contained no nitrates. The results are well shown in the accompanying photograph, the peas growing in the uninoculated culture solution being distinctly taller than in the other two, while in No. 3 (no nitrates) inoculation was quite unable to make good the deficiency caused by the absence of nitrates. On examining the roots of the plants grown in the culture solutions, it was seen that root nodules were entirely absent except from No. 1.

Before starting the experiments, the bottle and the nutrient solutions were thoroughly sterilized, and the peas were also sterilized* while dry by one minute's immersal in boiling water. Evidently, therefore, the culture solutions did actually contain root-tubercle bacteria capable of

* As regards root-tubercle bacteria.

infecting the roots of the pea, but they were either not very vigorous or not very numerous. The tubercles do not form so well under water as in soil, but this is mainly a question of aeration, and during the experiment, proper care was taken that this condition was fulfilled. It is curious that the only tubercles should have been formed in the solutions containing nitrates, for it is generally held that, in the soil, the abundant presence of nitrates tends to decrease the formation of root tubercles.

Although a single experiment is hardly conclusive, it is possible that nitrates do not influence the development of root-tubercle bacteria on roots grown in a culture solution in the same way that they do in the soil.

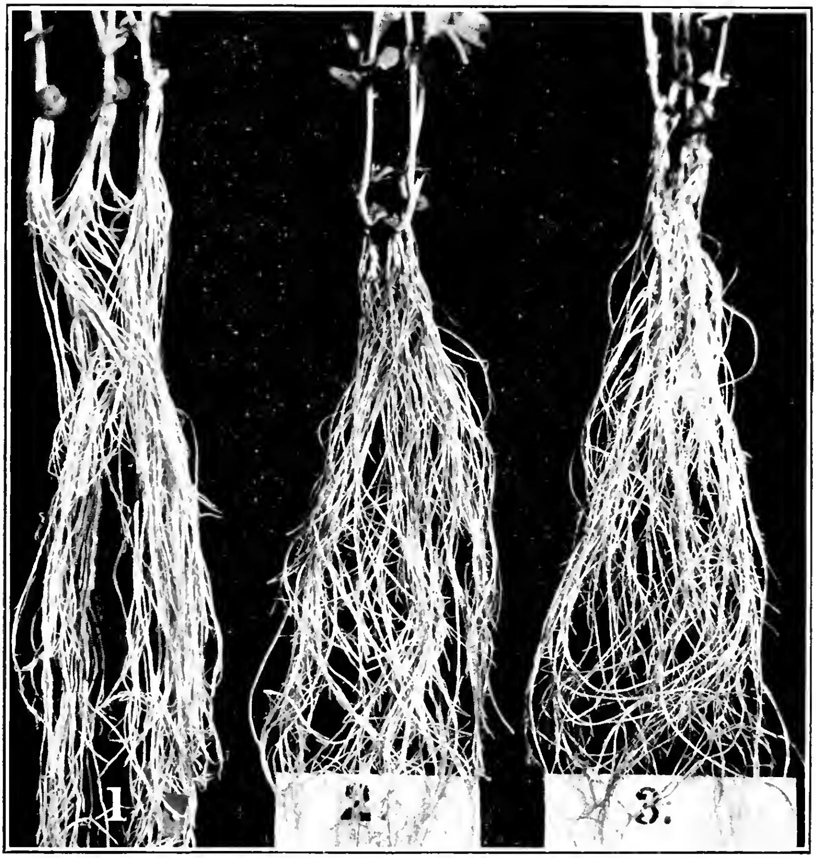


PEAS GROWN IN WATER CULTURE.

The actual size of the roots as grown in the different solutions is shown in the second illustration.

In addition to the culture experiments, six small plots were prepared, each 6 feet square, and laid out as in the plan on page 102. Care was taken to see that the soil and other conditions were quite uniform, and during the course of the experiments the plots were kept entirely free from weeds, and the soil open and pervious. The seeds were inoculated before planting, by mixing the cultures with sterilized skimmed milk and moistening the seeds with this mixture before planting. Care was taken to insure even planting, and in the case of the peas each plot contained the same number of plants. No replanting was necessary to fill up gaps, since both the peas and clover gave 100 per cent. germination. The experiments were begun on 13th May, and the seedlings were well above ground by 1st June. The plots were all surrounded by wire netting, and they were harvested about the middle of October, cut close to the ground, immediately placed in sacks and weighed on a special balance capable of weighing several hundredweight to a fraction of an ounce.

Although in large experiments done in the field the unavoidable error due to uncontrollable conditions may amount to as much as 10 or 20



ROOT SYSTEMS OF PEAS FROM WATER CULTURES.
1. Inoculated. 2. Uninoculated. 3. Inoculated No Nitrates.

per cent., even in good experiments, and in bad ones may be much greater, in small plots like the above where the conditions can be so thoroughly controlled, the limit of error may not be more than 2 to 5 per cent. Bearing this fact in mind, the plots show conclusively that inoculation did not benefit either the clover or peas in the slightest degree, but rather the reverse. In all the plots, tubercles were present on the roots, and they were as abundant in the uninoculated plot as in the inoculated one. The tubercles were possibly not quite so abundant in the plot to which nitrates were added, but, nevertheless, the yield in this plot was greater

EXPERIMENTAL PLOTS—UNIVERSITY.

Hybrid or Alsike Clover.

Inoculated. 13 lbs. 14 ozs.	Inoculated a week before planting. 14 lbs. 7 ozs.	Uninoculated. 14 lbs. 14 ozs.

Field or Dun Peas.

Inoculated 11 lbs. 6 ozs.	Inoculated + 2 cwt. KNO_3 per acre. 15 lbs. 15 ozs.	Uninoculated. 14 lbs. 14 ozs.

than in the other two. In the middle clover plot, the seeds before planting were mixed with soil which had been inoculated a week beforehand and allowed to dry. The difference between it and the other two plots is, however, less than 5 per cent., and is therefore hardly worth consideration.

Burnley Plots.

The plots were 18 by 35 feet, arranged in three rows of four, 2 feet apart in one direction, and 18 inches in the other. Half the plots were lime-dressed at the rate of approximately two tons per acre. The seeds were planted in drills, one foot apart in the case of the dun peas, *Pisum arvense*, and 15 inches apart in the case of the alsike clover, *Trifolium hybridum*. As before, the seed were inoculated by mixing the appropriate culture with cold, boiled, skimmed milk, and wetting them thoroughly with the mixture. It was found necessary to mix the clover seeds with three parts of dry sand so as to permit of even sowing on a large scale. Otherwise, the moist seeds adhered together and rendered even planting impossible. The peas were planted on 27th April, and harvested on 21st October while in full flower, as in the case of the University plots. The clover was planted on 5th May and harvested on 29th November, when the plants, though still small, were well on in flowering.

EXPERIMENTAL PLOTS—BURNLEY HORTICULTURAL GARDENS.

A. Peas.	**B.** Clover and Lime Dressing.	**C.** Clover.	**D.** Peas and Lime Dressing.
Inoculated. 324 lbs. 11 ozs.	Sterilized inocu'ation. 57 lbs. 9 ozs.	Uninoculated. 59 lbs. 7 ozs.	Inoculated. 298 lbs. 15 ozs.
Uninoculated. 199 lbs. 11 ozs.	Inoculated 29 lbs. 10 ozs.	Sterilized inoculation. 31 lbs. 3 ozs.	Uninoculated. 242 lbs. 6 ozs.
Sterilized inoculation. 257 lbs. 8 ozs.	Uninoculated. 41 lbs. 5 ozs.	Inoculated. 53 lbs. 11 ozs.	Sterilized inoculation. 306 lbs. 11 ozs.

Note.—In the middle row of plots, under equal conditions of drainage the yields are estimated as 290, 49, 46, and 302 lbs. respectively.

The central line of plots, and more especially the clover plots, suffered through the lack of drainage during the very wet winter season, and the plots were unfortunately not weeded as evenly and simultaneously as they might have been, which is of considerable importance in maintaining uniform conditions. In regard to the previous history of the plot, no legumes had been grown in the ground for years, but only roots and fodder crops.

Last season, however, some manure tests had been made, including some complete sets. No organic nitrogen, however, had been applied except to section D. This fact was not known at the time the experiments were begun, and it is responsible for a certain amount of fluctuation in the results from the different plots. To some extent, however, the discrepancies are removed by the fact that each experiment was done in duplicate, and that we may take a sterilized inoculation, where the culture had been boiled for one hour before the seeds were moistened, as being practically the same as not inoculating at all. On this basis, the inoculated plots of peas averaged 312 lbs., the uninoculated, 252 lbs., that is a difference within a 20 per cent. limit of error. As a matter of fact, the apparent slight benefit derived by the inoculated plots, is due to the partial failure owing to climatic conditions of the central line of plots.

Thus the bottom plot at D gave a greater yield than the inoculated one, and if the comparison is made between the inoculated plots and those where the culture was sterilized, the results agree within a 10 per cent. limit of error. In the same way, comparing the peas with and without lime, although the lime appeared to favour growth (780 lbs. without to 844 lbs., with lime) the difference is less than 10 per cent., and the biggest yield of all was given on one of the unlimed plots, 324 lbs.

In the case of clover, the smallest yield of all was given by one of the inoculated plots in the central row while the next highest was given by one of the inoculated on the outside row, and the highest of all by an uninoculated plot (59 lbs. 7 ozs.). The average for the inoculated plots was 41 lbs. 10 ozs., and for the sterilized inoculation plots 44 lbs. 6 ozs., which are agriculturally identical yields. This is because one of the inoculated plots was in the bad central row, and one in the good outside row, so equalizing the conditions, whereas with the peas, both the inoculated plots were on the outside.

The root systems of selected plants were lifted from all the plots and compared. The tubercles on the peas were especially abundant and large, those on the clovers were small, few in number, shrivelling and turning brown at the time the examination was made. No signs of any beneficial effects of inoculation upon the development of root-tubercles could be observed in any of the plots.

The net result of all these experiments is therefore to show—

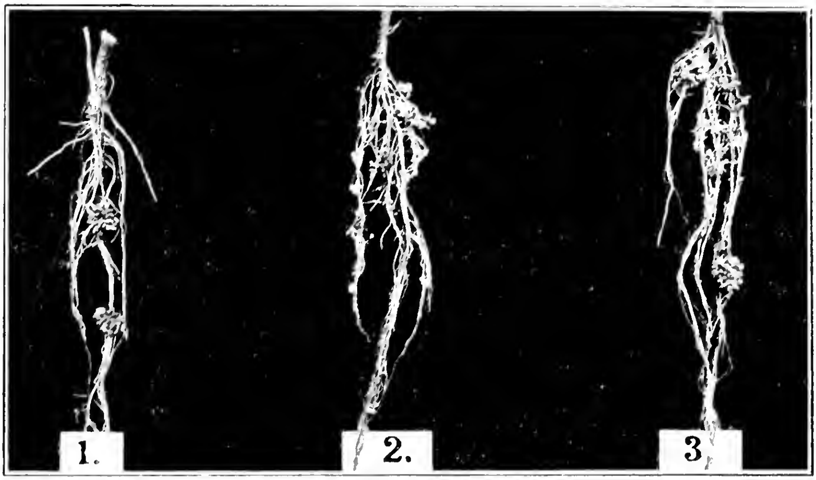
(*a*) Infection is possible in a water culture.

(*b*) Root-tubercle bacteria must be able to exist in the soil for at least ten years, for no legumes had grown in the University plot, and no manure had been added to it for at least that period of time.

(*c*) In soils containing these bacteria, even if they are not abundant, no appreciable benefit will be derived by inoculating the seed or soil with cultures of root-tubercle bacteria. The number of bacteria so added is trivial as compared with those already present in the soil.

(*d*) On the Burnley plots, the distribution of the water when in excess influenced the subsequent growth of the plants more than any other factor.

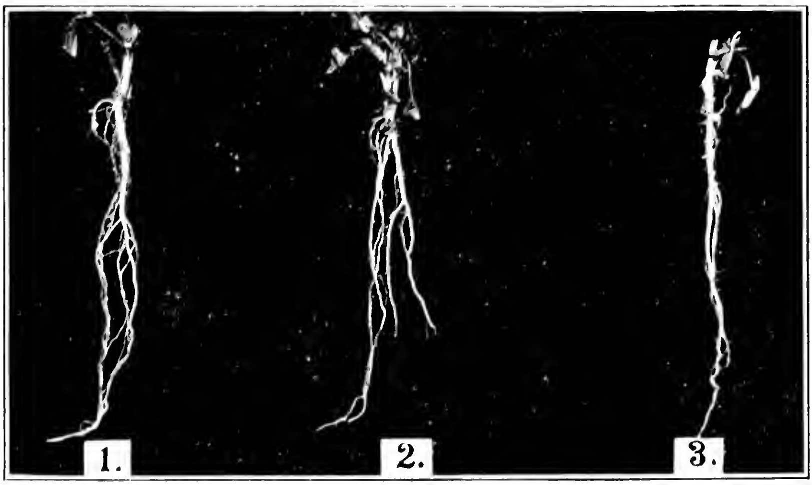
It is, therefore, only possible to recommend the attempt being made to add root tubercle bacteria to the soil, to a very limited extent, and only under certain very special conditions :—



ROOT SYSTEMS OF PEA PLANTS (SOIL CULTURE).
1. Inoculated. 2. Inoculated Nitrates. 3. Uninoculated.

(1) If the farmer finds it difficult or impossible to grow leguminous crops (peas, vetches, beans, lucerne, serradella, clover, trefoil, lupins, &c.) in what appears suitable soil.

(2) If the failure is not due to insufficient drainage, the need of lime or a deficiency of phosphates or potash or water.



ROOT SYSTEMS OF CLOVER PLANTS (SOIL CULTURE).
1. Inoculated. 2. Inoculated. 3. Uninoculated.

(3) And if, on examination, the plants which succeed are stunted and with few or no root tubercles.

Then the farmer may conclude that the failure of the leguminous crop is due to the absence of the appropriate root tubercle bacteria from the soil. The deficiency may be made good in several ways according to circumstances.

1. If an old field is close at hand in which the same leguminous crop has succeeded, inoculate the new soil with 130-300 lbs. of soil per acre from the old one, spreading broadcast and harrowing in with the seed, or, prior to drilling if the drill is used.

2. On a small scale soil may be inoculated by planting with living legumes of the same kind, transplanted with as complete a root system as possible.

3. On a larger scale, if plants are procurable, the root-tubercles may be stripped off, pounded to a thin paste with water, which is then mixed with the seeds before planting. The addition of a little milk aids the germs to adhere to the seeds, which should be dried and planted at once.

4. Nitragin or nitro-culture may be used in the same way for the inoculation of the seed, always provided that the cultures are good ones, and suitable for the particular crop. This is the most expensive and least sure method of infecting a sterile soil. To inoculate the soil directly with bacteria from cultures or from the tubercles is both wasteful and costly, no appreciable effects being produced unless relatively large quantities are used. Hence, there is no need for a large outlay for cultures, even when there is no other means of obtaining the required root tubercle bacteria. But any farmer desirous of maintaining the humus and nitrogen content of his land by the growth of leguminous crops which he has not been able to establish by other means, will incur no great risk by experimenting in the directions indicated, and if he cares to expend a few shillings in experimenting with a bottle of culture no great harm will be done. As matters stand at present, however, and in view of all the facts, it is impossible to advise any *large* expenditure on cultures for use on an extended scale. In any case, even if the cultures fulfilled all that is claimed for them, the farmer would probably always find it more profitable to use them on small plots on which the required legumes are grown, then infecting large fields by spreading the soil from the plots in the following year or years.

Finally, it is doubtful whether any well-drained land on which stock have been grazed, or to which farm-yard manure has been added, is ever totally devoid of the root-tubercle bacteria which the *Leguminosæ* need to enable them to form the root tubercles, by whose aid they can assimilate free nitrogen. There can be no doubt that the bacteria from the tubercles of one member of the pea family may infect others though possibly not all of the members of the same family, but so far as is known, only members of that family (peas, beans, vetches, clover, lucerne, medick, sainfoin, trefoil, &c.) are enabled by bacteria to directly assimilate the free nitrogen of the air. Hence, to advertise bacterial cultures as of direct benefit to *cereals* is not justifiable, and even their use for leguminous crops is hardly beyond the experimental stage, and is not to be advised until every other method of establishing a leguminous crop on sterile soil has failed, including manuring and cultivation. For fertile soils on which legumes have previously grown, the cultures are quite useless.

According to E. B. Fred (Virginia Station Report, 1908, pp. 132-134) root-nodule bacteria are able to assimilate free nitrogen even when not growing within the roots of a leguminous plant. They can only do this, however, when the culture medium contains carbo-hydrates, so that in the soil their nitrogen-fixing activity when free is slight or negligible. Actual tests have shown that, in the absence of leguminous plants, the net result of the activity of micro-organisms in well-aerated and cultivated soils is to produce a loss, rather than a gain, of nitrogen, and this loss is especially marked after the addition of organic nitrogenous manures to the soil.

BUILDING HINTS FOR SETTLERS.

VII.—PORTABLE TRAMWAYS FOR FARM WORK.

R. T. Archer, Dairy Expert.

The value of the silo as a means of conserving fodder in the most suitable succulent condition for feeding to cows for the production of milk is becoming more and more recognised. Maize has been proved to be the most suitable of all crops to grow for the purpose of filling the silo. Owing to its solid stems it packs closely, minimizing the amount of air space and thereby reducing to a minimum the loss through combustion of sugar, &c. On many of our rich flats, a very large weight of fodder per acre can be produced at the lowest cost for cultivation.

TRAM TRACK, MESSRS. HALFORD BROS.' FARM, KONGWAK.

But, through rain, these same rich flats sometimes become so soft, when the crops are ready for harvesting, that to cart the stuff off in the usual way is to convert the land into a quagmire and make the harvesting a very expensive item. These conditions presented themselves to some of the farmers in South Gippsland last season, notably Messrs. Halford Bros. and Mr. W. J. Williams, on whose farms abundant crops of maize and tick beans were grown and could not be got off before the heavy autumn rains softened the ground to such an extent as to make it almost impracticable for wheel traffic.

To avoid the almost total loss of the crops a system of portable tramways was tried with highly satisfactory results. By this means one horse was able to haul in 2 tons at a time; in one instance, one horse carted in 70 tons and the only feed it required was the maize it picked up on the way. The tramway is made entirely of wood. The sleepers, 6 ins. x 4 ins., are 3 ft. 2 ins. in length and are split out of rough logs. A groove is cut in the sleepers into which the rails of 4 in. x 2 in. sawn hardwood are fixed. The rails, which are secured by wedges, are 2 ft. 6 in. apart. To make the track stronger the joints are broken, that is, the joints of the rails on one side do not fall on the same sleeper as the joints of the rails on the other side. Lighter rails may be used for the

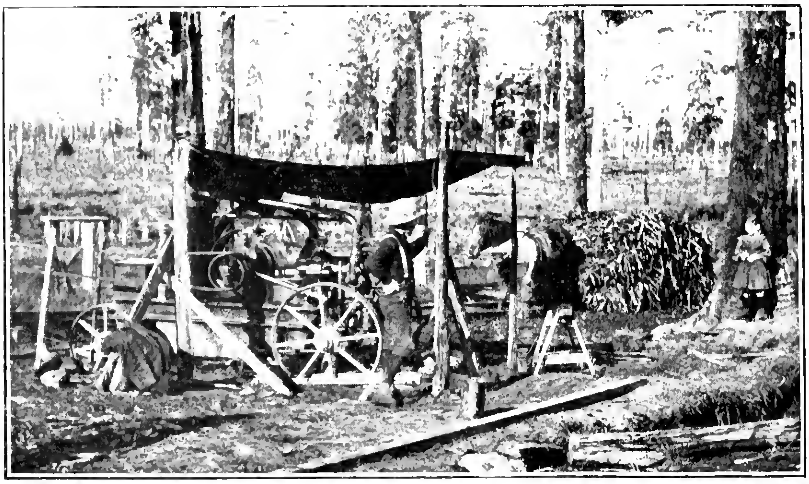
LOADING TRUCK WITH MAIZE.

portable portion of the track in the paddock so that it can be moved up to the crop as it is taken out in a face; that portion from the paddock to the silo could be of a heavier and more permanent nature. The truck used is 8 ft. long by 5 ft. 6 in. wide.

ON THE WAY TO THE SILO.

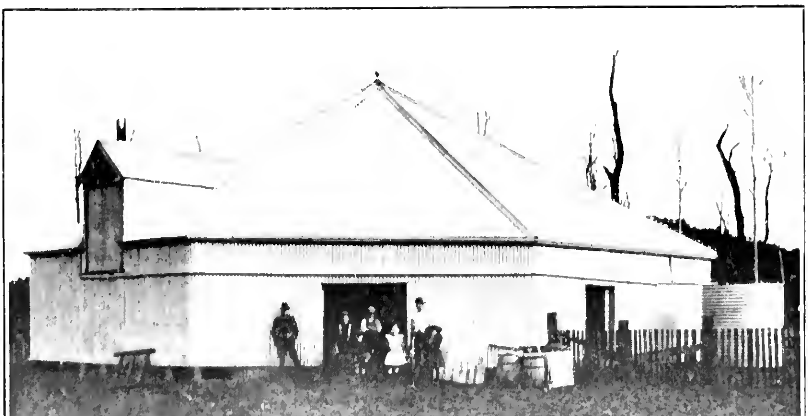
These tramways can also be utilized for many other branches of farm work. Similar ones are in operation at Mildura in connexion with the harvesting of fruit, but the track is of metal and more costly than those under review.

From the illustrations it will be seen that a somewhat unique plan has been adopted in the construction of the buildings on Messrs. Halford Bros.' farm. The silo, which has a capacity of about 100 tons and of



OIL ENGINE AND LOADED TRUCK.

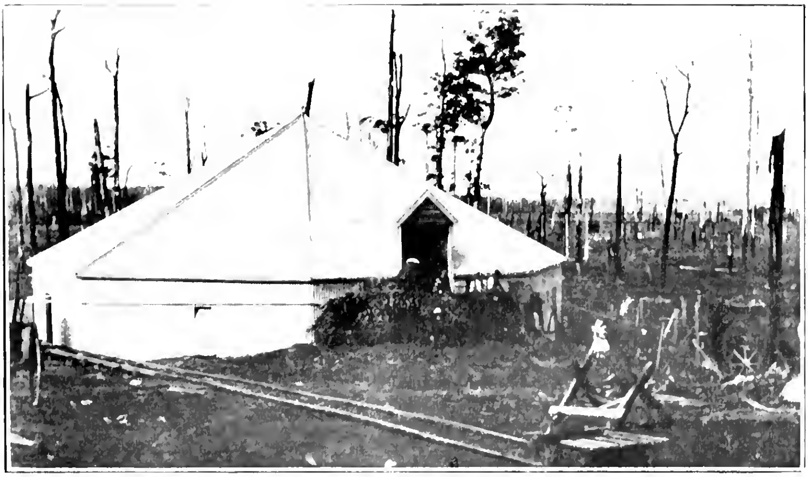
the type recommended by the Department of Agriculture, is placed in the centre of the milking shed. The latter is octagonal in shape and the cows stand facing the silo in the centre. About 5 feet of the silo is below



MILKING SHED AND SILO, MESSRS. HALFORD BROS.' FARM.

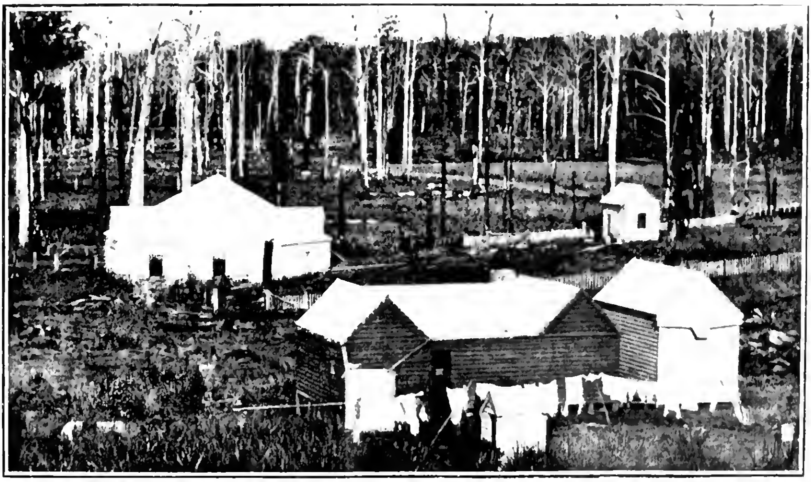
(The silo is in the centre of the building.)

the surface and the balance above. There is a gangway 6 ft. 6 ins. wide (including feeding trough) between the bails and the silo. The width of the bails at the head is 30 ins., and at the back 57 ins., the depth of the bails being 7 ft. with a 12-in. gutter and a 4-ft. path between it and the outside wall. The wall is on blocks 9 ins. to 18 ins. above the pavement, thereby allowing for ventilation. A loft with softwood floor runs



FILLING THE SILO.

all round the silo and above the milking shed. It will be seen that this plan provides for considerable economy of space as well as for convenient feeding arrangements. The bails accommodate over sixty cows.



GENERAL VIEW OF FARM BUILDINGS, MESSRS. HALFORD BROS.' FARM.

Men's quarters in foreground and dairy to right.
Flats where maize crop is grown in distance.

THE ARTIFICIAL MANURES ACTS.

Unit Values for 1910.

P. R. Scott, Acting Government Analyst and Chemist for Agriculture.

The requirements of the Victorian Artificial Manures Acts are as follow in regard to the analysis of samples of manures submitted each year:—

> "In the case of manures which are not liable to vary in quality during the current season every vendor of or dealer in manures, who is required by the Minister so to do and manufacturer or importer of manures shall every year in the month of October or November and also whenever required by the Minister so to do deliver to the said chemist without payment samples not exceeding two pounds in weight of the manures which he intends to offer for sale or which he will use in making any special mixture required and which are not liable to vary in quality during the current season."

> "The said vendor manufacturer importer or dealer shall forward with such samples a statutory declaration in such form as may be prescribed to the effect that the samples delivered are correct samples of all the manures to which this section applies which he will offer for sale or sell during the current season and declaring the prices at which he will either himself or through his agents sell such manures to persons who require the same for purposes of cultivation but he may vary any such price after giving notice of such variation to the said chemist."

> "The said chemist shall analyze or cause to be analyzed under his supervision all samples forwarded to him pursuant to this Act by vendors manufacturers or importers of or dealers in manures. and taking into account the constituents which have a commercial value in each sample, shall calculate from the results of the analysis the average unit value of such constituents, and shall then compile a complete list of all the manures offered for sale showing the prices asked for the same and showing also their value according to the average unit values as calculated from the analyses."

> "Such average unit values shall constitute the basis for calculating the values of all manures for twelve months from the publication of such list pursuant to the provisions of the Artificial Manures Acts."

The samples of manures forwarded to the Chemist for Agriculture for analysis and valuation for the 1910 season numbered 103. and the analyses of the whole of the samples, their selling price, and their calculated values are shown in the tabulated list on the following pages:—

UNIT VALUES OF MANURES IN THE MELBOURNE MARKET FOR THE 1910 SEASON.

	s.	d.
1 per cent. of nitrogen in the form of nitrate	17	6
1 per cent. of nitrogen in the form of sulphate of ammonia ...	14	6
1 per cent. of nitrogen in the form of blood manure, bonedust, or bone fertilizer	12	0
1 per cent. of water soluble phosphoric acid	4	6
1 per cent. of citrate soluble phosphoric acid	4	0

	s.	d.
1 per cent. of insoluble phosphoric acid	2	9
1 per cent. of phosphoric acid in fine bone (in bonedust or bonemeal)	4	0
1 per cent. of phosphoric acid in coarse bone (in bonedust or bonemeal)	2	9
1 per cent. of potash as sulphate	5	4
1 per cent. of potash as chloride	4	5

METHOD OF CALCULATING THE COMMERCIAL VALUE OF A MANURE.

The average commercial value per ton of a manure sold in Victoria is obtained by multiplying the percentages stated of the fertilizing sul stances by the corresponding unit values fixed therefor, and adding the separate values together. Examples:—

1. *Sulphate of Ammonia*—

Invoice certificate, 20.5 per cent. nitrogen—

Calculation—

	£	s.	d.
20.5 x 14/6	£14	17	3
Calculated value per ton	£14	17	3

2. *Superphosphate*—

Invoice certificate, 17.46 per cent. phosphoric acid (water soluble)

Invoice certificate, 1.16 per cent. phosphoric acid (citrate soluble)

Invoice certificate, 1.00 per cent. phosphoric acid (insoluble)

Calculation—

	£	s.	d.
Phosphoric acid (water soluble) 17.46 x 4/6 ...	£3	18	7
Phosphoric acid (citrate soluble) 1.16 x 4/ ...	0	4	8
Phosphoric acid (insoluble) 1.00 x 2/9 ...	0	2	9
Calculated value per ton	£4	6	0

3. *Bonedust*—

Invoice certificate, 3 per cent. nitrogen, 18.5 per cent. phosphoric acid.

Mechanical Condition: 30 per cent. fine, 70 per cent. coarse.

Calculation—

	£	s.	d.
Nitrogen 3 x 12/	£1	16	0
Phosphoric acid—			
Fine $\frac{18.5 \times 30}{100}$ = 5.55 x 4/	1	2	2
Coarse $\frac{18.5 \times 70}{100}$ = 12.95 x 2/9 ..	1	15	7
Calculated value per ton	£4	13	9

The unit value system enables a farmer to readily ascertain if the price asked for a manure is its reasonable commercial value. The term "commercial value" must not be confused with the "agricultural value" of a manure. The commercial value represents the value of a manure according to its composition, while the agricultural value is measured by the extent of the increase in quantity and quality produced by it in a particular soil under certain conditions. The agricultural value is liable to great variation, for instance, while most soils may respond to an application of ordinary superphosphate practically no benefit may be obtained on others. The same effect is noticeable with regard to other fertilizers. As a general rule, however, the application of a phosphatic manure is more or less effective on all soils, due, in a great measure, to a deficiency in the average soil of phosphoric acid. No attempt can therefore be made to place an agricultural value on any of the fertilizers submitted, further than to state that they all contain certain elements necessary for plant life. Some soils require, perhaps, only one of these elements, while others require more. Some soils contain the elements in a more soluble or available state than others. Fertilizers containing the plant foods in an insoluble or unavailable form are, of course, slow in action, and should not be used with quick-growing crops.

Section 3 of the Artificial Manures Act 1905 prescribes that the Unit Values shall be fixed from the constituents having a commercial value in each sample, and this has been done accordingly.

No rule can be laid down as a guide to farmers as to which fertilizer is most suitable for any particular soil. It should, however, be remembered that as there is no danger of the loss of phosphoric acid by leaching from the soil, it is advisable to buy that ingredient in its soluble or readily available form. Phosphoric acid appears in three forms—water soluble, citrate soluble, and insoluble. The first two forms are known to be readily available as plant foods, while the insoluble is slow in acting, and one would not expect satisfactory results from this form of phosphoric acid if used for a quick-growing crop.

A special feature of the Victorian Artificial Manures Acts is the requirement of a label or tag attached to the bags declaring the guaranteed composition by analysis of any manure sold in the State in quantities exceeding 56 lbs. at one sale. This is provided by section 7 of the principal Act, and, as a further measure of protection to farmers, it is made compulsory, under section 5, for vendors to deliver to all purchasers of manures, an invoice certificate declaring the guaranteed analysis of the manure sold. No farmer in Victoria should take delivery of manure unless the above conditions of sale are complied with. Substantial assistance would be rendered in the enforcement of the Act if farmers would immediately report any irregularity observed in the sale of manures to the Chemist for Agriculture. Additional control of the sale of manures has been provided by the amended Act of 10th October, 1905. Under section 4, sub-section 1, officers of the Chemist's Branch may collect samples of manures throughout the State. The results of the analysis as to the percentage for fertilizing constituents found in a manure, and the percentage claimed by the guarantee on tag and invoice certificate, are published side by side along with the calculated value. These analyses are published in the *Journal of the Department of Agriculture* from time to time, and should be read by all users of manures.

It is necessary in order to carry out the Act, for the Chemist to occasionally require purchasers of manures to forward copies of the invoice certificates supplied to them for his inspection. It has frequently been found that purchasers do not retain the invoice certificates in their possession. Every purchaser of manure is required by section 24 of the Act to keep any invoice certificate supplied by the vendor of manure, for failure to produce the invoice certificate when required to do so by the Chemist for Agriculture, renders purchasers of manures liable to a penalty not exceeding £1 for the first offence, and not exceeding £5 for any subsequent offence.

Artificial Manures Acts.

LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING 1910 SEASON.

Description of Manure.	Moisture. Per-cent-age.	Nitrogen. Per-cent-age.	Nitrogen. Estimated Value in One ton of the Manure. £ s. d.	Phosphoric Acid. Per-cent-age.	Phosphoric Acid. Estimated Value in One ton of the Manure. £ s. d.	Potash. Per-cent-age.	Potash. Estimated Value in One ton of the Manure. £ s. d.	Estimated Value of the Manure per ton. £ s. d.	Price asked for the Manure per ton delivered at the Local Railway Station. £ s. d.	Where Obtainable.
Mainly Nitrogenous.										
Sulphate of Ammonia	..	20.50	14 17 3	..	..	..	..	14 17 3	15 0 0	Aust. Explosives and Chemical Co., Melbourne
" "	..	20.56	14 18 2	..	..	..	..	14 18 2	15 0 0	Cuming, Smith, and Co., Melbourne
" "	..	20.67	14 19 9	..	..	..	..	14 19 9	15 0 0	Mt. Lyell M. and R. Co., Melbourne
" "	..	20.60	14 18 8	..	..	..	..	14 18 8	14 2 6	Metropolitan Gas Co., Melbourne
" "	..	20.51	14 17 5	..	..	..	..	14 17 5	15 0 0	Wischer and Co., Melbourne
Nitrate of Soda	..	15.45	13 10 4	..	..	..	..	13 10 4	13 10 0	Aust. Explosives and Chemical Co., Melbourne
" "	..	15.42	13 9 10	..	..	..	..	13 9 10	13 10 0	Wischer and Co., Melbourne
" "	..	15.40	13 9 6	..	..	..	..	13 9 6	13 10 0	Cuming, Smith, and Co., Melbourne
" "	..	15.32	13 8 1	..	..	..	..	13 8 1	13 10 0	Mt. Lyell M. and R. Co., Melbourne
Nitrate of Lime	..	12.85	11 4 10	..	..	..	..	11 4 10	10 0 0	A. T. Schreuder, Flinders-street, Melbourne
Blood Manure	12.90	12.57	7 10 10	0.85	0 2 4	0.40	0 2 1	7 15 3	7 10 0	W. Angliss and Co., Footscray
" Newport	13.23	11.65	6 19 10	2.18	0 6 0	0.19	0 1 0	7 6 10	7 0 0	J. Cooke and Co., Melbourne
"	12.97	10.84	6 10 1	0.43	0 1 2	0.10	0 0 6	6 11 9	6 0 0	Cuming, Smith, and Co., Melbourne
"	16.45	10.97	6 11 8	1.18	0 3 3	0.12	0 0 8	6 15 7	6 10 0	N. Dale, Bentleigh
"	13.28	10.73	6 8 9	0.90	0 2 6	0.08	0 0 5	6 11 8	8 16 0	Mt. Lyell M. and R. Co., Melbourne
"	22.16	8.21	4 18 7	1.55	0 4 3	0.36	0 2 0	5 4 10	6 0 0	Wischer and Co., Melbourne
Mainly Potassic.										
Kainit	..	..	..	..	..	13.30	3 10 11	3 10 11	4 17 6	Cuming, Smith, and Co., Melbourne
"	..	..	..	..	..	13.35	3 11 2	3 11 2	4 17 6	Mt. Lyell M. and R. Co., Melbourne
"	..	..	..	..	..	13.30	3 10 11	3 10 11	4 17 6	Wischer and Co., Melbourne
Potash Chloride (Muriate)	..	..	..	..	..	61.96	13 13 8	13 13 8	13 12 6	Aust. Explosives and Chemical Co., Melbourne
" "	..	..	..	..	..	62.06	13 14 1	13 14 1	13 12 6	Cuming, Smith, and Co., Melbourne
" "	..	..	..	..	..	62.09	13 14 3	13 14 3	13 12 6	Mt. Lyell M. and R. Co., Melbourne
" "	..	..	..	..	..	61.21	13 10 4	13 10 4	13 12 6	Wischer and Co., Melbourne
Potash Nitrate	..	13.27	11 12 3	..	..	46.41	10 5 0	21 17 3	20 0 0	Cuming, Smith, and Co., Melbourne
"	..	13.40	11 14 6	..	..	46.56	10 5 8	22 0 2	20 0 0	Mt. Lyell M. and R. Co., Melbourne
Potash Sulphate	..	..	..	..	..	52.02	13 17 5	13 17 5	13 17 6	Aust. Explosives and Chemical Co., Melbourne
"	..	..	..	..	..	52.04	13 17 6	13 17 6	13 17 6	Cuming, Smith, and Co., Melbourne
"	..	..	..	..	..	52.02	13 17 5	13 17 5	13 17 6	Mt. Lyell M. and R. Co., Melbourne
"	..	..	..	..	..	52.02	13 17 5	13 17 5	13 17 6	Wischer and Co., Melbourne

List of Unit Values of Manures in the Melbourne Market during 1910 Season—*continued*.

Description of Manure.	Moisture. Per-cent-age.	Nitrogen. Per-cent-age.	Nitrogen. Estimated Value in One ton of the Manure. £ s. d.	Phosphoric Acid. Water Soluble. Per-cent-age.	Phosphoric Acid. Water Soluble. Estimated Value in One ton of the Manure. £ s. d.	Phosphoric Acid. Citrate Soluble. Per-cent-age.	Phosphoric Acid. Citrate Soluble. Estimated Value in One ton of the Manure. £ s. d.	Phosphoric Acid. Insoluble. Per-cent-age.	Phosphoric Acid. Insoluble. Estimated Value in One ton of the Manure. £ s. d.	Phosphoric Acid. Total. Per-cent-age.	Phosphoric Acid. Total. Estimated Value in One ton of the Manure. £ s. d.	Potash. Per-cent-age.	Potash. Estimated Value in One ton of the Manure. £ s. d.	Estimated Total Value of the Manure per ton. £ s. d.	Price asked for the Manure per ton delivered at Local Railway Station. £ s. d.	Where Obtainable.
Mainly Phosphoric. Phosphoric Acid readily Soluble.																
Superphosphate, Ordinary	5.90	..	..	17.35	3 18 1	1.25	0 5 0	1.80	0 4 11	20.40	4 8 0	..	..	4 8 0	4 7 6	Aust. Explosives and Chemical Co., Melbourne
,,	7.33	..	..	16.00	3 12 0	1.90	0 7 7	2.70	0 7 5	20.60	4 7 0	..	..	4 7 0	4 10 0	J. Cockbill, P.O.-place, Melbourne
,, Florida	4.29	..	..	17.46	3 18 7	1.16	0 4 8	1.91	0 5 3	20.53	4 8 6	..	..	4 8 6	4 7 6	Cuming, Smith, and Co., Melbourne
,, Alberts, Concentrated	12.50	..	..	38.02	8 11 1	5.20	1 0 10	0.60	0 1 8	43.82	9 13 7	..	..	9 13 7	12 10 0	,, ,, ,,
,, Hasell's	10.05	..	..	18.80	4 4 7	1.25	0 5 0	..	..	20.05	4 9 7	..	..	4 9 7	4 6 0	A. H. Hasell, Melbourne
,,	4.86	..	..	17.50	3 18 9	1.13	0 4 6	1.83	0 5 0	20.46	4 8 3	..	..	4 8 3	4 7 6	J. Kitchen and Sons, Melbourne
,, No. 1	5.05	..	..	17.45	3 18 6	1.12	0 4 6	1.90	0 5 3	20.47	4 8 3	..	..	4 8 3	4 7 6	Mt. Lyell M. and R. Co., Melbourne
,, Concentrated	12.50	..	..	37.96	8 10 10	5.32	1 1 3	0.50	0 1 5	43.78	9 13 6	..	..	9 13 6	12 10 0	,, ,, ,,
,,	6.69	..	..	16.50	3 14 3	1.60	0 6 5	..	..	18.10	4 0 10	..	..	4 0 10	4 7 6	P. Rohs, Bendigo
,,	5.37	..	..	17.40	3 18 4	1.16	0 4 8	1.89	0 5 2	20.45	4 8 2	..	..	4 8 4	4 7 6	Wischer and Co., Melbourne
,, Concentrated	12.50	..	..	38.02	8 11 1	5.11	1 0 5	0.65	0 1 9	43.78	9 13 3	..	..	9 13 3	12 10 0	,, ,, ,,
Containing Nitrogen also.																
Nitro Superphosphate ..	4.71	1.45	0 17 5	8.05	1 16 3	7.20	1 8 10	5.05	0 13 11	20.30	3 19 0	..	..	4 16 5	5 10 0	F. and S. Bugg, Kyneton
Dissolved Bones Superphosphate	6.17	0.98	0 11 9	9.06	2 0 9	3.49	0 14 0	6.95	0 19 1	19.50	3 13 10	..	..	4 5 7	5 0 0	Cuming, Smith, and Co., Melbourne
Bonedust and Superphosphate	8.65	1.99	1 3 10	7.75	1 14 10	2.97	0 11 10	4.13	0 11 4	14.85	2 18 0	..	..	4 1 10	5 5 0	J. A. Dundas, Footscray
,, ,,	6.02	1.75	1 1 0	7.96	1 15 10	4.53	0 18 2	7.07	0 19 5	19.56	3 13 5	..	..	4 14 5	5 15 0	J. R. Elsworth, Ballarat
,, ,,	2.65	1.54	0 18 6	10.08	2 5 4	1.78	0 7 2	9.46	1 6 0	21.32	3 18 6	..	..	4 17 0	5 5 0	A. H. Hasell, Melbourne

Nitro Superphosphate ..	4.20	1.79	1 1 6	14.13	3 3 7	0.94	0 3 9	2.03	0 5 7	17.10	3 12 11	..	..	4 14 5	5 0 0	A. H. Hasell, Melbourne,
,, ,, ..	11.46	1.78	1 1 4	15.15	3 8 2	2.52	0 10 1	2.43	0 6 8	20.10	4 4 11	..	..	5 6 3	5 0 0	J. Kitchen and Sons, Melbourne
Dissolved Bones ..	5.86	1.00	0 12 0	9.04	2 0 8	3.46	0 13 10	6.90	0 19 0	19.40	3 13 6	..	..	4 5 6	5 0 0	Mt. Lyell M. and R. Co., Melbourne
Bonedust and Superphosphate	2.90	2.50	1 10 0	6.36	1 8 8	4.39	0 17 7	9.75	1 6 10	20.50	3 13 1	..	..	5 3 1	5 10 0	P. Rohs, Bendigo
Ohlendorff's Dissolved Peruvian Guano	5.63	5.71	4 2 0	9.75	2 3 10	2.32	0 9 3	0.96	0 2 8	13.03	2 15 9	2.60	0 13 10	7 11 7	13 5 0	Gibbs, Bright, and Co., Melbourne
Phosphoric Acid moderately Soluble.																
Thomas Phosphate ..	..	..	..	..	..	15.68	3 2 9	1.95	0 5 4	17.63	3 8 1	..	..	3 8 1	4 5 0	Wischer and Co., Melbourne
,, "Star"	..	..	..	..	..	15.65	3 2 7	2.00	0 5 6	17.65	3 8 1	..	..	3 8 1	4 5 0	Mt. Lyell M. and R. Co., Melbourne
,, ..	..	..	..	..	..	15.65	3 2 7	1.94	0 5 4	17.59	3 7 11	..	..	3 7 11	4 5 0	Aust. Explosives and Chemical Co., Melbourne
,, ..	..	..	..	..	..	15.70	3 2 10	1.82	0 5 0	17.52	3 7 10	..	..	3 7 10	4 5 0	Cuming, Smith, and Co., Melbourne
Phosphoric Acid difficultly Soluble.																
Guano, 50 per cent. ..	1.18	..	..	..	..	0.32	0 1 3	22.18	3 1 0	22.50	3 2 3	..	..	3 2 3	3 10 0	Cuming, Smith, and Co. Melbourne
,, 80 ,, ..	2.13	..	..	..	..	1.04	0 4 2	35.62	4 18 0	36.66	5 2 2	..	..	5 2 2	5 0 0	,, ,, ,,
,, 50 ,, ..	1.20	..	..	..	..	0.32	0 1 3	21.98	3 0 5	22.30	3 1 8	..	..	3 1 8	3 10 0	Mt. Lyell M. and R. Co., Melbourne
,, 80 ,, ..	2.50	..	..	..	..	1.04	0 4 2	35.59	4 17 10	36.63	5 2 0	..	..	5 2 0	5 0 0	,, ,, ,,
Guano	0.30	..	..	..	..	..	..	27.80	3 16 5	27.80	3 16 5	..	..	3 16 5	3 15 0	A. H. Hasell, Melbourne
,, ...	4.46	..	..	..	..	11.94	2 7 9	6.84	0 18 9	18.78	3 6 6	..	..	3 6 6	3 10 0	W. Holden, St. Leonards
Whale Refuse ..	7.75	7.03	4 4 4	..	..	..	..	12.06	1 13 2	12.06	1 13 2	0.45	0 2 5	5 19 11	8 10 0	A. T. Schreuder, 383 Flinders-street, Melbourne
Phospho Guano ..	6.08	..	..	..	..	8.01	1 12 0	7.35	1 0 2	15.36	2 12 2	..	..	2 12 2	2 15 0	J. Sinclair, Portarlington

LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING 1910 SEASON—*continued.*

Description of Manure.	Moisture. Per-cent-age.	Nitrogen. Per-cent-age.	Nitrogen. Estimated Value in One ton of the Manure.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Insoluble.	Phosphoric Acid. Total.	Phosphoric Acid. Estimated Value in One ton of the Manure.	Potash. Per-cent-age.	Potash. Estimated Value in One ton of the Manure.	Mechanical Condition. Per-cent-age of Fine Bone.	Mechanical Condition. Per-cent-age of Coarse Bone.	Mechanical Condition. Nitrogen. Per-cent-age of Fine Bone.	Mechanical Condition. Nitrogen. Per-cent-age of Coarse Bone.	Mechanical Condition. Phosphoric Acid. Per-cent-age of Fine Bone.	Mechanical Condition. Phosphoric Acid. Per-cent-age of Coarse Bone.	Estimated Total Value of Manure per ton.	Price asked for Manure per ton, delivered at Local Railway Station.	Where Obtainable.
			£ s. d.					£ s. d.		£ s. d.							£ s. d.	£ s. d.	
Containing Phosphoric Acid and Nitrogen. Phosphoric Acid difficultly soluble.																			
Bonedust ..	4.09	2.25	1 7 0	..	..	..	24.55	4 4 0	..	..	54.10	45.90	1.22	1.03	13.26	11.29	5 11 0	5 10 0	J. Adams, Dundas-street, Northcote
,, ..	4.97	3.40	2 0 9	..	..	..	23.10	3 17 1	..	..	47.70	52.30	1.62	1.78	10.98	12.11	5 17 10	5 5 0	J. W. Branch, Geelong
,, ..	4.76	3.90	2 6 10	..	..	..	22.97	4 1 10	..	..	65.00	35.00	2.54	1.36	14.94	8.03	6 8 8	5 15 0	Executors of T. Brown, Hamilton
,, ..	5.95	4.05	2 8 7	..	..	..	19.05	3 7 3	..	..	62.50	37.50	2.54	1.51	11.91	7.14	5 15 10	5 15 0	F. and S. Bugg, Kyneton
,, ..	8.12	4.13	2 9 7	..	..	..	18.73	3 6 3	..	..	62.70	37.30	2.60	1.53	11.79	6.94	5 15 10	5 10 0	J. Cockbill, Post-office place, Melbourne
,, Special ..	6.42	5.16	3 1 11	..	..	..	16.61	2 14 4	..	..	41.70	58.30	2.16	3.00	6.93	9.68	5 16 3	6 10 0	Cuming, Smith, and Co., Melbourne
Bonemeal ..	7.64	3.91	2 6 11	..	..	..	21.21	3 9 4	..	..	41.30	58.70	1.63	2.28	8.81	12.40	5 16 3	6 0 0	,, ,, ,,
Bonedust ..	7.00	5.72	3 8 7	..	..	..	14.37	2 0 8	..	..	6.40	93.60	0.37	5.35	0.92	13.45	5 9 3	5 5 0	N. Dale, Bentleigh
,, ..	8.53	3.20	1 18 5	..	..	..	17.05	3 0 7	..	..	66.20	33.80	2.12	1.08	11.26	5.79	4 19 0	5 10 0	J. A. Dundas, Footscray
,, ..	6.35	3.60	2 3 3	..	..	..	19.25	2 18 2	..	..	24.00	76.00	0.87	2.73	4.62	14.63	5 1 5	5 10 0	A. Day, Bendigo
,, ..	9.86	3.68	2 4 2	..	..	..	18.18	2 16 10	..	..	30.00	70.00	1.11	2.57	5.46	12.72	5 1 0	5 15 0	J. R. Elsworth, Ballarat
,, ..	16.69	2.99	1 15 10	..	..	..	17.65	3 0 0	..	..	52.20	47.80	1.56	1.43	9.18	8.47	4 15 10	5 5 0	P. Fitzgerald, Bentleigh
,, Magic No. 1	7.12	2.75	1 13 0	..	..	..	18.89	2 18 9	..	..	29.20	70.80	0.80	1.95	5.48	13.41	4 11 9	5 0 0	G. Gardiner, Geelong
,, Magic No. 2	6.97	2.64	1 11 8	..	..	..	20.49	3 6 7	..	..	40.00	60.00	1.06	1.58	8.20	12.29	4 18 3	4 15 0	,, ,,
,, ..	6.37	2.70	1 12 5	..	..	..	22.95	3 19 4	..	..	56.40	43.60	1.53	1.17	12.95	10.00	5 11 9	5 15 0	Heinz Bros. Ballarat
,, ..	5.58	3.78	2 5 4	..	..	..	20.62	3 5 7	..	..	34.50	65.50	1.31	2.47	7.12	13.50	5 10 11	5 10 0	J. Holdsworth, Beaufort
,, ..	11.14	3.53	2 2 5	..	..	..	19.17	3 12 3	..	..	18.50	81.50	0.66	2.87	15.62	3.55	5 14 8	6 0 0	J. R. Jopling, Ballarat
,, ..	10.05	3.72	2 4 7	..	..	..	22.70	3 10 4	..	..	28.00	72.00	1.05	2.67	6.36	16.34	5 14 11	5 10 0	E. A. Kleiner, Wangaratta
,, ..	5.34	3.20	1 18 5	..	..	..	20.75	3 15 1	..	..	69.50	30.50	2.23	0.97	14.43	6.32	5 13 6	5 10 0	E. Lloyd, Box Hill
,, Echuca Bone	4.43	4.59	2 15 1	..	..	..	18.48	3 4 3	..	..	58.30	41.70	2.67	1.92	10.72	7.76	5 19 4	5 10 0	Milo Bacon Co., Echuca
, Vauxhall	12.18	3.48	2 1 9	..	..	..	23.35	3 14 0	..	..	33.70	66.30	1.17	2.31	7.83	15.52	5 15 9	6 5 0	W. Moore, Panmure

Bonedust ..	5.77	3.15	1 17 10	..	..	..	16.55	2 17 0	..	..	55.50	44.50	1.75	1.40	9.19	7.36	4 14 10	6 0 0	A. Murphy, Ararat
,, ..	5.75	4.03	2 8 5	..	..	..	21.25	3 16 8	..	..	68.50	31.50	2.77	1.26	14.56	6.69	6 5 1	5 10 0	P. Rohs, Bendigo
,, Brown Hill	5.16	2.93	1 15 2	..	..	..	22.71	3 11 2	..	..	30.70	69.30	0.90	2.03	6.93	15.78	5 6 4	6 0 0	Turner Bros., Ballarat
Blood and Bone ..	12.99	5.26	3 3 1	..	4.15	11.87	16.02	2 9 2	..	..	24.80	75.20	..	..	..	..	5 12 3	6 0 0	Angliss and Co., Footscray
Bone Fertilizer ..	6.51	2.80	1 13 7	1.77	4.62	11.86	18.25	2 19 1	..	..	65.00	35.00	..	..	..	..	4 12 8	5 10 0	Aust. Explosives and Chemical Co., Melbourne
Blood and Digester Refuse	7.33	6.35	3 16 4	..	3.51	9.68	13.19	2 0 7	0.59	0 2 3	57.90	42.10	..	..	..	..	5 19 2	5 15 0	Thos. Borthwick and Sons, Portland
Animal Fertilizer ..	7.52	8.36	5 0 3	..	3.15	5.30	8.45	1 7 2	0.14	0 0 8	11.70	88.30	..	..	..	..	6 8 1	5 15 0	Thos. Borthwick and Sons, Melbourne
,, "Newport"	3.79	5.35	3 4 2	..	4.06	8.04	12.10	1 18 4	0.12	0 0 6	43.70	56.30	..	..	..	..	5 3 0	5 10 0	J. Cooke and Son, Melbourne
Bone Fertilizer ..	5.82	2.96	1 15 6	1.70	4.70	12.00	18.40	2 19 4	..	..	54.30	45.70	..	..	..	..	4 14 10	5 10 0	Cuming, Smith, and Co., Melbourne
,, ,, ..	5.65	2.63	1 11 7	..	3.09	11.96	15.05	2 5 3	..	..	44.80	55.20	..	..	..	..	3 16 10	5 5 0	H. J. Feore and Co., Lord-street, Richmond
Magic Fertilizer No. 1	7.64	1.95	1 3 3	..	2.15	16.27	18.42	2 13 4	..	..	50.60	49.40	..	..	..	..	3 16 7	4 10 0	G. Gardiner, Geelong
Magic Fertilizer No. 2	7.64	1.44	0 17 3	..	1.51	13.72	15.23	2 3 9	..	..	56.80	43.20	..	..	..	..	3 1 0	4 0 0	,, ,,
Vegetable Manure	10.00	9.63	5 15 7	..	2.30	4.09	6.39	1 0 5	..	..	22.60	77.40	..	..	..	..	6 16 0	7 0 0	,, ,,
Bone Fertilizer "Apollo"	5.01	5.00	3 0 0	..	4.90	12.00	16.90	2 12 7	..	..	45.30	54.70	..	..	..	..	5 12 7	6 7 6	J. Kitchen and Sons, Melbourne
Bone Fertilizer "Kensington"	7.42	3.43	2 1 2	..	6.81	12.89	19.70	3 2 8	..	..	48.00	52.00	..	..	..	..	5 3 10	5 15 0	,, ,, ,,
Bone Fertilizer "Waddell" ..	9.97	3.15	1 17 10	..	5.78	12.62	18.40	2 17 9	..	..	48.00	52.00	..	..	..	..	4 15 7	5 10 0	,, ,, ,,
Bone Fertilizer, 5 % Nit., 16 % Phos. Acid	6.69	5.10	3 1 2	..	5.04	11.49	16.53	2 11 9	..	..	51.00	49.00	..	..	..	..	5 12 11	6 10 0	Mt. Lyell M. and R. Co., Melbourne
Bone Fertilizer, 3 % Nit., 18 % Phos. Acid	6.73	2.81	1 13 8	2.02	4.59	11.67	18.28	2 19 5	..	..	62.50	37.50	..	..	..	..	4 13 1	5 10 0	,, ,, ,,
Bone Fertilizer, 3.5 % Nit., 19 % Phos. Acid	5.71	3.40	2 0 10	4.40	3.75	10.50	18.65	3 3 8	..	..	61.00	39.00	..	..	..	..	5 4 6	6 0 0	,, ,, ,,
Animal Fertilizer ..	4.84	3.96	2 7 6	..	3.69	12.21	15.90	2 8 4	..	..	40.90	59.10	..	..	..	..	4 15 10	5 5 0	G. W. Pennell, Braybrook
Bone Fertilizer ..	6.32	2.76	1 13 2	1.98	4.35	12.03	18.36	2 19 5	..	..	38.00	62.00	..	..	..	..	4 12 7	5 10 0	Wischer and Co., Melbourne

P. R. SCOTT,
Acting Government Analyst and Chemist for Agriculture

Government Laboratory,
Melbourne, 13th January, 1910.

The Purchase of Superphosphate.

Memorandum by the Hon. George Graham, M.L.A.

The Department of Agriculture numbers among its many functions, that of guide and protector of the farmers' interests, especially in regard to matters involving a complicated estimation of commercial worth. In the use of artificial manures, the Department has done much service in educating the farmer by means of lectures, demonstrations, and *Journal* articles, to understand that the value of such materials depend entirely upon their solubility and consequent availability to the crops to which they are applied.

Manures, nowadays, are looked upon as an absolutely essential item in the cost of crop production, and any falling off in the quality must be regarded with apprehension unless there is an equivalent reduction in the price of the material. It has been frequently pointed out that the *agricultural* value of a manure may differ widely from its *commercial* value, for the reason that the former is regulated by soil and climatic conditions over which the farmer has little control, whereas the latter is measured by the trade values of the plant foods present according to their degree of availability.

The farmer is more concerned with the commercial value of *superphosphate* than most other forms of artificial manure and the purpose of this article is to draw attention to the rise in value of the insoluble phosphoric acid as compared with that in previous years. As has been stated, the value of a manure depends upon its solubility and consequently thorough distribution throughout the soil, as well as its easy availability by the plant. The term "insoluble" implies a material of little service to the crop to which the manure is applied, and hence should only have a low commercial value. It has been the policy of the Department to discourage any more than a very small amount of insoluble phosphoric acid in superphosphates by the giving of only a nominal value per unit.

The unit values under the Artificial Manures Act have been calculated from the average qualities of the samples forwarded by vendors for analysis under the terms of the Act.

Superphosphate.	1904.	1905.	1906.	1907.	1908.	1909.	1910.
	s. d.	s. d.	s. d.	s. d.	s. d.		s. d.
Phosphoric Acid, Water Soluble	5 3	5 3	4 6	4 6	4 9	Not	4 6
,, ,, Citrate ,, ...	4 8	4 8	4 0	4 0	4 0	pub-	4 0
,, ,, ,, Insoluble ..	1 0	1 0	1 0	1 0	1 0	lished.	2 9

The effect of the increase of value for *insoluble* phosphoric acid in superphosphates is likely to have an appreciable influence upon the quality of superphosphates sold in the future, for the reason that it opens up the way for a reduction of the *water soluble* phosphoric acid and the increase of the *insoluble* phosphoric acid, without altering the total quantity contained in the manure.

It is admitted by all competent authorities that it is the water soluble phosphoric acid which gives value to superphosphate. The acid is made in a quickly soluble form in order that it may become thoroughly and rapidly distributed throughout the soil. If there is any fairly large amount of insoluble phosphoric acid it stands to reason that this portion cannot readily come in contact with the soil particles and hence is of practically no service to the crop to which the manure is applied.

The exact effect of the alteration of the unit values, on superphosphates of equal quality, in this year from those in 1908 (no values were fixed during 1909) is as follows:—

Superphosphate	1908.		
Phosphoric Acid, Water Soluble	17% @ 4/9	=	£4 0 9
do. do. Citrate ,,	1% @ 4/-	=	0 4 0
do. do. ,, Insoluble	2% @ 1/-	=	0 2 0
Total Phosphoric Acid	20%	=	£4 6 9
Superphosphate—	1910.		
Phosphoric Acid, Water Soluble	17% @ 4/6	=	£3 16 6
do. do. Citrate ,,	1% @ 4/-	=	0 4 0
do do. ,, Insoluble	2% @ 2/9	=	0 2 9
Total Phosphoric Acid	20%	=	£4 6 0

In other words, the portion of the manure usable by a crop (water and citrate soluble phosphoric acid) is worth £4 4s. 9d. in 1908, and only £4 0s. 6d. in 1910.

It is impossible under the present Artificial Manures Act to now alter the values fixed by the Acting Chemist for Agriculture, but it is the intention of the Minister of Agriculture, when Parliament meets, to introduce a Bill, which will give the officer administering the Act wider powers to check any tendency towards falling off in the quality of a superphosphate.

Another point of interest to the farmer is the date of publication of the unit values in each year. At present, the values do not appear until the bulk of the manures have been sold and despatched to the country, delivery in many cases having been taken by farmers during the season of wheat carting. By a much earlier publication of the values in each year, farmers will have more opportunity to study the quality of superphosphate offered and decide upon the brand offering the most advantage for the money.

RAPE FALLOW VERSUS BARE FALLOW.

Mr. P. F. Cloonan, Crown Lands Bailiff at Sea Lake, when forwarding the following letter, adds that the results obtained by Mr. Cathcart strongly support the advice given by Mr. Temple Smith at the Agricultural Classes held at Sea Lake last year:—

"The following goes to show that much may be done to better the splendid returns that have followed the adoption of improved methods of cultivation in these districts. It has been argued that the limited rainfall makes the use of bare fallow, as opposed to rape fallow, a necessity in the scheme of rotation that has done so much for the Mallee agriculturist.

With a view to testing the question, Mr. J. J. Cathcart, a successful farmer near Sea Lake, last season sowed rape on 30 acres of a large paddock of fallow. Off those 30 acres he has harvested 24 bushels of Dart's Imperial wheat of prime sample—a plump, good coloured grain—for which he received 1d. per bushel over the ruling price, while the adjoining portion that had been well worked right through the year, and sown at the same time, produced only the same number of bushels of Federation wheat.

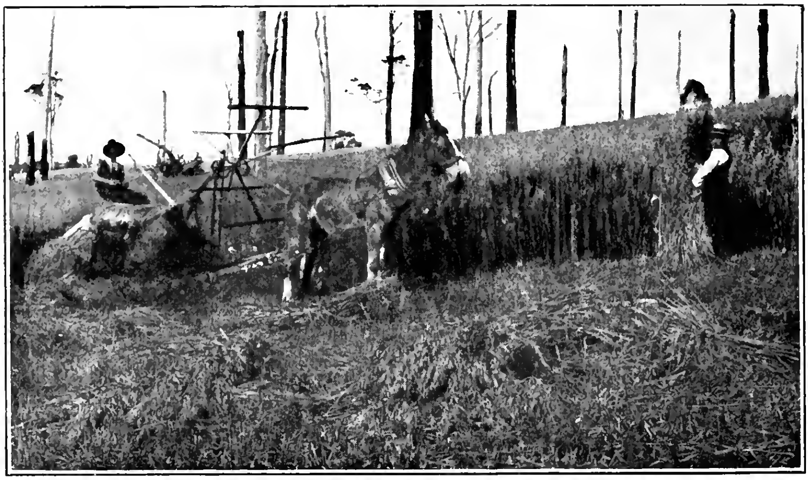
Mr. Cathcart claims that the result was most gratifying; he not only had 30 acres of rape with which to top off his lambs, but he was saved the extra labour involved in continuous working to conserve the moisture and destroy the weeds."

The satisfactory result obtained shows what can be done in a year when the rainfall is fairly good.

SILO BUILDING ON THE FARM.

The following interesting and appreciative letter and the accompanying illustrations have recently been received from Mr. H. T. Lawson, of Ulverstone, Tasmania :—

"In 1903 I was at the Melbourne Royal Show, and obtained one of your *Journals* there. Although not farming at the time, I kept it by me, and when I started farming about 2½ years ago I became a subscriber. I was so pleased with it that I sent for all back numbers, and they have been of valuable service to me. From the description of killing, dressing, and curing pigs, I started curing my own pigs, and was so successful that I had orders for all I could cure from the shops at the same price that they were paying for best factory bacon.



HARVESTING THE OAT CROP.

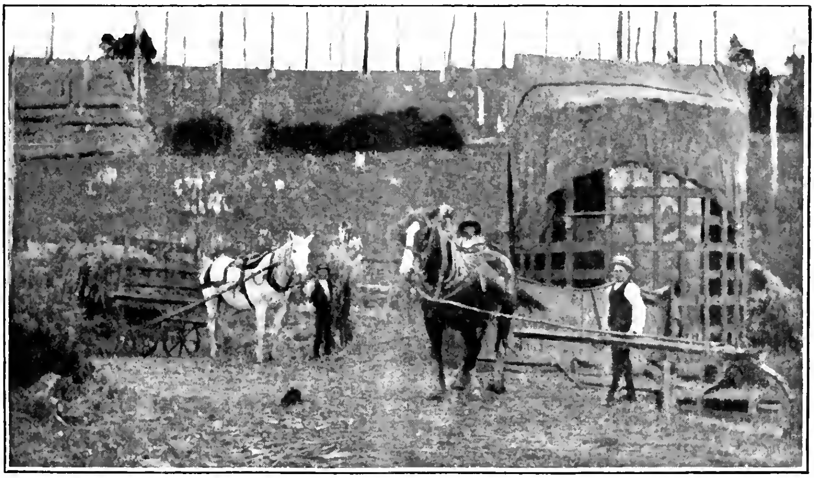
"With the help of a farm hand, I have now built a silo from the directions in the *Journal*. I had no difficulty in building the silo which will hold 45 tons. I was rather late in building, so had to fill it in a primitive way. I had a very small horse works, and fitted it to a very small hand chaffcutter, and carried the stuff in a bag cloth to the silo. One blade of the chaffcutter was taken off, so that it would cut longer stuff (about 1 inch). I filled it from a very heavy crop of Algerian oats, estimated to be one of the best in the district, and to go about 4 tons of hay to the acre. It only took 4½ acres to fill the silo. The silage was well trampled and then weighted with 2½ tons of stones. The stuff only settled about 2 ft. 6 in. There are very few silos on this coast, mine being the second in the district, but I believe there will soon be several more, as through the potato trouble, dairying has been gone in for more extensively.

"I am enclosing photographs of the silo and crop from which it was filled. The bag cloth over the silo is only a temporary roof till we finish harvesting. The oats had just finished the bitter stage, and were getting sweet, and there was a little milk in the oats, and the flower was still on. We cut in the morning with the binder and carted in with one horse in a small lorry on four binder wheels, so that the heavy sheaves had not to be lifted too high.

"The cost of material for the silo was about £17. I dug a hole in a bank about 9 feet deep, so that the silo could be filled much easier, and put the lowest porthole on the side of the silo where the digging ran out to nothing. If the silage turns out a success it will be very cheap winter feed for cows.

SILO BUILT FROM DIRECTIONS IN JOURNAL.

"Many thanks for your answers to my previous inquiries. I am forwarding some more by this mail. Of course, we have our own agricultural experts, but through lack of funds they are too handicapped to



FILLING THE SILO.

be of the service they should, so we gladly avail ourselves of the opportunity of getting our information from your fine staff of experts and splendid *Journal*."

A NOTE ON THE WORKING OF SOILS.

J. S. McFadzean, Dairy Supervisor.

Many soils vary largely in their consistency under different degrees of moistness, but there is some stage between wet and dry when each may be most easily reduced by mechanical action to that friable condition that is necessary in a good seed-bed. When breaking up land at any season, but more especially when the weather is dry, every effort should be made to work the ground at this stage, in order that the labour and cost of cultivation may be reduced to a minimum, and a satisfactory yield be ultimately obtained.

It is not to be supposed that any one would intentionally make this work of cultivation heavier for himself or his team; nevertheless, this is often done through overlooking some simple matter in connexion with the variations of the soil or weather. Even when apparently dry, all soil contains some moisture; but, when in a condition which allows of it being easily turned over by either plough or spade, there is usually an obvious amount present. In breaking up ground that is intended for cropping during the summer months such moisture should be carefully conserved. Want of attention to this point frequently has caused much loss of time, and has even resulted at times in the failure of that season's sowing.

If damp soil on being turned over should lie in an unbroken sod, exposed to the action of either a hot sun or a dry wind, much of the moisture it contains will soon evaporate; and it is apt then to become more or less caked and cloddy. In such a condition it will not make into a satisfactory seed bed; but, if broken down by harrowing before it becomes over dry, much of its moisture will be retained, and it will be more easily brought to the desired condition for sowing.

No gardener in digging sweet ground would turn it over in sods and leave it to dry in that state. Each spadeful is broken down as it is turned over; and when digging is finished very little more work is required to make a satisfactory seed-bed. On the other hand, it is quite a common occurrence for a ploughman to continue turning over acres of soil until he has finished a given area; meanwhile thoughtlessly leaving the damp soil to bake and clod, and the moisture to evaporate. The result is that, without an opportune rainfall, he afterwards experiences much difficulty in bringing that ground into anything like fair sowing condition, even by expending much extra time and labour on it in repeated working. In such cases the weather is blamed for the unsatisfactory result. But, if the farmer had worked his acres on a method similar to that applied by the gardener, and broken down the newly-turned soil before it became dry, he would have had no cause for complaint. A like result is obtainable with either plough or spade if the soil is worked down at the proper time; that is, before the moisture dries from it.

Under dry weather conditions, therefore, ground should be broken down as soon as possible after it is turned over; and the drier the atmosphere the less time must be lost in harrowing down the freshly ploughed surface. No rule, however, will suit all soils or weather variations. The point to be remembered is, that to allow soil to dry out to any extent before breaking it down by harrowing means increasing the cost of producing the crop by putting up more work for the man and team; and at the same time the possibility of a satisfactory crop is being materially reduced.

In either the farm or the garden, a small area properly worked will give a more satisfactory result than a larger extent of ground indifferently treated. Careful cultivation insures a more even germination of the seed when sown; each plant is also enabled to make better root growth; and the land has thus a better chance to yield a good return.

THE "WILLIAM FARRER" MEMORIAL FUND.

The following letter from the Under-Secretary for Agriculture, Sydney, is published in anticipation that a ready response to the request therein contained will be made by Victorian wheat-growers and others. As stated by Mr. F. E. Lee, on page 94 of this issue, the Federation variety of wheat, bred by the late Mr. Farrer, may fairly be claimed to be the most prolific yielding variety grown at present in Victoria. The labours of the noted wheat experimentalist have brought considerable benefit to wheat-growers throughout the Commonwealth, and it is fitting that his memory should be suitably remembered in perpetuity.

Department of Agriculture, Sydney,
18th January, 1910.

DEAR DR. CHERRY,

I have noticed with considerable satisfaction that you have been generous enough to give full credit to the value of some of the Farrer wheats in adding to the productive wealth of your State.

You may be, perhaps, aware that we are trying to raise a monument to the memory of the late William Farrer, to commemorate the splendid work he did on behalf of wheat-growers, and, incidentally, the millers and bread eaters of the Australian States. We have now raised £300, but wish to get considerably more, in order to establish a scholarship to carry on the education of some farmer's son who has shown special aptitude for wheat breeding. Probably the scholarship will take a student from the College or one of the Farm Schools to the University, on similar conditions to the *Daily Telegraph* Farrer Scholarship which is given to the best student at either of the Farm Schools, and provides the holder with another year free of cost at one of these Schools.

Would it be amiss to ask you to notice the matter in the next number of your *Journal,* and invite those interested in Victoria to co-operate with us in establishing this memorial? Any subscriptions from your State would be doubly welcome in this connexion.

Yours sincerely,

HENRY C. L. ANDERSON,
Under-Secretary.

Dr. T. Cherry, Director of Agriculture, Melbourne.

Donations should be forwarded to the Under-Secretary, Department of Agriculture, Sydeny, N.S W.—Editor.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. All inquiries must be accompanied by the name and address of the writer.

CONGESTION OF THE LUNGS AND PLEURISY.—Because of the clearness and terseness of the following letter, received from Mr. D. A. McDougall, "Craigielea," Maroona, it has been decided to publish it in full, together with the reply of the Veterinary Branch.

Mr. McDougall writes—"I had a mare die and would like to know what was the cause of her death and what would have been the proper treatment for such a case. She was working in the harvester when she took bad, but had not been in constant work for some time.

"It was first noticed that she would not eat, was shivering and her breathing was fast; the body was very hot, especially about the chest, and the heart was beating fast. In putting the ear to the front of the chest, a dry grating sound could be heard; it could also be heard on the right side of the chest and along the neck. The ears and legs were cold. She ate a little now and again, stood mostly in the one place with the head down and the ears drooping, and had a reddish discharge coming from the nostrils.

"She was bad for about a week, took another fit of shivering and fell over once or twice. The heart seemed to be getting thinner and not so full; more irregular. On putting the ear on the right side of the chest a sound as if the chest had a lot of water moving about in it could be heard. It sounded like water dropping from a height into a vessel; it could be heard from the bottom of the chest well up the sides of the horse. On looking at the side of the horse a line was noticeable, running from the flank to the shoulder along the bottom of the ribs, pressure on the right side of the chest caused pain, and a very low, painful, cough was present. The inside of the eyelid was of a dark red colour, the front legs swelled and a watery discharge was oozing out of them.

"I put mustard, vinegar, and a little turps around the sides of the chest and also on the front of it. There was some swelling under the chest and a little in front of it after the plaster came off. When breathing she would give a little grunt with each breath. She never laid down all the time she was bad, but at last she staggered, breathed faster, broke out in sweat, and dropped down dead. The illness lasted ten days. Doses of tincture of aconite, and sweet spirits of nitre were administered, and injections made. Towards the last I gave her whisky and water."

Answer.—The first symptoms shown were those of acute congestion (with hæmorrhage or apoplexy) of the lungs which was mainly indicated by the bleeding from the nose; from this the mare may have recovered had not pleurisy set in as a complication. The line described as running along the lower border of the ribs is very characteristic of this affection.

The most common cause of congestion of the lungs is found in putting a full blooded animal suddenly into hard work, more especially during hot weather. The first line of treatment to adopt in such a case should be an endeavour to stimulate the general circulation so as to relieve the blood pressure within the lungs. This may be effected by administering in the *very early* stages a dose of tincture of opium, 2 oz.; this should be followed every three hours with a stimulant such as ammonia in the form of aromatic spirits or, if that is not available, then 4 oz. of brandy or whisky, at the same time applying warm rugs to the body and warm dry bandages to the legs. The latter may also be rubbed with a mild stimulating liniment. A warm well ventilated loose box should be provided.

Pleurisy setting in renders the chance of successful treatment more remote. Treatment is similar to that for congestion of the lungs but, in addition, the chest walls should be rubbed with a strong stimulating liniment or mustard plaster. Tincture of aconite ½ dr., and spirits of nitre 2 ozs., may be given every four hours with advantage. Later on, as the fever subsides and recovery may be looked for, absorption of the fluids, which have been formed in the chest cavity, may be assisted by administering three times a day the following: Tincture of nux vomica ½ dr., iodide of potash ½ dr., tincture of ginger 1½ ozs., water 1 pint.

DEATH OF YOUNG PIGS.—R.J.S. writes:—"Several of my young pigs have died lately when about three weeks old and in good condition. The stye is dry, but dusty. The symptoms are—They start sniffing as if suffering from cold in the head, the nostrils get choked up and are blown by the flies, there is a bad smell and the pigs do not suck. Death ensues in three or four days."

Answer—Use plenty of antiseptics and disinfectants in the styes, and overcome the dust by flooring. Wash and keep the nostrils clean, and in the early stages before they block up blow a small quantity of the following powder up the nose daily :—Iodoform, 1 part; boracic acid, 4 parts.

FOUNDER.—C.L.S. inquires as to treatment for founder following foaling. He refers to a severe case in his district and states that, although the mare is likely to live, it is very probable that she will lose both front hoofs, as suppuration between hair and hoof is setting in.

Answer.—The same method of treatment is adopted in all cases of founder—standing in cold water or applying cold water bandages to allay the inflammation and administering 2 drams of nitrate of potash in every bucket of drinking water. When following foaling, the additional precaution of syringing the vagina daily with an antiseptic is advisable. In the case mentioned, as the mare has become so bad, cleanliness must be attended to, keeping her on a soft clean bed. Should the hoofs drop off, it will perhaps be the best termination in this case, as temporary horn will form and in time new ones grow, and she will be little the worse.

BLINDNESS IN SHEEP.—A.A.B. states that blindness in sheep is prevalent in his district. In one flock of 100 sheep fully 50 are affected; the eyes turn white.

Answer.—This may be a specific disease, but at the present season grass seeds in the eye, or the irritation of thistle pricks, must not be lost sight of as a cause. Make a careful search and remove, if present, and use the following lotion twice a day, dropping a few drops into each eye :—Sulphate of zinc, 2 grains; tincture of opium, 1 dram; water, 4 ounces.

MAMMITIS.—D.E.F. writes :—"My cow had milk fever and was cured by the injection of air into the udder. Now one of the teats does not work properly. There seems to be a lump in it. The milk splashes up when it is milked into the bucket. Is there anything I can do to remedy the defect?"

Answer.—A mild mammitis has evidently supervened on the air treatment, and the splashing referred to is probably due to clots which are forming and then being forced through the teat. The milk should not be used, and the udder should be fomented twice a day for about half an hour and then well massaged with camphorated oil.

INJURY TO BULL.—B.S. states that a valuable young Ayrshire bull of his was injured five weeks ago through being driven and yarded with a mob of strange bullocks, presumably by the latter jumping on him. The symptoms are :—Stiffness and humped back (especially after lying down), tail stiff and powerless, apparently in pain when about to pass urine, which is discoloured.

Answer.—The bull has apparently received internal injuries, probably affecting the kidneys through sprain of the underloin muscles. Place him in a convenient small enclosure by himself and apply a plaster to the loins. This should be done by first clipping the hair for a space of 15 inches long and 12 inches wide over the loins and croup. Then prepare the plaster by cutting a piece of calico to correspond to the clipped patch and smearing it with a molten mixture of 2 parts of pitch to 1 of beeswax. When at the right heat put the plaster on the loins, pitch side to skin, and smear the whole area over again outside. To spread the pitch evenly, a hot shovel or flat piece of iron should be held near the parts and the plaster made to stick firmly by pressing it against the skin with a flat stick at the same time. Give in a damped feed, night and morning, a tablespoonful of Epsom salts with one teaspoonful of saltpetre.

PLANTS FOR IDENTIFICATION.—W.T.D., R.F., and W.M. forward specimens for identification.

Answer.—W.T.D.—*Bartsia latifolia*, Sibth. and Sm., Common Bartsia. It is an introduced plant common in pastures in many parts of this State, often sent in as a supposed poison plant. It does not appear to have any definite poisonous properties, but might cause obstruction or irritation of the alimentary canal if eaten in large quantities. The plant is sporadic, being more abundant in some seasons than in others. It was originally introduced with impure agricultural seed, but the small seeds are now spread in pastures by the wind. Cultivation, and the avoidance of overstocking help to keep it down, as well as resting the pasture in spring, with an early mowing before the plant seeds. Since its roots are often parasitic on grass roots, its presence in pastures is additionally objectionable. Stock rarely touch it.

Answer.—R.F. (1) *Bartsia latifolia*, Sibth and Sm., Common Bartsia (see above). (2) *Trifolium subterraneum*, L., Subterranean Clover. An introduction from the Mediterranean regions. Of some use as a pasture plant; it also aids in suppressing annual weeds. (3) *Erodium moschatum*, L'Herit, Musk Erodium or Crane's-bill. An introduction from Europe. Of slight use as a pasture plant, more especially when young, but, on the whole, to be regarded as a weed.

Answer.—W.M.—*Trifolium glomeratum*, L., Clustered Clover, a native of the Mediterranean regions, introduced into this State and now widely spread. It is an annual which seeds freely and so maintains itself, even on dry, sandy soils. Whilst growing it yields fairly good pasturage, but dies down in autumn and late summer when usually herbage is most needed. It is a good plant for aiding in the improvement of bare, arid pasture land which it steadily enriches and adds to the carrying capacity for at least half the year. Sheep voiding the undigested seeds carry the plant from place to place.

Paspalum.—Orbost inquires why *Paspalum stoloniferum* has not come into public favour like *Paspalum dilatatum*. He also asks whether "Boyd's Clover" will form a turf from seed.

Answer.—*Paspalum stoloniferum* is comparatively little known. Its yield appears to be less than that of *Paspalum dilatatum*, and its creeping habit of growth makes it a nuisance in cultivated land. It is comparatively resistant to drought and has no injurious or poisonous properties recorded against it. There is no record of "Boyd's Clover." Is it a seedsman's name? Please forward a specimen.

Strawberry Clover.—T.E. desires information regarding Strawberry Clover.

Answer.—There are two forms of Strawberry Clover. One is the annual Strawberry Clover, *Trifolium resupinatum*, L.; the other is the perennial Strawberry Clover, *Trifolium fragiferum*, L. Both species are introduced plants. *T. fragiferum*, L. is a native of Europe, of North Africa, and of Asia. It somewhat resembles *T. repens*, the White or Dutch Clover, in its mode of growth, but after flowering the calyces expand into small bladders, and take on a reddish colour. Percival does not include either this or the preceding species among the clovers recommended for cultivation. It grows well on clayey or wet sandy soils. Cattle graze well and fatten on it. Baron Mueller regarded it as superior to Dutch Clover, but this is very doubtful. It may, however, stand summer heat better. The annual Strawberry Clover is a native of Europe, Africa, and Asia, affording a little grazing in spring, dying down in autumn or late summer, but maintaining itself readily from season to season by its numerous seeds. Baron Mueller mentions that "this clover is cultivated with predilection in Upper India, also in Afghanistan." This is evidently an error, as the plant is not mentioned in the official dictionary of The Economic Products of India. It is not worth cultivation, and is of very subordinate importance as a pasture plant.

Maize Cultivation.—J.S. inquires as to cultivation of maize and similar fodder crops.

Answer.—Every attention should be given to the proper cultivation of maize and similar fodder crops. The seed having been sown in rows at least three feet apart, the soil should be kept stirred on the surface between, both to keep down weeds and to conserve the soil moisture. Care must be taken not to work too close to the growing plants or to stir the soil too deeply. The fine feeding roots of the plants are liable to be damaged in either case, and the growth of the crop to be thus checked. Also, as the object of inter-cultivation is to conserve the soil moisture, shallow working only is required. To bring damp soil to the surface from below will cause unnecessary loss of moisture, and the crop will suffer from its loss. The lightest possible stirring of the surface soil is all that is required; but the work should be repeated frequently till the crop is too high to get the cultivator through it without damage to the plants. On very light soils a piece of brush fixed under the cultivator will shorten the working length of the teeth, and prevent them from running too deep.

Fodder Value of Rye.—H.H.W. inquires as to value of rye as fodder for stock.

Answer.—The comparative values of green rye and green oats are as follow:—

	Protein	Nitrogen. Free Extract.	Fat.
Rye ...	1.8 per cent. ...	6.8 per cent. ...	0.6 per cent.
Oats ...	2.5 ,, ...	19.3 ,, ...	1.4 ,,

Earliest Variety of Wheat for Grain.—H.H.W. wishes to know the earliest variety of wheat recommended for sowing for grain

Answer.—Bunyip.

Manuring after Burning of Crop.—H.H.W. writes:—"Supposing a field be heavily manured with superphosphate and the luxuriant resulting crop be destroyed just before harvest time, is the manure lost or is it returned to the soil through the ash?"

Answer.—The amount of phosphoric acid in the ash of a burnt crop would be trifling. The manure is practically wasted by the crop being burnt.

BLACK ANTS.—D.E.F. wishes to know how to poison black ants. They are located in a chimney and are a great pest.

Answer.—Mix arsenic with sugar or honey, and with a brush or rag smear same on chimney, out of the reach of children and domestic animals. If squirted into the crevices in the brick-work, benzole will, if persisted in, drive the ants away.

HAWTHORN HEDGE.—H.P.B. asks whether it is advisable to cut a young, fast-growing hawthorn hedge during the summer.

Answer.—The best and most suitable time to cut a hawthorn hedge is immediately after the flowering season. If the season be fairly cool the cutting may be delayed till January. It should be cut hard back so as to insure a good furnishing of lower growths, otherwise the hedge will grow all to top with very little undergrowth.

STATISTICS.

FOURTH QUARTER, 1909.

Rainfall in Victoria.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with corresponding monthly and quarterly averages for each Basin, deduced from all available records to date.

Basin or District.	October.		November.		December.		Quarter.	
	Amount, 1909.	Average.	Amount, 1909.	Average.	Amount, 1909.	Average.	Amount, 1909.	Average.
	points.	points.	points	points.	points	points.	points.	points.
Glenelg and Wannon Rivers	343	284	157	187	104	141	604	612
Fitzroy, Eumeralla, and Merri Rivers	320	288	180	192	119	150	619	630
Hopkins River and Mount Emu Creek	210	254	118	197	145	157	473	608
Mount Elephant and Lake Corangamite	178	247	120	195	190	151	488	593
Cape Otway Forest ...	299	345	182	237	253	209	734	791
Moorabool and Barwon Rivers	138	251	99	200	179	183	416	634
Werribee and Saltwater Rivers	93	251	56	200	177	216	326	667
Yarra River and Dandenong Creek	223	337	118	273	370	314	711	924
Koo-wee-rup Swamp ...	258	346	137	257	296	257	691	860
South Gippsland	268	390	137	270	333	311	738	971
Latrobe and Thompson Rivers	276	367	143	266	352	284	771	917
Macallister and Avon Rivers	145	237	58	186	193	275	396	698
Mitchell River	155	293	26	203	203	243	384	739
Tambo and Nicholson Rivers	150	315	42	176	196	286	388	777
Snowy River	174	365	45	208	219	285	438	858
Murray River	120	191	29	140	107	149	256	480
Mitta Mitta and Kiewa Rivers	259	345	37	263	73	243	369	851
Ovens River	181	355	40	241	51	240	272	836
Goulburn River	121	254	34	188	84	181	239	623
Campaspe River	99	217	45	173	78	182	222	572
Loddon River	84	179	42	146	74	125	200	450
Avon and Richardson Rivers	74	153	84	126	54	92	212	371
Avoca River	81	159	65	133	58	113	204	405
Eastern Wimmera	128	212	100	166	60	118	288	496
Western Wimmera	202	202	107	142	38	82	347	426
Mallee Country	70	125	88	93	29	84	187	302
The whole State	155	241	83	174	119	170	357	585

100 points = 1 inch.

H. A. HUNT,
Commonwealth Meteorologist.

Perishable and Frozen Produce.

Description of Produce.		Exports from the State. (Oversea). Quarter ended 31.12.1909.	Exports from the State. (Oversea). Quarter ended 31.12.1908.	Deliveries from the Government Cool Stores. Quarter ended 31.12.1909.	Deliveries from the Government Cool Stores. Quarter ended 31.12.08.
Butter	lbs.	19,274,028	11,723,384	12,505,216	9,387,112
Milk and Cream ...	cases	254	135	203	137
Cheese	lbs.	19,920	16,800	4,410	7,110
Ham and Bacon ...	"	...	1,680	...	...
Poultry	head	330	750	3,276	3,434
Eggs...	dozen	...		266	538
Mutton and Lamb	carcases	616,474	443,754	147,851	108,603
Beef	quarters	1,558	1,164	...	803
Veal	carcases	866	4,105	103	356
Pork...	"		76	71	
Rabbits and Hares ...	pairs	42,252	23,466	16,476	3,075
Sundries	lbs.	..	...	13,676	11,344

R. CROWE, *Superintendent of Exports.*

Fruit, Plants, Bulbs, Grain, &c.

Description of Produce.	Imports. Inter-State.	Imports. Oversea.	Exports. Inter-State.	Exports. Oversea.
Apples ...	9,304	377	1,844	69
Apples (Custard)	2	—	—	—
Apricots ..	—	—	7,394	604
Bananas, bs.	73,515	25,943	—	—
Bananas, cs.	11,313	13,726	900	—
Barley ...	7,809	—	—	—
Beans ...	4	98	—	—
Bulbs ...	1	254	11	—
Cherries ...	1	—	25,514	5,148
Chillies ...	1	152	—	—
Cloves .	—	22	—	—
Cocoa beans	—	573	—	—
Cocoanuts..	—	721	35	—
Coffee beans	—	858	—	—
Copra ...	60	266	—	—
Cucumbers	5,766	6	549	—
Currants ...	—	17,964	—	—
Dates ...	—	12,623	—	—
Figs ...	—	908	1	—
Fruit—				
Canned...	—	--	—	967
Dried ...	12	—	1	1,015
Mixed ...	2	4	10	—
Garlic ...	1	51	—	—
Gooseberries	5	—	1,207	—
Granadillas	1	1	—	—
Green ginger	—	32	1	—
Heather ...	—	1	—	—
Hops ...	—	314	—	—
Jams, Sauces, &c.	—	—	—	894
Lemons ...	3,145	5,741	74	468
Lentils ...	—	47	—	—
Linseed ...	—	572	—	—
Mace ...	—	93	—	—
Totals ...	110,942	81,380	37,541	9,165

Description of Produce.	Imports. Inter-State.	Imports. Oversea.	Exports. Inter-State.	Exports. Oversea.
Maize ...	1,833	5,155	—	—
Mangoes	79	5	—	—
Marrows ...	170	—	—	—
Malt ...	14	—	—	—
Melons ...	82	3	—	—
Moss ...	3	—	—	—
Nectarines	4	—	2	—
Nutmegs ...	—	431	—	—
Nuts ...	59	2,342	2	—
Oats ...	2,114	33	—	—
Oranges ...	54,792	3,644	226	724
Passion fruit	539	—	35	—
Paw Paws...	—	8	—	—
Peaches ...	151	—	726	483
Pears	—	—	281	—
Peas, Dried	132	377	—	—
Pepper ...	—	245	—	—
Pines ...	17,756	410	470	476
Plants, Trees, &c.	32	162	101	57
Plums ...	—	—	534	713
Pomelos ...	1	—	—	—
Popcorns ...	—	7	—	—
Potatoes	84	2	—	—
Prunes	—	488	—	—
Raisins ...	266	5,452	—	—
Raspberries	—	—	1	—
Rice ...	1,829	12,457	—	—
Seeds ...	539	5,500	—	—
Spice	—	42	—	—
Strawberries	2	—	—	-
Tomatoes ..	1,263	—	5	6
Vegetables	5,256	259	3	—
Wheat ...	50	139	—	—
Yams ...	42	105	—	—
Grand Totals	198,034	118,646	39,927	11,624

Total number of packages inspected for quarter ending 31st December, 1909 = 368,231.

J. G. TURNER, *Senior Inspector, Fruit Exports and Imports.*

Agricultural Education in Victoria.

DOOKIE AGRICULTURAL COLLEGE.

H. PYE, Principal.

The College offers every facility to students to become competent agriculturists, vignerons, and dairymen. The work is carried out on a large commercial scale, the ploughing, drilling, manuring, harvesting, threshing, and shearing being done by students under competent instructors. Over 2,000 sheep and lambs, 150 head cattle, 50 horses, including stallion, are on the farm.

Fees—£28 5s. per annum, payable half-yearly.

Sessions begin first week in March and September.

LONGERENONG AGRICULTURAL COLLEGE.

G. A. SINCLAIR, Principal.

One aim of this institution is to fill in the gap between the State School and Dookie, *i.e.*, to take students between the ages of fourteen and sixteen years.

The farm contains an area of 2,386 acres, and is admirably adapted for demonstrating what can be done in farming with irrigation. There is a large area of the farm under cultivation, and the orchard and vineyard cover an area of 30 acres.

Fees—Resident, £18 5s. per annum: Non-resident, £5 per annum, payable half-yearly.

Sessions begin first week in March and September.

BURNLEY SCHOOL OF HORTICULTURE AND SMALL FARMING.

E. E. PESCOTT, Principal.

The School Course includes regular lectures in Agricultural and Horticultural Science, Veterinary Work and the Management of Animals, Dairying, Pig and Poultry Management, and kindred subjects.

Fee—£5 per annum.

Session begins 14th February.

WYUNA IRRIGATION FARM.

G. H. TOLLEY, Manager.

Students are admitted for three months' practical instruction in Irrigation Methods, including the Preparation of the Land, Application of Water, Harvesting and Marketing of Crops, Dairy Farming under Irrigation.

Fee—£5 5s.

Terms commence at any date.

LECTURES ON AGRICULTURAL SUBJECTS, 1910.

Agricultural or other Societies wishing to have one or more public lectures delivered during 1910 are requested to make early application, so as to permit of a complete syllabus being drawn up. Many of the lectures are illustrated by limelight views. The hall, advertising, &c., must be provided locally, free of cost, but all other charges are borne by the Department.

Staff—The Director, and Messrs. Archer, Cameron, Carmody, Carroll, Castella, Connor, Crowe, Ham, Hart, Hawkins, Kenyon, Lee, McFadzean, Pescott, Robertson, Smith, and Strong.

AGRICULTURAL CLASSES, 1910.

At least thirty students, exclusive of school children, must be enrolled at each centre, the rent of the hall and all local charges to be paid by the Agricultural Society under whose auspices the Class is held.

Applications relative to the above Institutions, Lectures, and Classes should be sent to the Secretary, Department of Agriculture, Melbourne. On receipt of Post Card a copy of the Prospectus of either College will be posted.

ol. VIII. Part 3.

CONTINUOUS WHEAT EXPERIMENTS.
VINEGAR FROM APPLES.

[Registered at the General Post Office, Melbourne, for transmission by Post as a Newspaper.]

The Journal of the Department of Agriculture of Victoria

March, 1910.

PRICE THREEPENCE. (Annual Subscription—Victoria, Inter-State, and N.Z., 3/-; British and Foreign, 5/-.

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CONTENTS.

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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. VIII. Part 3. 10th March, 1910.

RESULTS OF CONTINUOUS WHEAT EXPERIMENTS.

F. E. Lee, Agricultural Superintendent.

The policy, initiated five years ago, of conducting wheat experiments upon different sections of the same plot of ground, is just now beginning to bear fruit. Among progressive wheat-growers, the usual practice is to grow one or two crops of wheat, followed by a crop of oats, then a year or so in grass before the land is fallowed prior to resowing with wheat. This practice is an admirable one when the holding is sufficiently large to permit new land to be broken up each year without diminution of the area under wheat; but it is not possible upon a small farm. One of the objectives of the present wheat experiments is to test the possibility of more intense cropping of the same land, without diminishing its producing power or rendering it foul with wild oats and weeds.

The returns referred to in this respect are from land which has borne three wheat crops in five years. The figures are eloquent as demonstrations of two facts:—

(*a*) That the yield of suitable varieties of wheat under a system of thorough soil preparation and manuring, and aided by the use of only prime graded seed, can be maintained over a longer term of years, without fouling the land, than has hitherto been considered possible.

(*b*) That the future improvement of the State average yield of wheat is likely to be more dependent upon soil treatment than manures.

The writer, having consistently opposed the burning of stubble for several years past, was confronted with the problem of satisfactorily dealing with this problem upon the experimental plots. A method which has been found to give good results is the rolling of the stubble and cross discing to cut it into small pieces which are worked into the soil without serious difficulty. Another method having many advantages, is a thorough scarifying of the stubble prior to fallowing. This latter method is advocated by Professor Campbell, the prophet of "Dry Farming," as an effective means of restoring capillarity between the subsoil and cultivated portion.

It will be remembered, that loose soil bonds more easily, than is the case where the soil is separated by a layer of grass, or stubble from the bottom of the furrow.

The fallowing on the experimental plots has, in the majority of cases, been done earlier and the soil mulch has been better maintained throughout the summer, than is the case on larger areas. The fact that higher yields have followed such improved methods is a strong argument in their favour, and points the way for a reduction of the large areas grown by some wheat-farmers and the concentration of energy and implements on smaller areas. The saving in seed, manure, and time is more than sufficient as a set off against more frequent working of the land.

Upon the question of graded seed, I can speak emphatically. Federation wheat is not a large grain and, during grading, a rather high proportion goes away as seconds and thirds, but the first grade seed is a prime quality and in every way capable of producing vigorous plants. I go so far as to say that no farmer should sow any wheat seed which has not been graded, and the same principle might be applied to other farm seeds with profit.

It has been observed that the wheat upon the experimental fields germinated more uniformly and quickly than is ordinarily the case and, moreover, the young crops did not seem so liable to checks in growth by unfavourable weather conditions. This, I consider, is directly traceable to the vigorous quality of the graded seed. Manure may influence both germination and vigour of young crops to a large extent, but the vegetable processes slow down if the plant is not capable of maintaining its progress by a well developed root system.

THREE CROPS IN FIVE YEARS ON THE SAME LAND.

Reference to the table of results will show that, for five consecutive years, Federation wheat has been grown on some of the plots. The yields have shown no falling off, which goes far to prove that the producing power of the land is not impaired by such heavy cropping, provided it is helped by other conditions. The following are the yields of five crops of Federation in the Wimmera, Mallee, and fringe, and northern plains:—

Wimmera.—

C. Nowatna, Jung, average for 5 years, 31.3 bushels per acre.

A. Boyd, Minyip, average for 5 years, 22.1 bushels per acre.

A. Hutchings, Lubeck, average for 5 years, 19.5 bushels per acre.

Mallee and fringe.—

B. Lavery, Watchem, average for 5 years, 19.8 bushels per acre.

A. Barber, Narraport, average for 5 years, 19.3 bushels per acre.

D. B. Innes, Rainbow, average for 5 years, 17.6 bushels per acre.

W. Williamson, Boort, average for 5 years, 16.2 bushels per acre.

North and North-Eastern Plains.—

W. Sproat, Donald, average for 5 years, 28.8 bushels per acre.

Nixon Bros., Eddington, average for 5 years, 22.9 bushels per acre.

H. Pollard, Glenloth, average for 5 years, 12.0 bushels per acre.

WHEAT VARIETY YIELDS FOR LAST SEASON.

Federation wheat, like most other varieties, has shown a disposition to favour certain soils and weather conditions. Other varieties with reputations for prolificacy are constantly coming forward, hence the trials, year after year, of varieties having good reputations against Federation. A consideration of the returns which are grouped into districts, allows a good idea to be formed of the suitability of varieties to particular districts.

WHEAT RETURNS.—SEASON 1909-10.

Name.	Address.	ederation.	College Purple Straw.	Australian Talavera.	Yandilla King.	Jumbuck.	
		Yield per Acre in Bushels.					
Northern and North-Eastern.							
Sharp, T. R.	Goorambat ..	20·7	15·1	15·8	17·3	21·5	18·0 average of all varieties
Nixon Bros.	Eddington ...	11·2	7·3	10·4	11·5	8·2	9·7 " "
Trewick, J.	Elmore ...	19·1	15·9	14·0	14·4	10·8	14·8 " "
Sproat, W.	Donald ..	29·6	28·2	33·2	33·3	21·4	29·1 " "
Carter, J.	Marong ...	12·7	8·7	8·7	10·8	8·8	9·9 " "
Pollard, H.	Glenloth ...	18·8	19·1	19·5	19·0	17·6	18·8 " "
Average yield per acre of six fields	..	18·7	15·7	16·9	17·7	14·7	16·7 " "
Wimmera District.							
Longerenong College ...	Dooen ...	35·0	19·41	24·10	32·06	17·43	25·61 average of all varieties
Hutchings, A.	Lubeck ..	21·2	14·4	11·0	13·1	8·4	13·6 " "
Boyd, A.	Minyip ...	27·5	18·6	19·6	17·6	11·9	19·0 " "
Gibbins, E.	Wail	32·4	22·0	25·6	28·8	14·2	24·6 " "
Nowatna, C.	Jung	27·9	19·6	19·7	27·0	23·8	23·6 " "
Average yield per acre of five fields	...	28·9	18·8	20·0	23·7	15·1	21·2 " "
Mallee and Mallee Fringe.							
Witney, J.	Jeparit ...	4·4	8·0	4·9	4·0	4·5	5·1 "
Pilgrim, J.	Nhill	22·0	20·1	21·9	17·7	13·7	19·0 "
Lavery, B.	Watchem ...	27·4	20·4	24·4	31·2	21·0	24·8 "
Barber, A.	Narraport ...	26·8	23·0	25·3	29·0	23·8	25·5 "
Williamson, W.	Boort	16·2	10·6	17·3	18·6	20·4	16·6 "
Innes, D. B.	Rainbow ..	17·0	10·9	12·5	15·3	14·5	14·0 "
Average yield per acre of six fields	...	18·9	15·5	17·7	19·3	16·3	17·5 "
Average yield per acre for whole State	...	21·7	16·5	18·1	20·0	15·4	18·4

Northern Plains.—Federation exceeds all other varieties by a bushel per acre. Yandilla King, however, produced nearly 4 bushels per acre more than Federation on the same plot (W. Sproat's) at Donald. Another variety which has yielded consistently well is Australian Talavera. Of the other two varieties, College Purple Straw did well, but in no case did the yield exceed that of Federation. It has decided advantages as a hay wheat. Jumbuck is reported as liable to shell, and the low returns in some cases are due to this loss.

Wimmera.—In no place in the State has Federation yielded so consistently well as in the Wimmera. The magnificent average yield of 28.8 bushels per acre, with a maximum crop of 35 bushels, constitutes a record in experimental field work. Yandilla King has yielded 5 bushels per acre less on the average than Federation. Australian Talavera is $3\frac{3}{4}$ bushels per acre behind Yandilla King, the next varieties in order of yield being College Purple Straw and Jumbuck.

Mallee and fringe.—In the Mallee and fringe, Federation sustains its first defeat for the premier position as a grain wheat. Under identical conditions at Watchem, Narraport, and Boort, Yandilla King gave superior returns. At Nhill, Rainbow and Jeparit, Federation gave the better returns. While it is far too early to form a definite conclusion upon the matter, I must point out that, in the western portion of the Mallee and fringe country, Federation has yielded consistently better than on the eastern side. Especial efforts will be made to confirm this fact next season.

Australian Talavera again holds third place to Yandilla King and Federation. It is evident that this is approximately its true comparison as a grain producer. Jumbuck occupies fourth place for the Mallee group in place of College Purple Straw. It is curious that few, if any, cases were reported from the Mallee fields, of Jumbuck shelling its grain. It is just possible that a rather earlier harvesting escaped the heavy winds prevailing at that time, hence a greater proportion of grain harvested.

The general averages for each variety, regardless of locality, entirely confirm the order of precedence as grain producers. Federation has fairly won and worthily maintained the high opinions formed of it, when introduced into Victoria by the writer five years ago. Upon a wide range of soils, and under a variety of weather conditions, it has yielded consistently well, and may, with absolute certainty, be recommended as a grain wheat in any district in northern Victoria.

Conclusion.

The writer takes this opportunity to state that, from henceforth, new duties will occupy him elsewhere, and the continuance of the experimental field work will be in other hands. It is difficult to adequately express the obligations the writer is under to those farmers who have so wholeheartedly and sympathetically assisted him in carrying on these wheat experiments during the past five years. That they have served a useful and practical purpose, and have added largely to the wealth of the State, is evidenced by the universal popularity and extensive growth of Federation wheat.

The work of improving the State yield of wheat is laid down with a considerable amount of personal regret which is tempered by the knowledge that the wheat-grower is now sufficiently alive to the fact that the work must go on without interruption. A further acknowledgment is due to the patience, loyalty and co-operation of the officers of the Field Branch, through whose efforts the field operations were carried into effect.

THE ADVANTAGES OF SUBDIVISION OF ESTATES.

The Results of a Three-years' Experience of a Subdivided Estate in the Lilydale District.

J. S. McFadzean, Dairy Supervisor.

The value of agricultural land is based on its contained fertility as represented by its capacity to produce an estimated quantity of some saleable commodity. The natural fertility of land is always possible of improvement by cultivation; and up to a varying limit, the more systematic that cultivation is, the higher the production will be. On this fact rests the practicability of the system of closer settlement. To allow of such settlement being profitable there must, however, be a fair working margin in sight between the price of all land purchased for this purpose, and its prospective value when ultimately brought to its full state of productiveness. Where full allowance has been made for this, the subdivision of land for closer settlement has a fair prospect of being satisfactory to all concerned, and not otherwise.

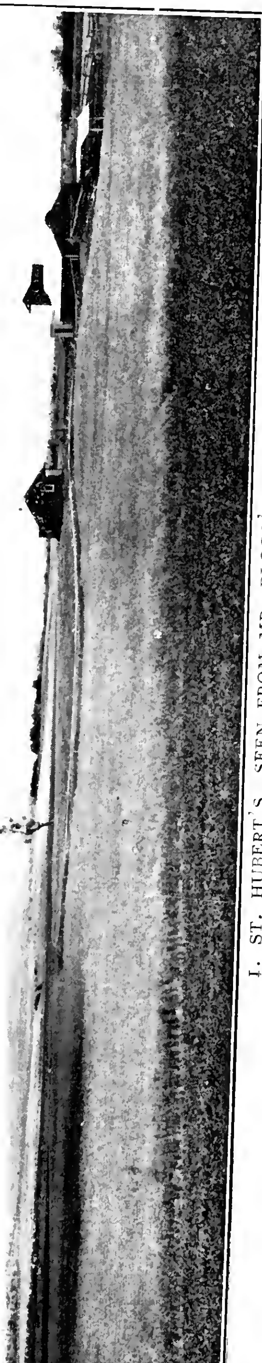
In reviewing the conditions of the dairying industry then existing in the Lilydale Shire, allusion was made in the *Journal*, of February, 1907, to the probability of some of the larger estates there becoming subdivided before long; and their carrying capacity for stock being accordingly increased. Since then, some little progress has been made in this direction with Mr. Joseph Timms' St. Hubert's estate at Yering.

This property lies between the Yarra and the Healesville-road, some 6 miles to the north-east of Lilydale; and was so named by one of the original owners, Mr. Hubert de Castella. Along with the Chateau Yering estate, and a large area of adjoining country, this property was purchased from the Crown by Mr. Paul de Castella some 45 years ago. Soon afterwards, that portion which comprised the St. Hubert's estate, as later named, was sold to Messrs. H. de Castella and Andrew Rowan, who carried on dairying and stock raising here for many years.

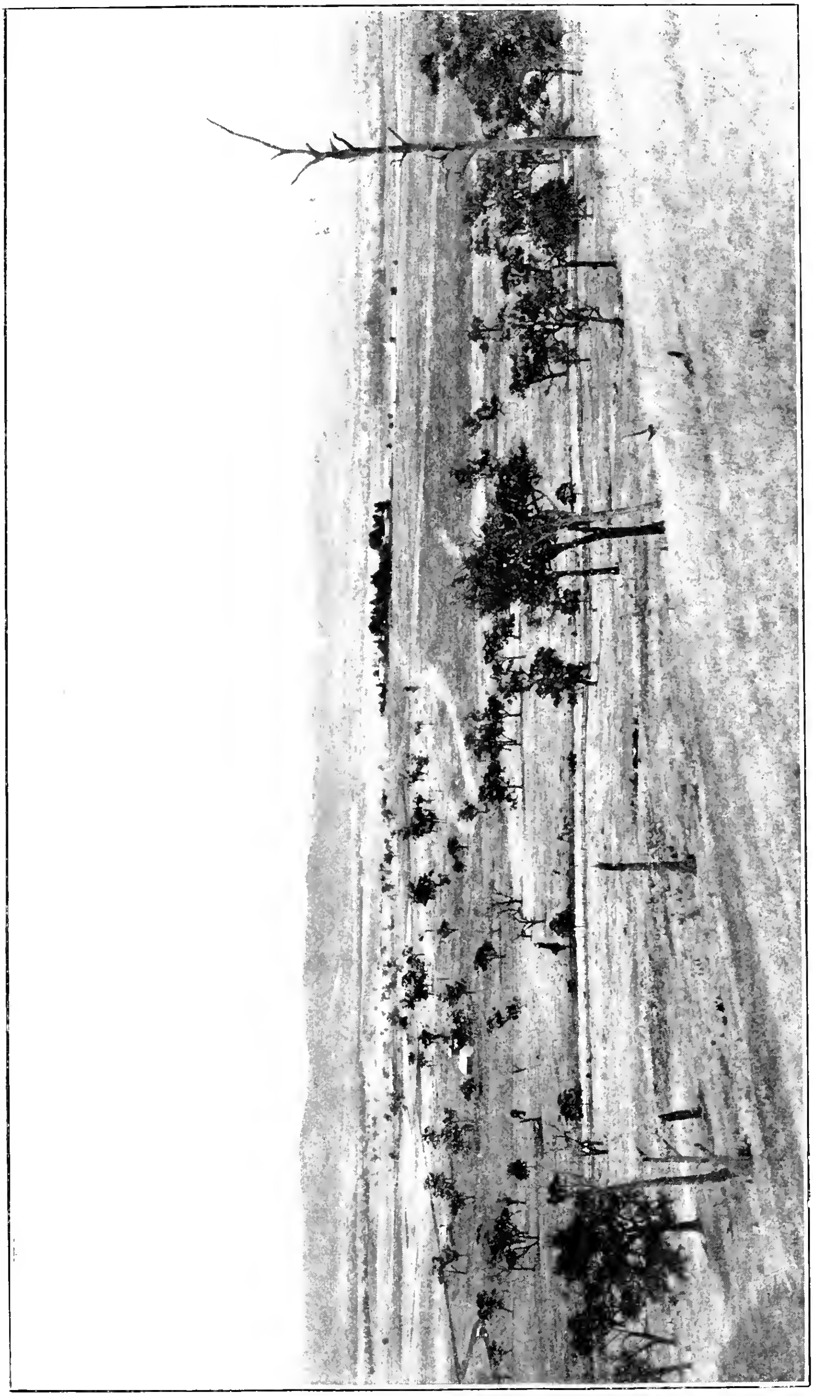
Among the many improvements effected under Mr. Rowan's management was the building of a levee bank to keep back the flood waters of the Yarra from the rich flats lying on that side of the property. This bank is about 4 yards high and about 9 yards wide at the base, and extends down the whole length of the St. Hubert's river frontage of some 5½ miles. A smaller bank, with drain above it, was also made at the foot of the rising ground on the other side of the flats to check the surface water from the hills, and carry it round to the river; thus leaving this low lying ground protected from flooding other than by the rain falling directly on it. Only one breakaway is recorded in connexion with this work, and that occurred about 1890-1; not long after the bank was built, and before it had become properly settled.

The St. Hubert's "No. 1" milking shed and dairy, with rough pit silo adjacent, were also built by Messrs. Castella and Rowan; and the spacious brick buildings comprising wine cellars, men's quarters, stabling, &c., which surround the homestead will long remain as evidence of much capital spent in improvements under their ownership. The wine cellars, which have quite recently been converted into bacon and cheese factories, were contained in a large two-storied brick building divided into two parts. The larger of these is fitted with lifts, and had a floor space of 38 yards by 40 yards; but a portion of this is now partitioned off for the cheese-making room, and part for the manager's office; the rest being in use for cheese storage. The ground floor of this section is still in the hands of the workmen; and large refrigerating rooms for cool storage are being fitted on one side of it, and curing vats for the bacon on the other. The smaller section of this building is taken up by the bacon curing, and small goods factory. It may be mentioned that, connected with this farm, there is a beautifully fitted and well stocked dairy produce establishment in Elizabeth-street, Melbourne, where the many lines of goods produced and manufactured at St. Hubert's are retailed direct to the consumer. The whole of the factory buildings are being fitted with electric light; and considerable expense is being incurred to make them complete for their work.

The large expanse of roofing covering these several buildings previously gave a catchment area for rain water sufficient to supply all the requirements of the homestead in this respect. This is stored in underground tanks; and pumped by steam as required to a large distributing tank, which forms the base of the clock tower surrounding the feed room end of the stabling. From this it was reticulated throughout the buildings in pipes. The demands of the piggeries, slaughterhouse, and factories now call for a much greater quantity of water than can be thus provided; and a pumping plant supplies the deficiency from the Yarra, about 1½ miles distant. The piggery is a lofty wooden building, with concrete flooring and drains, containing 30 pens 12 feet by 10 feet; and adjacent to this are steam boiler, coppers, feed-house, &c., and some larger pens for brood sows. This piggery is situated about half-a-mile from the homestead on the line of the water piping from the river; and still nearer the homestead is the slaughter house, where the pigs are killed under Government supervision.



1. ST. HUBERT'S, SEEN FROM MR. BLOGG'S FARM.



2. ST. HUBERT'S, SEEN FROM MT. MARY.

Surrounding these buildings are cultivation paddocks of oats, wheat, peas, &c., occupying ground that was formerly taken up by the 350-acre vineyard which supplied the wine cellars. This vineyard was first planted by Messrs. Castella and Rowan. About ten years ago the St. Hubert's property was purchased from these owners by Mr. D. Mitchell, of Cave Hill, who in turn sold it some five years later to Mr. J. Timms. Part of this latter sale agreement provided for Mr. Mitchell retaining the vineyard and cellars for a further term; and this time having elapsed during the past year, Mr. Mitchell had the wine on hand removed to Melbourne. Mr. Timms then had the vines uprooted, and the land ploughed for cropping. Though artificial manures were applied at sowing, only light crops resulted, the wheat making the best yield. Apparently the continual cultivation of the vines over a long period has greatly reduced the humus content of this soil, for it has now a very hungry appearance, which contrasts most unfavourably with the fertile looking heavily grassed paddocks of similar land adjoining, but which have had the advantage of being kept in good heart by judicious stock grazing for many years past. The natural grazing quality of much of this property was improved during Mr. Mitchell's term of ownership; for a large portion of it was then ploughed and sown with English grasses.

For many years past Mr. Joseph Timms, senior, has been, and still is, personally engaged in carrying out large railway contracts in the various States. His first purchase of property in this district was the Chateau Yering estate of 1,000 acres, which he bought some ten years ago from Messrs. C. and E. Miller; and for a time he made that his residence. Five years later, he bought the adjoining St. Hubert's estate, and some

3. St. Hubert's No. 2 Milking Shed.

additional property in the Eltham Shire across the Yarra. The St. Hubert's property then included about 600 acres across the Healesville-road, known as the Mount Mary paddocks; and the estate altogether in the Lilydale Shire then amounted to 3,900 acres. When Mr. Timms put this estate together he intended to run it as a dairy farm. There was already a 40-bail milking shed and separating room on the Chateau, and a 90-bail shed with separating room and cheese factory on St. Hubert's. He supplemented these by building what is known as the "No. 2" shed of 80 bails, with cooling room, about $1\frac{1}{4}$ miles from the St. Hubert's homestead towards the Healesville end of the property. In its winding course here the Yarra will give this estate some 6 to 7 miles of water frontage; and the adjoining flats run back to a low ridge varying from half-a-mile to perhaps 1 mile distant therefrom. The "No. 2" shed is built on a level rise at the foot of this ridge in as central a position as could be chosen.

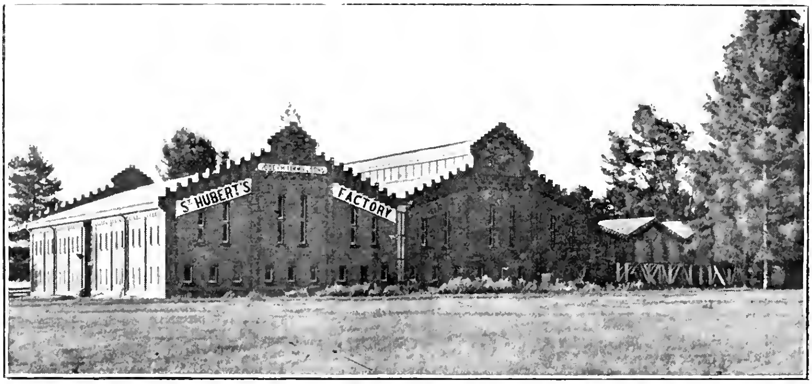
4. MR. WHITEHEAD'S MILKING SHED.

Mr. Timms began dairying in the No. 1 Chateau shed in 1905; and the "No. 2" shed was finished and work commenced in it in the spring of 1906. With 400 milking cows in these three sheds the difficulty of obtaining satisfactory labour to carry on the dairy work soon presented itself; and it also became apparent to the owner that, to make the concern properly successful, his whole time would need to be given up to the management of the dairy farming. His contracting business would not allow of this; and the idea of subdividing the property and offering it by auction was put into effect.

The heavy value of the improvements on the St. Hubert's homestead placed it beyond consideration as an ordinary dairy-farm property, and with 1,208 acres it was retained by Mr. Timms; but the rest of the estate changed hands, being divided amongst fourteen buyers.

A block of 130 acres of splendid river flat in the extreme easterly end of the estate was purchased by Mr. C. Blogg. The Mt. Mary paddocks were bought by Messrs. Du Pury and D. Mitchell, who own adjoining properties. Messrs. Whitehead Bros. obtained a 227-acre block of mostly flat land, with a creek running through the length of it, fronting the Healesville-road. Two adjoining blocks of 75 acres and 110 acres fell to Messrs. Rowe and Thos. Timms respectively. The "No. 1" St. Hubert's shed, with 203 acres running from the St. Hubert's-road to the Yarra, was purchased by Mr. McClure. Messrs. Gilbert and Pochon bought the next two blocks of 164 acres and 177 acres respectively, each having a road and river frontage. Mr. F. Towt bought The Lodge—the brick dwelling at the entrance to the St. Hubert's estate—with 366 acres between Mr. Pochon's block and the Chateau Yering; this block also running from road to river. The Chateau Yering homestead with 433 acres, and including several acres of vineyard and the wine cellars, were purchased by Mr. K. H. Blogg. Blocks adjacent to this of 120 acres, 52 acres, and 44 acres, were bought by Messrs. Kerr, Gillespie, and Jeans respectively. Mr. Timms also subsequently sold his Eltham properties. The prices obtained for the blocks in the Lilydale Shire comprising the estate, ranged from £6 10s per acre for the poorer quality of the hill land furthest away from the river, up to £30 per acre for the river flats; the average run of the blocks having a fair proportion of medium to good land with road and water frontage going at about £20 per acre.

Mr. J. Timms, junior, continued to use the St. Hubert's farm in its reduced area for stock grazing, holding firm to an intention to resume dairying again before long. The drought of 1907-8, however, caused some temporary changes on some of these farms; for the splendid growth of English grasses on the flats resulted in some tempting offers being



5. ST. HUBERT'S BACON AND CHEESE FACTORY.

made for their hire from owners of starving stock in other less-favoured districts. Mr. C. Blogg let his land for six months for 30s. per acre. About half of the St. Hubert's farm was let at 25s. per acre for twelve months; and on both the Chateau and the Lodge properties dairying gave place to grazing for a time. Some further changes have also recently taken place here. Both of these last mentioned properties, as well as those of Mesrs. Thos. Timms and McClure, have changed hands at an advance on the prices paid for them at the subdivisional sale. Mr. J. Timms, senior, has again added the Chateau and Mr. T. Timms' block to his local possessions. Mr. Prior has bought the Lodge; and Mr. Herkes has purchased Mr. McClure's. Since Mr. C. Blogg resumed possession of his block, he has brought nearly the whole of it under cultivation, 70 acres being sown for hay, and 30 acres planted with potatoes this season. His shed is also in use, as he is milking 45 cows there, on shares for the St. Hubert's owner, and grazing them on one of the adjoining paddocks of that farm.

Photograph No. 1 shows this farm in the foreground of a general view of that side of the old St. Hubert's estate. The "No. 2" milking shed is seen on the left; and the high ground to the right in the distance is Mt. Mary. A tree, further to the right, almost hides the piggery, and the slaughter house above it. The St. Hubert's homestead is also hardly distinguishable through the pines surrounding it which show in the centre of the picture. On the line of hill showing between Mr. Blogg's house and his shed. Mr. Gilbert's place can be seen; while to the right of the milking shed a cluster of buildings mark Mr. Pochon's and Mr. Prior's buildings in line; the former being about half-a-mile the nearer in reality. This photograph was taken from the levee bank before mentioned, which begins on this farm, the success of which is demonstrated by Mr. Blogg being able to cultivate the whole of his ground during the past season of heavy rainfall. A small portion of this bank may be seen in the right of the picture.

Turning to photograph 2 the view shows the estate from the top of Mt. Mary. In this, Messrs. Whitehead Bros.' farm and one of the dwellings are shown nearest on the left. Directly over the house, and still to the left are Mr. Prior's house and shedding. Over Mr. Whitehead's milking shed is seen the old "No. 1" St. Hubert's shed, now owned by Mr. Herkes. The pines in the centre again hide much of the old homestead. To the left of this, lies Mr. Gilbert's farm steading. Over that again is seen the Chateau Yering; and Mr. Pochon's farm is over Mr. Herkes' shed. From these photographs some slight idea of the position as well as the extent of the subdivided estate may be gained, for in No. 1 nothing of the Chateau nor of Whitehead's can be seen, and in No. 2 almost nothing shown in 1 is in view; while from neither can the size of the Chateau or St. Hubert's homesteads be gauged.

Illustration No. 3 shows the "No. 2" shed and dairy with the pit silo which is now being enlarged by raising the wall. A herd of 160 cows

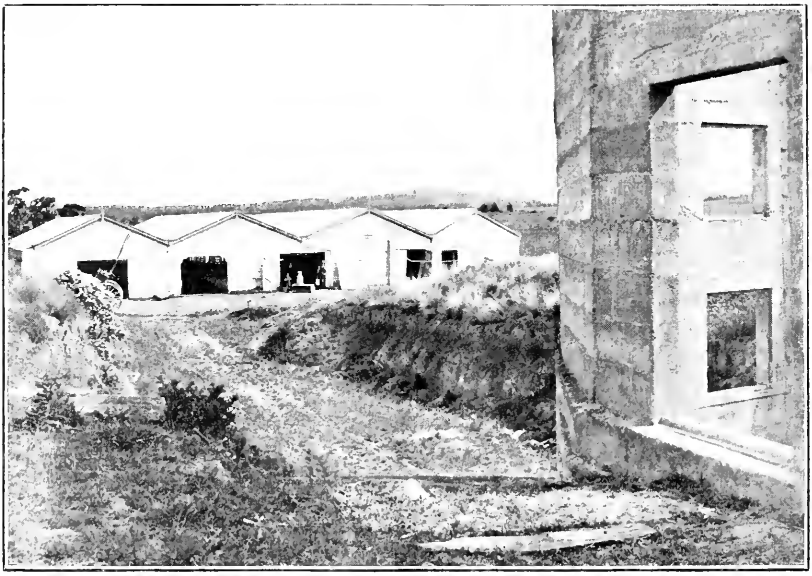
6. ST. HUBERT'S FARM BUILDINGS.

are milked here for supplying the cheese factory; and they were averaging 2 gallons per cow at the time of inspection in November, being then nearly all in their flush.

Photograph No. 4, shows the milking shed on Whitehead Bros.' farm where 40 cows are milked. This farm is also supplying the factory. The majority of these cows are Ayrshires; and are very typical stock, and good producers. A 100-ton wood and iron silo is in use here, and 72 acres are under cultivation. The flats along the creek are of very good quality; but their working could be much improved by underground drainage.

Nos. 5 and 6 show as much of the St. Hubert's steading and factory as the trees around it will allow.

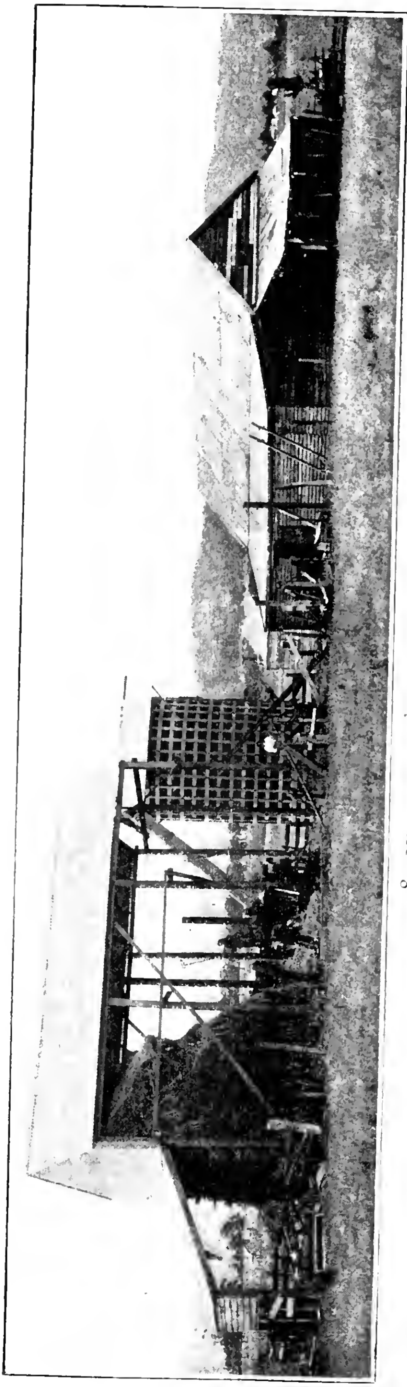
In No. 7 we have the old "No. 1" shed and silo on Mr. Herkes' property. This silo is of concrete, and was built by Mr. D. Mitchell on the site of the old pit used by Mr. Rowan. It is octagonal in shape.



7. MILKING SHED AND SILO, MR. HERKES' FARM.

32 feet diameter, and 28 feet high. Only a portion of this silo has been lately used; the maize being stacked across one half of its floor space. There are 27 cows in milk here, and 60 acres under cultivation; the factory taking this milk also.

Mr. Gilbert's steading is shown in illustration No. 8. Twenty-five cows are milked here, and 50 acres are cultivated. This farm is probably the most productive for its acreage on the estate up to the present, the cows being kept in a good flow of milk throughout the year by judicious management and the assistance of the silo. All these farms have a good proportion of the river-flat land; and the rich black soil therein is not to be surpassed for growing fodder crops. Mr. Gilbert sows his oat crop early, and gets as much out of it as possible by feeding it off with his dairy herd right into September; and the ultimate yield of hay appears to be all the heavier for the treatment. The cows here were

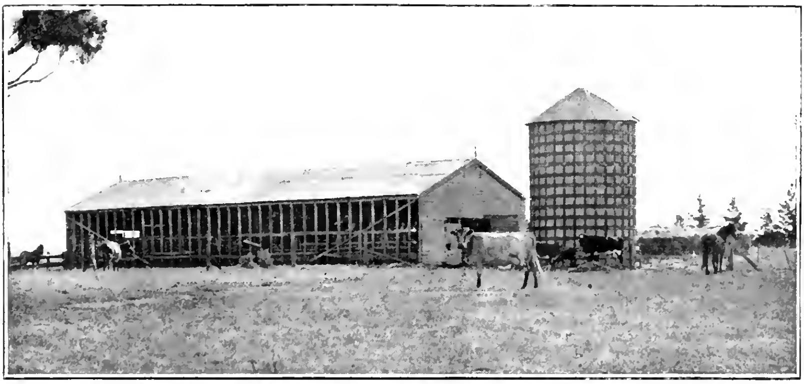


8. MR. GILBERT'S FARM STEADING.

9. HOMESTEAD AND FARM BUILDINGS, MR. POCHON'S FARM.

averaging 7 quarts per day last February, 8 quarts in August, and 9 quarts in November.

The next view (No. 9) shown is that on Mr. Pochon's farm, where 22 cows are milked to supply a Hawthorn retailer. There are 28 acres in cultivation here; but as yet there is no silo, the surplus maize crop being stacked till used. Besides working this farm Mr. Pochon, under contract with a city firm of wine-merchants, continues to manage the vineyards on Mr. Prior's and the Chateau Yering properties, which now total only 40 acres.



10. MR. PRIOR'S MILKING SHED AND SILO.

Photograph No. 10 shows the milking shed and silo on Mr. Prior's farm. For some time after he purchased this farm, Mr. Towt milked from 50 to 60 cows; but, up to the present, Mr. Prior has gone in mainly for grazing and cultivation. The place is at present carrying 160 head of stock; while 50 acres were cropped for hay, and 25 acres are sown in maize.

The last illustration (No. 11) is that of the old Chateau shed. As has been stated, on Mr. J. Timms deciding to again take up the dairying business, this property was re-purchased by him from Mr. Blogg; and 75 cows are now milked here. This shed, as well as the "No. 2," is fitted with tramways to facilitate the carriage of milk to the cooler, as well as the other work of feeding and cleaning. Mr. Timms now intends to fit both these sheds up with machines, owing to the difficulty of obtaining reliable milkers.

With the exception of Mr. Whitehead's herd the cows on all these farms are big framed stock showing Shorthorn, Holstein and Ayrshire crosses, and are well suited to the heavily-grassed country they are on. The dairying and general farming are under the superintendence of Mr. J. Timms, jnr.; while the factories and general business of the place is in charge of Mr. Merry, who has for many years been connected with Mr. Timms, snr., in other lines of business. Besides this, each department throughout the farm and factory is under a working manager who is directly responsible for the proper carrying out of his part of the work.

As regards the result of this subdivision to date there are, of the original estate, 1,285 acres now used for grazing stock other than dairy cattle. This leaves 1,830 acres in use for grazing dairy stock, and 785 acres under cultivation. Though as yet we have practically no increase in the number of cows milking at the dates of the two spring inspections of 1906-7 and 1909-10, still, from the 400 cows, the returns at the first date were (approximately) 520 gallons per day; while on the latter inspection the yield was 770 gallons—an increase of almost 50 per cent. within three years. In the former instance, these cows were in three herds; now they are divided into seven. By this subdivision, not only have the cows much shorter distances to travel to the sheds, but the number of hands engaged in milking has been increased from 18 to 25; which

11. THE OLD "CHATEAU YERING" SHEDDING.

allows for the work being done more quickly; and the cattle having more time to graze, or rather having less time under durance in the yards and sheds. A good many of those engaged in milking the stock now, have also a personal interest in the results; which makes for better work than usually results from hired labour. As the cultivation in this three years has also increased from 320 acres to 785 acres, and several silos have been built, the increased yield may be expected to be maintained, and possibly improved upon. There are several families residing on the estate; and, whereas the total number of hands previously employed was usually less than 40, there are now about 70 regular employés and 20 temporary men on the place.

The cheese factory books show milk purchased up to 1,195 gallons per day, with an average of 900 gallons per day for the months of October, November, and December. This, of course, includes surplus milk from farms in the neighbourhood other than those on the old estate; and if it were not for the establishment of this factory almost the whole of this milk would have been under offer to city retailers. There is no doubt, therefore, that the withdrawal of this milk from the city supply would have some little bearing on the wholesale price of the milk forwarded from here during the past spring months; and the producers of the city supply have reason to be slightly interested in the success of this factory.

As the whole of these farms now dairying are possible of being cultivated, and only a small portion of each is at present broken up, it will be many years yet before all will have reached their full limit of productiveness as regards dairy farming. With its handy position to the railway station, proximity to the metropolis, first class water supply, and splendid soil, the Yering district has many advantages that render it particularly adapted for dairy farming when carried out on up-to-date lines.

BACCHUS MARSH FARM COMPETITION, 1909.

A. V. Becher, Dairy Supervisor.

A. Stock.—The cattle on the farms visited were considerably above the average. Especially was this so in the case of four herds of milking shorthorns, which included some Royal Show winners. The country around the Marsh seems particularly adapted for growing typical specimens of this very fine dairy breed; Mr. James Lidgett at Myrniong possesses some of the best cows in the State; whilst his brother, Mr. Henry Lidgett, has the present champion milking shorthorn bull.

The only farm where I saw evidence of the scales and Babcock tester being used was at Mr. Meyers', and he duly gained points for it. It seems very difficult to get farmers to realize the importance of regularly weighing and testing each cow's yield, when it has been asserted on good authority that at least a third of the cows milked in this State do not pay for their feed let alone show any profit; and it is only by this means of keeping records that the individual yield has any prospect of being improved.

In horses, Mr. Robertson gained most points, having two very good stallions, which I was pleased to see did their share of the ordinary farm work. It is a pity that stallions are not more often given regular farm work, instead of, as in most cases, being pampered up and overfed on boiled barley and not given nearly enough exercise to keep them in good health and effective as sires. Some nice draught mares were also to be seen at Mr. Meyers', a two-year-old filly in particular being exceptionally well grown.

Sheep were in evidence on all the Myrniong farms, and seemed to do particularly well, Shropshires being most in evidence. Mr. James Lidgett had 30 acres of very fine rape on which some well-grown wethers were grazing. His ewes and lambs also looked well. Mr. Meyers' pure Shropshires were a select little lot, the lambs being well grown and showing plenty of quality. Four competitors did not carry sheep on their farms.

On most of the farms, pigs were conspicuous by their absence; I only saw two brood sows on the nine farms visited. It seems hard to understand why this very profitable branch of farming is not given more attention; and I should like to see more points allotted for this class of stock in future. I know many of the farmers get no skim milk from the factory, but with the fine lucerne country most of them have, I see no reason why they should not all keep a brood sow or two. My own experience has been that a good sow always paid me better than my best cow

The poultry were mostly of a nondescript class, with the exception of Mr. Dickson's; but most competitors lost points in this section on account of the poor accommodation provided for the birds and the insanitary state of the houses; on one farm they evidently roosted on the implements.

B. Best System of Cropping.—The crops seen on the majority of the farms were not as good as one might expect considering the good season. This I consider was mainly due to defective cultivation methods and dirty seed. Several crops suffered from want of harrowing, the roller having been used last, thereby causing the soil to cake, strangle the crop, and allow the moisture to evaporate. In a wet season like the one just passed through, the harrows require to be used frequently to keep the surface soil loose, prevent evaporation, keep down weeds and give the growing crop a chance to stool.

There seemed to be no regular rotation followed by any competitor, except Mr. Kerr, who, on his graded flats, grew oats, barley, maize, and lucerne in the order mentioned. The others seemed to confine themselves to oats, barley and wheat, no rye having been grown at all. Few farmers realize the value of rye as a rotation crop. This cereal, besides leaving a much larger amount of organic matter in the form of roots and stubble than either wheat, oats, or barley, provides sufficient available plant food for a succeeding cereal crop. If sown in the autumn it can be fed off with sheep, and either threshed for seed (which brings about 4s. per bushel) or ploughed in for green manure.

Red Clover (*Trifolium pratense*) is also a good rotation crop, being known in America as the King of Soiling Crops; sown with wheat or barley as a nurse crop, it does remarkably well, and provides splendid summer feed in the stubble. Being a legume it has the power of obtaining the free nitrogen from the air, besides making a tremendous amount of root matter.

C. Cleanest and best Crop of any kind.—Mr. Burgess' crop of 40 acres Algerian oats gained the maximum points in this section. Being grown on new ground it had every appearance of making a very fine clean sample of seed oats if kept for grain. He also had 100 acres of Federation wheat of good colour, and well stooled, but in places it had suffered from the wet winter. Mr. Urquhart also had a very good oat crop, but it lost points from having patches of Cape Weed through it, as did also Mr. James Lidgett's crop.

D. Machinery and Implements.—The implements on the whole were very complete. Mr. James Lidgett has a very handy oil engine, which seems to do practically everything except milk the cows. Mr. Urquhart's implements were exceptionally well cared for. A binder, which had been in use for six years, looked as if it had only cut about 10 acres, and I was pleased to see the ploughs and harrows had their regular place in the shed on this farm. Many farmers think that because an implement is made of steel or iron, exposure to the weather does it no harm; it not only rusts all the bolts and mould-boards, but destroys the temper of the material it is made of as well. Mr. Dickson lost many points in this section, as he had sold all his implements some time ago, and has now to depend on outside work for his cultivation, which has the disadvantage of often not being able to get the work done at the right time.

E. Fencing.—The fences on the majority of the farms were in good order, and appeared to be regularly attended to, judging by the supplies of posts and rails available for repairs. I should, however, have liked to have seen more subdivision fences on some of the Myrniong farms. It is far better to divide some of the larger paddocks in two, and spell one half while the other is being grazed, than have the stock running over the whole paddock and getting no chance of fresh grass periodically. The gates on the winning farm deserve special mention; they are well hung on separate posts and nearly all neatly painted.

F. Orchard and Vegetable Garden.—All the farms, I was pleased to see, grew their own vegetables, and also possessed a few useful fruit trees. Mr. Kerr's garden was the best seen, water being laid on everywhere. Besides a regular supply of fresh vegetables, there is a good flower garden and shrubbery surrounding the house. Mr Burgess also deserves credit for a young orchard of about sixty trees, planted last year, which ought to do well in that class of country.

G. Watering Stock.—The water supply was good, nearly all the farms having troughs supplied with ball taps. At the same time, the open dams would be better fenced off from the stock and water laid on by gravitation which is possible in most cases. Stock during hot weather generally stand in open dams, treading in the banks and contaminating the water. This can be easily avoided with a little forethought.

H. Dwelling and Outbuildings.—This section was exceptionally good. Points were lost more from a lack of tidiness and maintenance than from want of buildings. Mr. Urquhart has an admirable system of having his buildings, drays and waggons painted every three years, a plan which is very rarely carried out among the farming community of the State. Some of the stables would have been the better for a few more windows, as they must be very dark during the winter months.

I. Reserve of Fodder.—Mr. Kerr scored the maximum points in this section, having an old stack of lucerne hay of 25 tons and another containing about 15 tons. Mr. Burgess was unfortunate in being a new settler. Having only been eighteen months on the Staughton Vale estate, he had to buy all his feed; but he has a good hay shed in course of erection, and in future he will be able to make adequate provision.

Silos were conspicuous by their absence. After the experience this district had last year, it is surprising there are not any to be seen on the farms, as a good deal of the surplus feed seen about the headlands and plantations could be put to profitable use if converted into silage.

J. Tree Planting.—A great many new plantations are to be seen on the majority of the farms visited. Mr. Burgess has done wonders in this respect with sugar gums. Should they all grow, he will have a bountiful supply of shelter around his homestead and paddocks. Mr. Robertson also has some corner plantations of pines and cypress evidently doing well.

K. Improvement in the Original Productiveness of the Soil.—Mr. Burgess deserves great credit for the work he has done during the short period he has been at Staughton Vale. He started with a raw block of 234 acres. Seeing the farm now with buildings, fencing, fallowing, grubbing, tree planting and 150 acres of standing crop, it is hard to realize that it has all been done within so short a period. It just shows what the right class of man with a little capital behind him can do on a closer settlement block. Mr. Kerr scored well in this section for the way he has graded and levelled some of his flats for lucerne under irrigation.

I was particularly struck with the poor quality of the feed in the grazing paddocks. Thistles, Barley Grass, Wild Mustard, Spear Grass, Crow's Foot, and Cape Weed seemed to comprise the bulk of the herbage. Mr. Robertson was the only competitor who had a paddock of rye grass. It seemed to be doing remarkably well, and proves that there is no excuse for not having clean well-grassed paddocks. Farmers are too apt to keep to the same paddocks for cropping and grazing year by year, instead of going regularly around the farm with the plough, cultivating some new ground each year, and putting the old ground down in grass. By this means they not only improve the fertility of the soil, but keep down the useless weeds and rubbish that gradually creep into all the paddocks.

The lucerne seen on many of the farms clearly shows what a valuable fodder it is. At Mrs. Scott's, in particular, there is a splendid 30 acre paddock, which for a first season's growth is exceptionally clean.

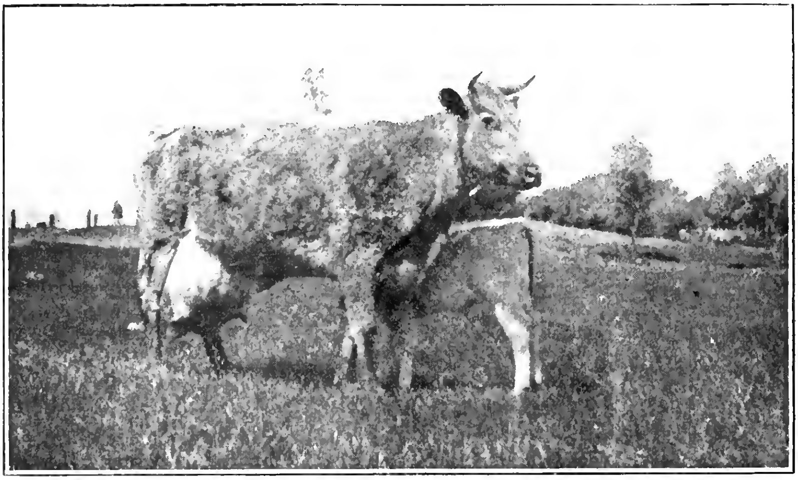
Farmyard manure is evidently valued in this district. Good compost heaps were to be seen on most of the farms. If the use of gypsum is adopted in the stables, cow-sheds and pig-styes, it will not only help to keep them sweet and clean, but by fixing the ammonia in the manure considerably enhance its value.

BACCHUS MARSH FARM COMPETITION, 1909.

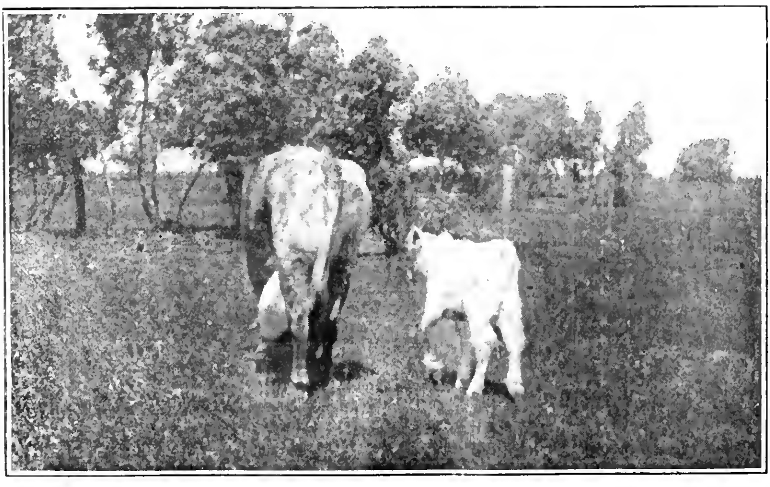
Competitor and Address.	MAXIMUM POINTS OBTAINABLE—															
	A.					B.	C.	D.	E.	F.	G.	H.	I.	J.	K.	Total
	Cattle. 30	Horses. 20	Sheep. 15	Pigs. 5	Poultry. 5	15	20	20	15	5	10	20	15	5	50	250
Urquhart, James, Bacchus Marsh	15	15	8	—	2	13	18	20	14	3	8	19	12	2	25	174
Lidgett, James, Myrniong	29	12	15	2	1	10	16	17	11	2	8	18	10	3	12	166
Kerr, James, Bacchus Marsh	24	16	—	—	1	9	8	16	9	5	9	17	15	4	30	163
Meyers, Thomas, Myrniong	20	14	12	4	1	8	14	15	12	1	7	14	10	2	17	151
Burgess, O., Staughton Vale	4	14	—	—	1	12	20	18	13	4	5	12	—	5	40	148
Robertson, D., Myrniong	12	17	11	2	1	9	13	12	7	2	4	7	9	3	25	134
Lidgett, Henry, Myrniong	25	9	10	—	1	6	8	15	9	2	6	13	7	2	10	123
Scott, Mrs., Parwan	18	8	—	1	1	8	10	15	9	2	7	10	5	2	15	111
Dickson, Robert, Greenside	7	9	—	2	5	9	7	2	12	3	4	10	5	2	25	102

A DECEPTIVE COW.

The accompanying illustrations are those of a cow prohibited under the *Milk and Dairy Supervision Act.* On appearances she would be judged a heavy milker. As a fact, she gave practically no milk, and such as was



yielded was either purulent or curdled. The bulky appearance of the udder was due to tissue enlargement ("callousing"), the result of long-



continued sub-acute inflammation (Mammitis) of all the quarters. The illustrations have been reproduced from photographs furnished by Mr. E. A. Ryland, Dairy Supervisor.

BEE MORTALITY.

R. Beuhne, President, Victorian Apiarists' Association.

The mortality of bees in apiaries along the eastern base of the Grampians, which was referred to in the January issue of the *Journal*, continued for a short time after my inspection of the affected apiaries. Since then, I have received a report from Mr. Holden, Secretary of the Stawell Apiarists' Association, which includes many apiaries I was unable to visit. It shows that out of a total of 1,783 colonies of bees, 996 succumbed. The total number of colonies which went into winter includes over 100 colonies in the Victoria Valley where no losses were experienced. Deducting these from the total, the actual loss in apiaries affected amounts to 59 per cent. of the original number of stocks. But, as many of the surviving colonies had dwindled away to the minimum number of bees which is essential to recovery, I estimate the loss of bee life in the apiaries affected at 80 per cent.

The investigation as to the cause or causes of these enormous losses, which appear to occur at intervals of some years, has not proceeded far enough yet to definitely connect them with either *Nosema apis* or *Bacillus pestiformis apis*. In the case of both of these diseases, there are certain well defined symptoms which are absent in bees disappearing as those in the Stawell district did.

Microscopical examination of bees from different apiaries in Victoria, carried out by Messrs. C. A. Price and O. Willgerodt, has certainly proved the presence of *Nosema apis* spores in the chyle stomach of bees, showing either symptoms of bee paralysis or an absence of that robust and well-groomed appearence which the specialist bee-keeper associates with a thrifty condition of his stocks. But these symptoms have been known in Victoria for at least fifteen years and re-queening colonies so affected with a queen of a different (resistant) strain, together with replacing the old brood combs, has generally proved effective in eliminating the disease. On the other hand, there is reliable information available that a wholesale disappearance of bees without showing any symptoms of disease occurred as far back as 1872 in Central Victoria, long before the advent of Italian bees and of the frame hive. While colonies affected with disease are generally on the verge of starvation during a dearth of nectar and always less profitable, even in a good honey flow, it was the colonies yielding the best returns which disappeared during the recent epidemic in the Stawell district.

In view of the heavy losses sustained, bee-keepers look anxiously forward to a solution of the problem. The investigation on scientific lines being, as yet, in the initial stage, any means employed to prevent the recurrence of losses can be based only on the facts as they present themselves at present. Consideration must, however, be given to the possibility that this mysterious mortality may eventually be connected with *Nosema apis*, or proved to be another disease due to special bacteria, or merely the result of the consumption of food unsuitable under the prevailing atmospheric conditions.

In visiting the various apiaries I repeatedly found that two distinct lots of bees, in one instance both owned by the same bee-keeper but treated differently during the autumn months, showed totally dissimilar results. The best results were obtained with colonies which were extracted late in the season, the bees being afterwards confined to a single storey. In a small apiary of 27 colonies, extracting took place as late as June, even the honey from the brood chamber being removed. Although 9 colonies died, apparently from starvation, the others were in good order, whilst, at an apiary within a mile, where the hives had been left in what is, by most bee-keepers, considered ideal condition, that is "full of honey," the loss was 70 colonies out of 86. With one exception, the surviving 16 colonies were extremely weak. In another instance, an apiarist extracted the honey from 23 of the weaker colonies in his apiary of 88, after the main honey flow, and placed them, in single stories, in the scrub country some two miles distant. At the time of my visit, the 65 colonies in the main apiary, which had not been extracted, had dwindled down to 7 weaklings, while the 23 in the scrub had built up strong enough to divide each colony into two for increase. In a third case, part of an apiary was moved to the scrub without extracting the honey, and there was practically the same rate of mortality in both lots of bees.

From the foregoing facts the inference might be drawn that it was the late gathered honey which saved the bees, but the honey analyses (see page 62) show that samples 1, 2 and 3 were late gathered honey from *Eucalyptus leucoxylon* (White Ironbark) and taken from colonies which had succumbed. The percentage of moisture of this honey, which was found in the unsealed cells of the outside combs, is too high for safe food for bees at that time of year, even apart from the presence of fermentative organisms. It is well known that feeding sugar syrup, made too thin, in autumn, brings disaster to bees during winter or spring. Honey gathered late in the season, if the atmosphere is very humid as is the case after the autumn rains, cannot be evaporated by the bees to a sufficient density when stored in combs outside the cluster of bees. If contained in combs not covered by bees during winter, even honey gathered previously and of proper density will absorb moisture from the atmosphere, particularly if the cells are not capped over.

In Northern Europe and North America, bees are confined during winter to just the number of combs they can cover. In Australia, there is supposed to be no wintering problem with bees. Colonies are, in the majority of apiaries, left with all or most of the spare combs in the hives. If these combs are empty and dry, or sealed over when containing honey, there may be no other harm in this practice than a certain waste of the animal heat generated by the cluster of bees. But when a late honey flow occurs, and is succeeded by a severe winter, the honey stored in combs outside the cluster absorbs an abnormal amount of moisture from the atmosphere, as well as the condensed moisture due to the respiration of the bees.

The experience of several apiarists who have always shut their bees down to a single storey rather early in autumn, and the instances I noted in the Stawell district of bees coming through well when confined to a few combs, seem to point to the necessity of adopting a method of preventing the very late gathering of honey, and the deterioration of honey gathered earlier, by leaving to the bees only as many combs as they can cover. Even if, ultimately, the mortality should be proved to be due to a disease caused by a bacterium, it must be apparent that bees kept warm, and on food of normal density, are likely to be more resistant than when consuming great quantities of watery honey to produce the amount of animal heat necessary to maintain the requisite temperature of the cluster in a larger space.

Pending the final results of scientific investigation, I would recommend to bee-keepers :—

1. To avoid the transferring of combs of brood honey or pollen from one colony to another.

2. To return, as far as possible, extracted combs to the hive from which they were taken.

3. To remove all surplus combs before winter, after replacing them in the hive for cleaning up by the bees.

4. To mark the boxes of spare combs with the number of the hives from which they came, and to return them to the same hives when wanted in spring.

5. To treat a certain number of strong, medium, and weak colonies in the way suggested, if it should be impossible to deal with all.

VINEGAR FROM APPLES.

F. de Castella, Government Viticulturist.

A correspondent writes for information concerning the making of vinegar from apples. He asks the following questions :—

1. Would it be likely to pay?
2. What implements would be required?
3. How he should proceed?

As conversion into vinegar may provide a means of turning to account, apples which would be unsaleable for other purposes, a reply to the above questions at some length may prove of interest to apple-growers.

Good wholesome vinegar can undoubtedly be made from apples. Large quantities are produced from this source every year, in France. Though not quite equal to wine vinegar, it is, if properly made, superior to much of the malt, and other vinegars which find so ready a sale in Victoria, where the general public is very easy to please in the matter of vinegar. Curiously enough, it seems to have become so accustomed to the inferior article usually to be met with, that many persons even prefer it to the best wine vinegar, at least at first. Wine vinegar, in spite of its marked superiority, is, to some extent, an acquired taste with us, though once such taste is acquired it is preferred to all others. The writer had occasion to discuss this question recently with the leading wine-vinegar maker of South Australia. Though admitting that he encountered a good deal of prejudice at first, his business in the article continued to expand since, as he explained, "I never lose a customer."

The superiority of wine vinegar over that from all other sources is proved by the considerable quantity which is still imported, in bottle, from France. In spite of its high cost, persons with educated palates refuse to use any other. Excellent vinegar, equal to the best French, is now produced on a commercial scale, in Victoria, so there is no longer need to have recourse to the imported article. Apple, or perhaps more correctly, cider vinegar, though not equal to the best made from wine, from which it differs by a slight characteristic (but not unpleasant) taste, reminding of the apple, is nevertheless an excellent and wholesome product and one which is appreciated in most apple-growing countries. Indeed, persons accustomed to cider vinegar usually prefer it to any other.

WOULD IT BE LIKELY TO PAY?

To grow apples for the sole purpose of conversion into vinegar would, in all probability, be found unprofitable. It is only as a means of disposing of surplus fruit, which would otherwise be wasted, that the question merits consideration and trial on a moderate scale. Though ordinary vinegar (malt and artificial) is of poor quality, it is also very cheap. Competition, aided by the prejudice referred to above, in favour of the better known, though inferior article, would also have to be reckoned with. These militate against a rapid increase in the use of wine vinegar, although the latter is of a quality the best cider vinegar cannot hope to equal. Nevertheless, on a small scale, and more particularly for local sale in apple-growing districts, these obstacles apply with less force, and there would probably be a sufficient local demand to absorb a good deal of cider vinegar at a profitable price. Its suitability for use in the making of pickles and preserves should lead to a considerable local demand for this purpose alone.

The prices ruling for grapes for wine-making purposes should give some idea as to what might reasonably be expected for apples intended for somewhat similar purposes. Grapes have considerably increased in value, quite recently, owing to various causes, but until the present season £4 per ton has rarely been exceeded. Apples for cider making are worth even less, and it would appear, therefore, that for conversion into vinegar, it is scarcely probable that more than a couple of pounds per ton would be obtainable. Needless to point out, the grower who utilized his own produce would realize a higher price than he could expect from a purchaser who would have to make his profit.

Probable Yield per Ton of Apples.—Mr. J. Knight records a large number of observations as to the percentage of juice, and its specific gravity, yielded by numerous varieties of apples, chiefly grown in the cooler portions of the State.* Fifty-two samples of apples yielded an average of 71 per cent. of juice, with an extreme range of from 50 per cent. to 80 per cent. The average gravity of the juice for sixty-four samples was 1.069 (9.3 deg. Beaumé), the extremes being 1.051 and 1.088. On this basis the average yield in juice would be 158 gallons per ton. Allowing for loss during fermentation at the rate of 5 per cent., the yield in cider would amount to about 150 gallons per ton.

One of the leading cider makers in this State informs me that, with the plant generally in use, and operating on a large scale, he cannot obtain yields of juice equal to the above, which were obtained by treating small quantities of apples. Under these conditions, very much more thorough extraction is possible. He assures me that he does not get more than 80 or 100 gallons of cider to the ton. On a large scale, the last portions of juice can only be extracted by great pressure. After a certain point has been reached, the cost of extraction appears to be greater than the value of the juice obtained. The substitution of diffusion for pressure (see *Journal*, 1909, p. 365) would greatly increase the yield of juice.

During acetification a further loss would take place. This would amount, at a liberal estimate, to 7 per cent.: on this basis, the quantity of vinegar yielded by a ton of apples would be about 140 gallons. Common vinegar is sold in bulk at 1s. per gallon, at which price, £7 would be the amount realized from a ton of apples. Cost of manufacture would

* See *Journal*, 10th June, 1909, p. 348.

certainly not exceed £2 per ton.† This would leave £5 per ton as the value of the ton of apples after conversion into vinegar. It may be objected that 1s. per gallon is too high a value to place upon the product: it must be remembered that the cider vinegar would be much better, and especially much stronger, than that usually sold in bulk, so much so that the addition of a considerable proportion of water to it prior to sale would be permissible. Under skilful treatment, apple juice of 1.069 specific gravity should produce vinegar containing 8 per cent. of acetic acid, whereas the minimum strength allowed by the Pure Food Act is 4 per cent. Much of this extra strength must, however, be allowed as a set-off against the difficulty in pressing out the last portions of the juice from the apples. It will be seen that, after allowing for several contingencies, the amount realized by the conversion of apples into vinegar should be about equal to selling them at £4 or £5 per ton.

PROCESS OF MANUFACTURE.

The third question can be more conveniently dealt with before the second.

A Two Stage Process.—The operation of converting apples into vinegar consists of two very distinct operations:—

1st. The conversion of the juice of the apple into cider.
2nd. The transformation of this cider into vinegar.

The sugar of the apple is the substance which eventually becomes the acetic acid of the vinegar, but the conversion cannot take place directly—the intermediate stage of alcohol has to be passed through. In other words, the sugar must be converted into alcohol by the first or alcoholic fermentation stage, and only after the completion of this stage, can the liquid enter on the second or acetic fermentation stage.

The Alcoholic Fermentation or Cider Stage.—Full information concerning the conversion of apples into cider will be found in the article by Mr. Knight already referred to. To briefly resume. The apples must first be reduced to pulp in the cider mill. From this pulp, the juice is extracted, usually by pressure, in suitable presses, but diffusion may also be employed. The juice must then be strained or filtered, after which it undergoes alcoholic fermentation in suitable vessels.

It will here be sufficient to deal with the points in connexion with which the making of cider for conversion into vinegar differs from that of ordinary cider for drinking purposes. The most important of these is the absolute necessity for the conversion of sugar into alcohol being complete. In other words, the cider must ferment out quite dry. In Victoria, the public taste favours a more or less sweet cider. The presence of a varying proportion of unfermented sugar is insured chiefly by repeated filtration but also by pasteurization or the use of sulphur. For conversion into vinegar sweetness (even slight) must be carefully avoided. Since it is only alcohol which can be transformed into acetic acid, the presence of any remaining sugar would mean so much loss of acetic acid (or of strength) in the resulting vinegar.

The presence of sugar is even more undesirable, however, in other ways. It serves as a food for numerous micro-organisms, other than the acetic

† In France the cost of conversion of a similar quantity of wine into vinegar is estimated at about 15s. The cost of crushing and fermentation into cider, added to this, and the higher price of labour being taken into consideration, the cost would come to about £2 per ton in Victoria.

acid bacillus, the development of which is interfered with at the expense of the quality of the resulting product.

In the presence of sugar, the acetic ferment itself often behaves in a faulty manner, producing, instead of the thin film or veil on the surface characteristic of healthy fermentation, a gelatinous membrane at the bottom of the cask. This mass, often termed mother of vinegar, is an indication of faulty conditions, and its formation is to be avoided.

In order to insure complete fermentation the juice should, when first crushed, be of suitable composition. A gravity of 1.069 or 9.3 deg. Beaumé, corresponding to a resulting alcoholic strength of 15.8 per cent. proof, should ferment out rapidly and completely. This is, as we have seen, the average gravity of Victorian apple juice. Abundant exposure to air prior to or at the commencement of fermentation is very beneficial, and will insure its being active and healthy. Filtration during fermentation is to be avoided, although straining through any coarse tissue, such as hessian, to remove rough impurities in suspension, can do no harm.

Conversion into vinegar is not likely to be ever applied to high grade fruit. On the contrary, it will be of greatest use as a means of preventing faulty or damaged fruit from going to waste. With such, the addition of a small quantity of tannin to the apple juice prior to fermentation will often be found very beneficial. This will cause the precipitation of albuminoid or mucilaginous substances in the juice and insure an appreciable improvement in condition at the close of the first fermentation, thus producing a cider better suited for the healthy growth of the acetic ferment later on. From $\frac{3}{4}$ oz. to $1\frac{1}{4}$ oz. of tannin of good quality dissolved in warm water, or preferably in weak spirit, per 100 gallons of apple juice, will be sufficient. More than $1\frac{1}{4}$ oz. should not be used, and if the fruit is in fair order this quantity may be correspondingly reduced. When the alcoholic fermentation is complete and all sweetness has disappeared, the cider may be filtered or fined; it should, as soon as fairly clear, be racked into fresh casks. It is now ready to undergo the second part of the process.

Needless to say, absolute cleanliness must be observed in all manipulations. It is just as necessary here as in the making of wine or ordinary cider. The only organisms, the development of which is desired, are the alcoholic and acetic ferments. That of so-called secondary or parasitic ferments is to be carefully guarded against. These are largely filth organisms and one of the best safeguards to use against their development is cleanliness.

Sulphur, the fumes of which are of so much value in wine making for preventing the development of noxious organisms, cannot be had recourse to here; its antiseptic action would check the healthy growth of the acetic ferment. It must be very sparingly used, if at all.

The Acetic Fermentation.—Having transformed the apple juice into cider it would be possible to proceed immediately with the second stage of the process. Before commencing this, however, it will be well to allow it to rest for a certain time, in order that it may become clear, and lose the carbonic acid gas with which it was charged at the close of its alcoholic fermentation.

Acetification does not take place actively at low temperatures. The best temperature for the development of the acetic ferment is from 86 deg. F. to 95 deg. F. (Pasteur). This, however, is not that adopted in the best vinegar works, a superior product being obtained between 68 deg. and 89 deg. Below 50 deg. acetic fermentation is slow and unsatisfactory.

Unless the room in which acetification is to take place can be warmed artificially, it will be better, especially in cool districts, to store the cider until the following spring, when the weather is sufficiently warm for satisfactory action. Such rest will improve condition, a very important advantage, for the growth of the surface ferment film, the agent which carries out the transformation of alcohol into acetic acid, is not normal unless the liquid be clear. Filtration or fining should be had recourse to, prior to acetification, if the liquid be cloudy.

The most satisfactory strength for the cider is between 12 per cent. and 16 per cent. proof spirit. Above 16 per cent. action is slow and below 12 the resulting vinegar is too weak. Should the strength of the cider be above 16, it should be reduced with pure water, preferably boiled and allowed to cool.

As regards the process of acetification, full information as to how this can be best conducted on a small scale is given in the *Journal* of March, 1905, in an article by B. Fallot on the production of "Home-made Vinegar" by the Orleans method. Though this is one of the oldest methods, it is one which is capable of producing excellent vinegar, with very simple plant. The chief objection to it, on a large scale, is that it is rather slow. It therefore necessitates the holding up of a considerable stock, in course of manufacture. (As the *Journal* mentioned is out of print, the article is reproduced herewith.) For this reason, several other methods have generally been substituted for it in large vinegar works, notably the English method, the German method, and what is known in France as the Luxembourg method. These require elaborate plant. On account of its simplicity, as well as the good quality of the product it is capable of yielding, the old Orleans method, as described in the article mentioned above, is the one to be recommended for our present purpose.

The percentage of acetic acid in the vinegars produced by ciders of different strength is a point of great importance. Theoretically, 100 parts of alcohol should produce 130 parts of acetic acid, but in practice there is a loss of about 15 per cent. of alcohol. The following table* shows the strengths of vinegars yielded in practice by wines of different strengths:—

Wine.		Vinegar.
Absolute Alcohol by volume.	Proof Spirit Per cent.	Acetic Acid Per cent.
6	10·5	5·3
7	12·3	6·2
8	14·	7·1
9	15·8	8·
10	17·5	8·9
11	19·3	9·8
12	21·	10.7

These figures apply to the manufacture of vinegar from wine, but they apply equally well in the case of cider, provided the conversion takes place under normal conditions, as would be the case in properly conducted works under skilled supervision. On a small scale, it is doubtful if the full yield of acetic acid, as stated above, would be obtained.

PLANT REQUIRED.

Full particulars as to this will be found in the two articles referred to (see *Journals*, March, 1905 (reprinted below), and June, 1909, p. 347).

* Portes and Ruyssen. *Traité de la Vigne et de ses Produits.* Vol. II., p. 613

To briefly resume, the following would be necessary:—Cider mill, cider press and casks of various sizes—chiefly hogsheads for the fermentation of the apple juice, and after, for its conversion into vinegar. A filter will also be found useful, and of course the usual cellar appliances such as pump, hose, buckets, &c., will be required, as well as saccharometers, thermometers, &c.

Mr. Knight informs me that one of his assistants, Mr. T. H. Heathcote, has for some time been conducting experiments in the making of vinegar from apples. He will be pleased to give information to those interested in the question. At the A.N.A. Exhibition, now being held in Melbourne, are to be seen pickles made with this type of vinegar, which has also been successfully used by the fruit preserving expert, for the making of raspberry vinegar and other cordials.

* * * * *

Home-made Vinegar.

B. Fallot.

Vinegar is a condiment of daily use not always offered for sale commercially in a state in which it can be consumed with impunity. This can be understood when it is general to call by the name of vinegar all liquids obtained by the acetification of alcoholic beverages, such as wine, beer, and cider, or the transformation of their alcohol into acetic acid. But if this organic acid is the essential basis of vinegar, it does not follow that a simple dilution of acetic acid with water would be vinegar. Vinegar is a substance endowed with hygienic properties dependent upon the composition of the liquid from which it was formed. In addition to acetic acid, there should be organic and inorganic salts, ethers which give the bouquet, glycerine, a small proportion of alcohol, in reality all the elements which constitute the original liquid. It is to the general effect of this combination that the properties of vinegar are due. We speak here of true vinegar, of which wine vinegar is the type, and which is becoming, it must be regretfully noticed, more and more rare. Actually it is through perfected systems of acetification that the vinegar maker hardly uses wine, but rather diluted cheap spirits. Vinegar made from these spirits diluted possesses none of the abovementioned hygienic constituents. It may even from its excessive acidity be a danger to weak digestions. If even its origin were known it might be possible to remedy the inconvenience of defective composition, but the trade as a rule offers it for sale as wine vinegar. A little glucose is sufficient to cover the excessive acidity, and the consumer purchases it with confidence at a high price, and at the expense of his stomach.

True wine vinegar is becoming rare, but as it is necessary to be sure of having it good, the only method is to make it oneself. This is quite possible anywhere. On the farm, in the town and cities, every household should make its own vinegar. It is so simple, and the necessary material so cheap, when even the bottoms of bottles of wine may be used, which are otherwise thrown away, as will be gathered from the following practical details of the operation. Before beginning on the purely practical side of the question, it is as well to cursorily examine the theories upon which it is based.

We have said that the process of making vinegar consists in transforming alcohol into acetic acid. Let us examine the phenomenon which produces this transformation.

It is known that the formation of acetic acid is due to an oxydation of alcohol, with a production of water, as expressed in the chemical formula—

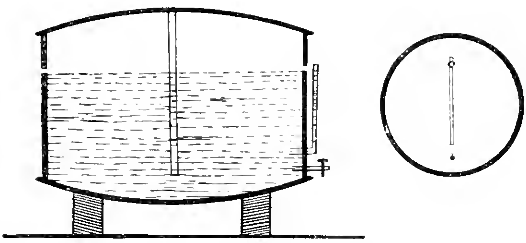
$$C^2H^6O + O^2 = C^2H^4O^2 + H^2O.$$

Pasteur discovered how this transformation actually took place, and proved that acetification is a fermentation due to the presence of a ferment *Mycoderma*, or *Mycrococcus aceti*, without which air alone, which is indispensable, cannot act. Classed among the group of aerobian ferments, *i.e.*, requiring the oxygen of the air in order to exist, this ferment lives on the surface of alcoholic liquids in the form of a fine white veil, which is so instable that the least agitation of the liquid submerges the cellules of the ferment and asphyxiates them. In time this veil thickens, and ends in forming a consistent membrane, to which is given the name of "mother of vinegar." An essential condition for the life of the ferment is a temperature between 67 degrees and 87 degrees Fahr., outside of which limit the ferments suffer, and eventually cease to work. Pasteur proved that this ferment is indispensable for the transformation of alcohol into acetic acid, and that without air it cannot be produced. From a practical point of view it is deduced from the preceding points of consideration that to make vinegar there must be:—The presence of acetic ferment, the presence of air, a temperature between 67 degrees and 87 degrees, and an alcoholic liquid containing the elements necessary for the life of the ferment. The presence of the ferment is the first condition. If Pasteur's theories are considered, which show the air to be full of germs of all kinds, it would seem that there would be no necessity to trouble about the ferment itself, and by only exposing the wine to the air acetification would soon be produced. This does happen, as may be seen in ullaged bottles. But in this case the commencement of fermentation is slow, and there is a risk of developing other ferments, which would have a different action, and possibly destroy even the alcohol.

To have good vinegar this accident must be avoided, and by obtaining only the acetic ferment. It is therefore preferable to add to the liquid some of the cellules of the ferment, which, when placed upon the surface, develop rapidly. For this a sort of culture is made in a shallow receptacle—a saucer, for instance in which is placed a little wine, reduced to 10 per cent. proof spirit and one-third its volume of good vinegar. This is exposed to the air in a warm place, and very soon a veil formed by the cellules of the ferment will be formed from the germs in the air, and they can be added to the surface of the liquid to be acetified. The manufacture of vinegar is condensed into these few lines. Take an alcoholic liquid, place on its surface traces even of acetic ferment, leave it exposed to the air in a proper temperature, and the ferments do the rest. This is the old Orleans method, which was discarded by the trade on account of the time it takes (about two months) before good vinegar is obtained. For household use this does not matter, on account of the moderate consumption, and this process is the best for the purpose when employed under the following conditions:—A cask is chosen, in accordance with the quantity consumed. A ten-gallon keg would be large enough for almost any household. If it has iron hoops they should be painted, as otherwise they would be rapidly destroyed by the vapours of acetic acid. In each head a hole should be bored, say a quarter of the way down from the top chimb, and covered with mosquito netting, so as to prevent the entry of any insects. Below the front opening is placed a bent glass tube, tightly fixed in a cork, so as to show the level of the liquid.

A wooden tap is inserted below this. It is essential that no metal tap should be used, and the wooden tap should turn easily, and the cask should be solidly fixed, so as to prevent any shaking, which would break the veil formed by the cellules of the ferment, and so destroy them.

For the same reason, it is as well to fit a wide glass tube through the bung-hole, reaching nearly to the bottom of the cask, through which the wine to be acetified can be added without breaking the veil of cellules on the surface of the liquid.



To start the affair working, the operation is very simple. The wine to be acetified, reduced to 12 per cent. proof, together with one-third of its volume of good vinegar, is poured into the cask, so that the level of the liquid comes within half an inch of the air-holes in each head. Then the vinegar ferment previously prepared is carefully placed on the surface of the liquid, and the glass tube is inserted, and secured into the bung-hole through a cork bung, and the cask left in a proper temperature.

At the end of from four to six weeks vinegar may be drawn, and every succeeding fortnight, each time replacing the quantity drawn by an equal quantity of wine to be treated.

Such an installation can be fixed in any house—in a kitchen, for instance, provided always the temperature is constant and suitable. To obtain good vinegar, sound, clear wine should be used, and reduced to from 12 per cent. to 15 per cent. proof spirit. Above that strength acetification is slow and somewhat incomplete.

ORCHARD STUDIES.

I.—GREEN MANURING.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The system of green manuring, or as it is called in America, the system of growing cover crops, because the crops cover the ground at a time when it is otherwise bare of foreign growths, is one that should commend itself to every orchardist, who desires to perpetuate, or to continue as long as possible, the fruiting abilities of his trees. To do this, the grower must decide that his soil shall never become exhausted, or "tree sick." When a tree has been growing, and of course in the one place, for a number of years, it can easily be understood that it has removed from the soil a very large amount of the constituents necessary for its nutriment and sustenance. Thus the soil becomes somewhat exhausted, and perhaps depleted of the particular food that the tree requires; and the tree has then continually to struggle against very adverse circumstances; and so it is not easily possible for it to grow, to remain vigorous, and to regularly produce fruit. The fruit-grower should look upon his land as his fixed bank deposit, and the tree as the interest producer. So long as the trees are not drawing upon the soil to reduce its value, then they are doing well; but every means must be taken so as to perpetually keep the soil as near to its original state of productiveness as possible, or to improve this condition. Thus, a judicious system of manuring comes into operation, and it is with the work of green manuring that we are now immediately concerned.

In a few words, green manuring consists of growing a crop of plants, preferably plants of a leguminous nature, in the late summer, and, when the crop is in full flower, ploughing it into the soil, there to rot and add to the amount of humus already in the soil, ultimately becoming a valuable plant food. A large variety of plants may be used for this purpose, but those of a leguminous or pod-bearing character are by far the most valuable. These plants possess the ability to gather atmospheric nitrogen and store it up, especially in the nodules which are so prevalent upon their roots. Thus, when the plants have been turned in by the plough, the garnered nitrogen becomes readily available as a food supply for the trees. The leguminous plants are thus a nitrogen factory, collecting, storing, and ultimately dispersing one of the most necessary and valuable of plant foods. Of course, nitrogen may be added to the soil by means of nitrogenous chemical fertilizers; but it is the addition of humus as a result of the decay of the green manure, that is so valuable, not only as a manure, but as an amelioration of undesirable soil conditions. American calculators have estimated that the world's annual expenditure in nitrogenous manures is about 25,000,000 pounds sterling; and it is stated by them that over every acre of the world's surface there is as much nitrogen in the air as would replace the total quantity used, assuming that it be utilized in the form of green manuring by growing leguminous cover crops. The crop of leguminous plants is sown broadcast or drilled in the orchard in early autumn, March for preference. The plants thus obtain all the advantages of any early rains, and should reach a fairly advanced stage before the frosts and cold weather of winter arrest their further development. In spring, the plants start into growth again, and are soon in full flower. The crop is then rolled, and ploughed in.

Various legumes are grown, chiefly vetches, tares, various species of beans, lupins, cow peas, partridge peas, and field peas. The last-named is the variety that is more grown than others.

According to the nature of the plant sown for green manures, so should the quantity of seed used be small or large. Thus, a greater quantity of field peas would be required than that of beans or lupins. One hundredweight of superphosphate and bonedust should be sown with the crop; and the seeding should be a liberal one, at least one bushel per acre of field peas (if that be the legume selected) being used.

As soon as the crop has reached maturity, and this is judged by the fact that the whole of the crop has reached its full flowering stage, the crop should be rolled so as to render the ploughing more easy of accomplishment; then it may be ploughed in, using a circular coulter in front of the ploughshare to cut up the crop, and thus make it more readily to become covered by the soil.

One danger to be guarded against is the continuance of dry weather, after the crop has been ploughed in. If such a contingency should arise, the land, after ploughing, should be well harrowed and then rolled, so as to retain any moisture that may be in the soil; frequent cultivations will also be necessary.

The advantages of green manuring are many. Humus and nitrogen are added to the soil, the former amending the physical texture, and the latter adding to its manurial value. Thus, the fertility of the soil is not only restored, but it is largely increased. The succulent plants being turned into the soil, a large amount of plant moisture is therefore added, and so the system is one of natural irrigation. The physical condition of the soil being improved by green manures, the soil is in a more fit state for soil æration; the presence of a cover crop in winter prevents the severe frosts from affecting any tree roots that may be near the surface; the presence of a growing crop prevents largely any surface washing that may occur on hill lands, through excessive rainfall. These and many other benefits accrue through the carrying into practice the system of green manuring. And so naturally any one, or all, of these conditions occurring, the trees must benefit, the orchard must be in a stronger condition, and the resultant crops of fruit must be largely increased.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

FRUIT NOTES.

The past month has been a very unfavourable one to the proper development of fruit. The alternating cold and heat changes have set up undesirable conditions. Large numbers of apples have been scorched by the hot sun to such a degree as to render them absolutely useless. Reports have come to hand from all districts that bitter pit is more than usually prevalent this season. This seems to add weight to the suggestion that this "disease" is the result of an uneven and irregular flow of sap.

A crop of plums on one tree at the Burnley Gardens has this season shown all the signs of bitter pit, and the fruit is now under investigation. If it should prove to be this trouble, another species of fruit is added to the list of fruits attacked by this mysterious disease, as no record has previously been noted, of plums being so affected.

Reports have been received that the much heralded apple King David has fruited in various places this season. At Diamond Creek, Inspector

Wallis noted that this apple is now bearing, and that every fruit is very badly affected with bitter pit. The trees, however, are young, and mature trees may give a better result.

At Emerald, the fruit shows good signs, and looks well, but so far it does not appear to be any earlier than Jonathan.

Some fruit trees in the collection at the Burnley School of Horticulture are every year proving themselves to be of good quality and consistent in bearing; and though they are not generally in cultivation, they possess characteristics which would make them desirable to grow, especially where orchardists grow for the local market, and desire a continuous succession of fruit.

Souvenir de Congress pear is of a very vigorous nature, fruit fine, large, and juicy. The fruit ripens shortly after the William's Bon Chretien; and seems to possess some of the flavour of that pear. It is rather coarser, but as a succession is well worthy of cultivation.

Wright's Early plum is a plum belonging to the Japanese section. The fruit is almost similar to that of the Burbank; but it is one of the earliest known ripening varieties, and hence it is desirable. It fruited this year a fortnight earlier than the ordinary cherry plum.

Early Almond apple is a good quality cooking apple, of very fine flavour, and good size. The tree carries fair average crops. It is ready for use early in January. If the fruit is allowed to mature, it is of a beautiful amber colour, of acid flavour; and is ripe in mid-February, although for cooking it may be used earlier.

Garden Royale apple is an apple possessing the first quality of cooking flavour. It is an excellent early cooking apple, a very good bearer, and is ready for use in mid-January.

Wealthy apple is a fine flavoured apple, very crisp and juicy, sweet, and a mid-season fruit well worthy of cultivation for dessert purposes. The tree bears well, the fruit is of good size, and the apple is very attractive, being well streaked with rich red lines; it ripens towards the end of February.

Orchard Work.

Where orchards are requiring renovation or manuring, an early start should be made to plant a crop of leguminous plants for green manure. An early start is absolutely necessary, and the advantages of this practice are too numerous to be overlooked by orchardists. A separate study on green manuring will be found on another page.

A start should now be made in preparing land for winter planting. The soil will require to be well ploughed, and it will be necessary to have it thoroughly aerated and sweetened before the young trees are planted. All tree roots and stumps should be removed, and burned, so as to remove all possibilities of the root rot fungus attaching itself to the tender growing roots. If at all possible, the soil should be well drained, and as far as it can be done, the system of drainage should be well carried out as early as convenient.

When ploughing the land, it would be a distinct advantage, and of great profit to the orchardist, to subsoil the land as well. The usual method of subsoiling has been to follow along in the furrows made by the plough, with a second plough, which has had the mouldboard removed. A more economical method, and one just as advantageous is now in vogue; and it is simply to attach a subsoiling "foot" behind the ploughshare. This stirs the subsoil 4 or 5 inches below the sole plate; if necessary, the depth can be lessened to 2 inches. The implement has been patented and is now on sale in Melbourne. It was fully described in the *Journal* for April, 1908. The benefits of subsoiling cannot be overestimated, and fruit-growers cannot afford to overlook this operation. Soil aeration, drainage, increase of root room, an easy root run, and an increased feeding area, &c., are among the many benefits to be derived. One fruit-grower of many years' experience has stated that, as a result of subsoiling one of his orchards before planting, he has never had to manure his trees, and they have been in bearing for a good number of years.

Spraying.

The dry season has had the effect of increasing the number of codlin moths, and they are now fairly prevalent. All apples and pears, especially late fruiting varieties, should be well sprayed, and well covered, so that the fruit shall be immune from attack. Opinions have come from America that sprayed fruit keeps far better in the storeroom than unsprayed. This is a matter for growers to consider, and it is very easy to test it in their own fruit houses.

Now that the majority of the soft fruits is gathered, a good spraying of red oil, a 5 per cent. emulsion, should be given wherever the San Josè scale has appeared. This pest has been discovered in a number of orchards in the southern districts, and although a dangerous and insidious pest, it may easily be kept in check with the red oil emulsion.

Vegetable Garden.

During March the main crop of vegetables and salad seeds for the season will be sown, the ground having been well manured and worked over previously. Beet, cabbage, cauliflower, kohl rabi, parsnip, parsley, turnip, lettuce, radish, carrot and spinach seeds may be sown. Cauliflower, cabbage, celery, and lettuce plants may be set out in the beds. Later in the month, onion seeds may be planted in the seed beds for future transplanting.

Flower Garden.

The various plants in the flower garden will require liberal food supplies at the present time. The soil having been so frequently watered during summer, the food supplies of various plants have been considerably reduced by the process of "washing out"; and as it is the season of the year when the most popular flowers of the year will be blooming, viz., dahlias, chrysanthemums, and roses, the plants will require a good stimulus. Liquid manures should be used in preference; and these should always be used in a weak solution at first, gradually making it stronger as the plant becomes accustomed to the feeding. Once a week is sufficient for liquid manures, and never should the plants be excessively fed.

Animal manures may be prepared for liquid manures by soaking about one pound of well rotted and well preserved manure in 20 or 30 gallons of water for a few days. A few handfuls of soot thrown into this makes a great improvement in the food. If ordinary chemical manures, such as nitrate of soda, superphosphate, or sulphate of ammonia, be used, the proportion of one ounce to four gallons will be ample, for the weekly supply. Excessive manuring and over-feeding tend to gross growth and coarseness of petals, and these should always be avoided in floriculture.

The popular zonale pelargonium, more commonly known as the geranium, will now be at its best. The autumn flowers of these plants are generally better than those at any other time of the year. With little culture, and less water, these beautiful herbaceous plants will produce a profusion of beautiful flower trusses through the season. They prefer a sheltered position, and should be planted so as to receive only a moderate amount of sun, and no wind whatever. Cuttings of these plants will now strike readily, and a few late blooms may even be obtained from these when rooted. The well-known bedding variety, Rev. F. Atkinson, produces a blaze of colour in the garden all through the summer, early and late; and this variety rivals the popular "Bonfire" salvia for intensity and profusion of bloom.

A good small selection would be:—Scarlets—Rev. F. Atkinson, F. V. Raspail improved, Deuil de Mirabella, Fiery Cross, Cremorne Scarlet. Crimson—Lord Curzon, Egypt (very dark). White—Albion, Adolphe Brisson, and Mary Seaton (crimson and white), California (brick red, double), Rainbow (cerise and white), Madame Landry (pink, double), and Fire Dragon (scarlet, cactus).

Plantings of all varieties of spring blooming bulbs should now be made. The soil should be deeply dug, so as to allow a very free root run for the bulbs. All manures, either animal or chemical, should be thoroughly worked into the soil, being well distributed all through. The roots of most bulbs grow in an almost vertical direction, and hence the greater percentage of the manure should be placed below the bulb. A small layer of soil or sand should cover the manure and the bulbs planted in this. On no account, should any manure whatever come into immediate contact with the bulb itself. This always weakens, and more frequently rots, the bulb completely. Bulbs should not be planted too shallow; ordinary daffodil bulbs may be planted with about three inches of soil above them, the soil being firmly pressed around and above the bulb. Smaller bulbs require shallower planting and vice versa. A few bulbs may be kept for planting till April, for later blooms in the spring.

Sow now, all varieties of hardy annuals and perennials, as well as seeds of flowering trees and shrubs.

Palms and shrubs may now be lifted, if necessary, and placed in more favourable situations, cool weather being selected, and every preparation for their reception being made previously. In moving permanent plants and shrubs, a good ball of earth should be lifted, and as few of the roots disturbed as possible.

THE ONION EEL-WORM.

EXPERIMENTS FOR THE ERADICATION OF—

WITH A SHORT DESCRIPTION OF ITS LIFE HISTORY AND HABITS.

W. Laidlaw, B.Sc., Micro-Biologist; and C. A. Price, Microscopist.

It is only within recent years that special attention has been directed to the systematic study of the Nematoda or thread worms parasitic on plants, as distinguished from those affecting animals, though various experiments were made many years ago by the Department of Agriculture for the eradication of eel-worms affecting the onion crops in the Drysdale district.

In the year 1890, Dr. N. A. Cobb, in the *Agricultural Gazette of New South Wales*, called attention to the fact that an eel-worm, known to science as *Tylenchus devastatrix*, was believed to exist in Australia. This was confirmed by an article from the pen of Mr. A. N. Pearson, who at that time was Agricultural Chemist for Victoria.

At the instance of the late Mr. Levien, M.L.A., a prominent onion-grower, Mr. Pearson visited the Drysdale district for the purpose of ascertaining the cause of a disease affecting the onions. He discovered in the diseased onions a minute eel-worm. He says:—

> The ground at present is in a deplorable state. It is not surprising that this should be so. In almost all cases where crops are grown year after year on the same land, without rest or change, such a condition of things arises, but besides this continuous onion growing the ground is not cleared of the diseased onions which are allowed to remain bearing the eggs or spores to the next season.

For many years previous to this date, this land had been continuously cropped with onions, owing to its suitability for their culture. Mr. Pearson arrived at the conclusion that the only remedy for the state of things then existing was an entire change in the system of agriculture, the abolition for a time of the onion crop from the district and the establishment of suitable rotations. He experimented with a number of chemicals, including chloride of lime, gas lime, dilute solutions of mercuric chloride and dilute arsenical solutions. He also burned straw and brushwood on the surface of the soil, without any or only slight beneficial effects.

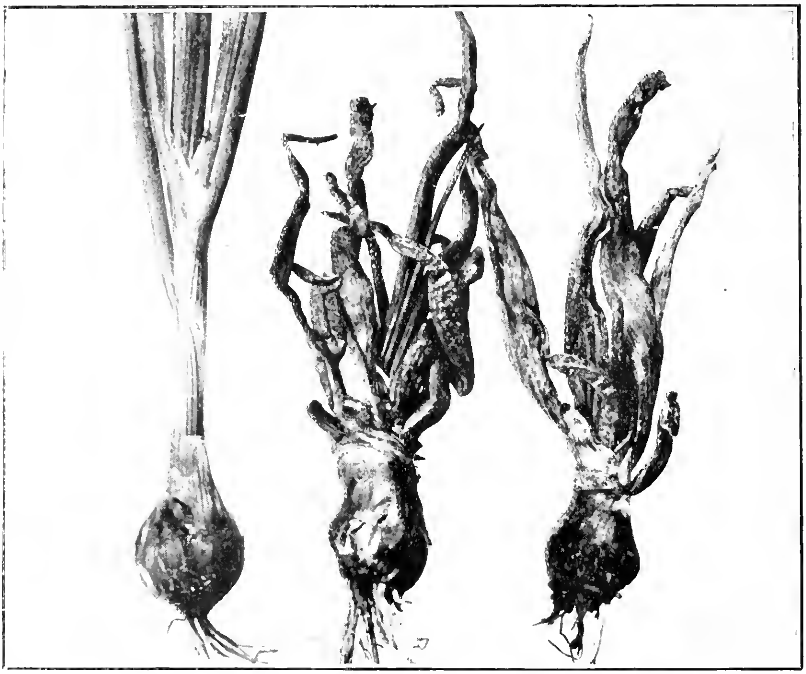
Dr. Cobb applied to Mr. Pearson for specimens of the diseased onions, which were forwarded and on which he contributed a report to the *Agricultural Gazette* in 1891. After a minute description of the anatomy of the eel-worm (which he recognised to be *Tylenchus devastatrix*), and the various agencies by which it is spread, he suggested the following remedies:—

1. To destroy all affected plants.
2. To remove all weeds that might afford the worms a subsistence.
3. Removal of the first three inches of the surface soil.
4. Deep and thorough ploughing which turns the soil exactly bottom side up.
5. The promotion of a rapid growth of the plants cultivated.
6. Sowing the infested land thickly with rye, and reaping it while young.
7. Injection of carbon bisulphide into the soil, the injections to be shallow and numerous.
8. A good system of drainage.

In the year 1891, various chemicals were tried by Mr. D. McAlpine, Vegetable Pathologist, for the eradication of the onion eel-worm. The following chemicals were used during the experiments carried out at that time:—

1. A mixture of sulphate of potash and sulphate of ammonia.
2. A dressing of lime.
3. Spraying the plants with diluted phenyle.
4. Spraying with dilute corrosive sublimate.
5. Dilute corrosive sublimate applied to the soil in the badly affected parts.
6. Sulphate of iron forked in between the rows of the onions.

These chemicals, it is stated, produced no effect, the disease being as bad on the treated as on the untreated plots. Since then, numerous experiments for the eradication of this pest have been tried by other investigators, principally on their own initiative. Amongst these, special attention must be made of Mr. R. J. Fletcher, of North Geelong, whose work extended over a period of four years, and included not only the effect of chemical



DISEASED ONIONS ON THE RIGHT, SHOWING DAMAGE CAUSED BY THE EEL-WORM. (HALF NATURAL SIZE.)

substances and manures on the affected land, but also a study of the life history and habits of the eel-worm. By this observer over 300 plots were treated, scattered over nine different farms in paddocks known to be diseased, and included within an area of 30 square miles, thus getting a variety of soils, drainage, and other conditions.

The chemicals used were the following:—Sulphurous acid, chloride of lime, arsenic and soda, potassium cyanide, corrosive sublimate, spent oxide from gas works, common salt, ground quicklime, freshly slaked lime, saccharated solution of lime, flowers of sulphur, precipitated sulphur, and naphthaline. Out of this comprehensive list of chemicals, he found that sulphurous acid and ammonia were the only two that gave results worth further consideration. As the sulphurous acid was only tried on two farms, the results obtained were not considered conclusive. Some experiments with this gas were carried out by us in the laboratory, but the soil was rendered so acid that onion seed failed to germinate. No good results were obtained by enriching the soil by manurial treatment, or burning brushwood or straw on the surface. Mr. Fletcher summarizes as follows:—

> No good is obtained by chemical insecticides, fertilizers, change of seed or burning, and little reliance can be placed on transplanting. Good barley can be grown on diseased land and can be followed by one, sometimes two, good crops of onions; then barley must be sown again. Soil fertility has little to do with the presence of eel-worms.

During the season 1909, further experiments with some of the more recent chemical substances were again undertaken by the Department, the land being kindly placed at our disposal by Cr. R. Willey, of East Bellarine, who is an old resident, and a close and enthusiastic observer of the eel-worm and its habits.

The soil in this district forms an almost ideal nidus for the development and spread of nematodes, being volcanic, rich in humus, and capable of retaining a large amount of moisture. The following recent analyses will give some idea of its richness in plant food:—

	Parts per 100,000.
Nitrogen	284
Phosphoric acid	102
Potash	637
Lime	1,100
Chlorine	2

The large quantity of lime present in this soil is mainly due to the use of sea shells as a means of altering its mechanical condition, it being of a very sticky and tenacious character, when moist.

A number of plots were set apart for the experiments, each measuring one-fortieth of an acre. The land, having been recently ploughed and harrowed, was in a fine condition; but, owing to the wetness of the season, together with the sticky nature of the soil, and the absence of drainage excepting that of the natural fall of the ground, it was somewhat difficult to apply the chemicals to the soil, especially those in solution.

The following is a list of the chemical solutions and powdered substances used in the experiments, together with their cost per acre:—

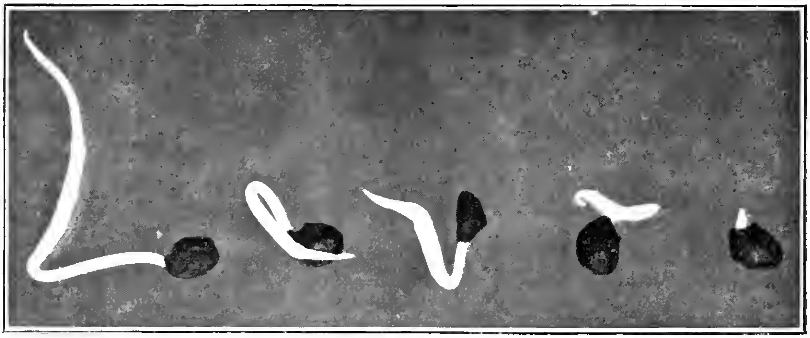
	£	s.	d.
Plot 1.—$2\frac{1}{2}$ lbs. of Potassium Cyanide at 10d. per lb. ...	£4	3	4
Plot 2.—3 pints of Cyllin at 7s. per gallon	5	5	0
Plot 3.—$\frac{3}{4}$ lb. Potassium Cyanide at 10d. per lb.	1	5	0
Plot 4.—25 lbs. of Apterite at 10s. per 100 lbs.	10	0	0
Plot 5.—3 lbs. of Vaporite	Expense prohibitive.		
Plot 6.—$1\frac{1}{2}$ tins of Pestox at 1s. 6d. per tin	4	10	0

METHOD OF APPLICATION.

Plot 1.	Plot 2.	Plot 3.	Plot 4.	Plot 5.	Plot 6.
1-40th of an acre.	1-40th of an acre	1-40th of an acre.	1-80th of an acre.	12 square yards.	1-40th of an acre.
Watered three times with 100 gallons of Potassium Cyanide, ·08 % solution, at intervals of three weeks.	Watered three times with Cyllin solution, 1 pint to 100 gallons, at intervals of three weeks.	Watered four times with 100 gallons of ·025 % solution of Potassium Cyanide, at intervals of two weeks.	Treated with $8\frac{1}{4}$ lbs. of powdered Apterite, forked into the soil to a depth of 4 inches, on three different occasions, at intervals of two weeks.	Treated with 1lb. of Vaporite in the same manner as Plot 4.	Watered three times with 100 gallons of water containing $1\frac{1}{4}$ lbs. of Pestox, at intervals of two weeks.

During the time the plots were under treatment, the almost continuous rainfall tended to facilitate he solution of the powd red substances, and the absorption of the chemical solutions.

It will be noticed from the above table that the expense of some of the chemical substances is very great. Besides this, their application to the land requires a great expenditure of time and labour, thus materially adding to the cost of treatment. When powdered chemicals were used they were cast over the soil and then dug in to a depth of 4 inches, the onion seed being sown in the usual way some three weeks later. The seed germinated freely and did not appear to show any ill effects from the chemical treatment which the soil had undergone. Unfortunately, very low temperatures prevailed at this time, which with the almost continuous rains greatly retarded the growth of the young plants. Owing to this heavy rainfall some of the plots were completely flooded, many of the seedling onions being washed out of the ground. A subsequent inspection of the plots showed a number of broken rows of young onions, many of which had reached the height of $1\frac{1}{2}$ inches. Almost all of these, on a closer examination, were found to be diseased. On the higher ground, a small number of the plants appeared to be healthy; but even these were found to contain worms in different stages of growth, in both the stems and leaves.



EARLY STAGE AT WHICH THE GERMINATING ONION SEED IS ATTACKED BY EEL-WORM. (× 3.)

The almost complete failure of the chemical treatment to prevent or even check the attack of the nematodes was remarkable; for it must be remembered that in some of the plots that as many as 5,000 seeds had been sown, and it was confidently expected that at least some of the plants would escape, particularly in the earlier stages of their growth. Probably the majority were already diseased before showing above the surface.

That the seed soon after its germination is attacked by the eel-worm can easily be demonstrated by sowing onion seed in pots filled with infected soil. If the germination of the young plants is carefully examined from day to day with the microscope, the worms can be seen attacking the young shoots and invading them, even in the earliest stages, and in some instances worms have been detected in the germinating seed itself.

Carbolized lime, Naphthaline and sand (a patent preparation), and calcium carbide, were used on some of the land adjacent to the plots. These substances were either drilled in along with seed, or spread along the furrows, so as to remain in close contact with the seed. Germination was interfered with by this method of application, and, besides, it did not prevent the ravages of the worms, all of the plants eventually dying off from disease.

A number of young plants, grown on soil free from infection, were taken and transplanted, one lot being dipped in a solution of lead arsenate, the other being untreated. They were then planted out in an infected area. In a little over a week all the plants treated with the lead arsenate had died off, probably owing to the solution being too concentrated. The untreated plants did not show any evidence of attack by the eel-worm.

Our experiments show that onions transplanted from a sterile seed bed are not liable to attack by nematodes, unless the bulb be injured in the process of transplantation or by other agencies.

METHOD OF DETECTING THE EGGS OF NEMATODES IN THE SOIL.

It is extremely difficult to detect the eel-worms or their eggs in the soil, more especially is this the case in the black soils of the Drysdale district. Hundreds of micro slides prepared from this soil may be examined without detecting the presence of either the nematodes or their eggs. Owing to the great amount of labour entailed by the above method of examination, it was necessary to have recourse to one which would reveal their presence in a quick and satisfactory manner.

THE ONION EEL-WORM IN VARIOUS STAGES. (× 35.)

EGGS OF NEMATODES, SHOWING THE CONTAINED EMBRYOS. (× 120.)

The process adopted by Dr. Cobb* of washing the nematodes out of the soil, by mixing with water, and pouring back and forth from one dish to another, allowing the mixture of earth and water to stand until the organisms have settled, then pouring off the muddy water, was found to be unsuitable when dealing with the black soils.

Our first experiments for the detection of the nematodes in the soil were carried out somewhat on bacteriological lines. Boiled onions were taken and the pulp inoculated with small quantities of the affected soil. After an interval of twelve days, an examination of the pulp showed the presence of numerous embryo eel-worms, while the uninoculated pulp remained sterile. The latest method adopted by us is on similar lines. A quantity of soil taken from infested land is placed in a small glass jar, the soil moistened with sterile water, and strips of onion leaf free from nematodes laid on the surface, and examined at intervals of a few days. After a period ranging from seven days to a fortnight, the eggs of the eel-worm, if present in the soil, will have hatched out in the vicinity of the leaf. All that is necessary then is to take a small fragment of the

* Nematode Parasites, Miscellaneous Publication, No. 215, Dept. of Agr., N.S.W.

leaf, place it in a watch glass with a little water, and examine it under the microscope when the young worms can be seen in active movement. It is even possible to detect them by the aid of a good pocket lens. This method was found to give positive results in all cases when affected soil was submitted to examination.

Samples of soil taken from infested land at a depth of 4, 8, 12, and 14 inches, were all submitted to the above method of examination, and in every case with positive results. This shows that deep ploughing which turns the soil exactly bottom side up, the use of a skim coulter to remove the upper layer of the soil, the burning of straw or brushwood on the surface, and even the use of chemicals will have little or no effect on land where the soil is liable to crack, as it is in the Drysdale district, thus allowing the eggs and embryos to be washed by rain storms, or blown by the wind into the deeper layers of the soil.

Of all the constituents of the soil, none probably are more likely to be moved from place to place than minute organisms, such as the eggs and larvæ, of nematodes by the action of currents of water on or beneath the surface. It has long been known that drainage has an important bearing on the spread of nematodes. Wind, animals, in fact anything that moves either in or upon the soil, will act as agents in disseminating the disease.—(Cobb.)

The Effect of Flooding and of Drying the Soil.

The experiments showed that, if boxes of soil were completely submerged in water for ten days, the nematodes were sufficiently abundant in the soil to attack plants sown subsequently. When soil dried in the laboratory for six months was moistened and strips of onion laid on the surface, the eggs present in the soil were hatched within fourteen days, and the young worms were found in great numbers, having been attracted to the food supply on the surface of the soil.

In any experiments carried out for the eradication of the onion eelworm, its great vitality and power of resisting desiccation, especially whilst in the egg and embryonic stages of its existence, must always be borne in mind. Onion plants that had been kept in a dried condition for over two years were moistened and, on examination a few hours later, young worms were seen moving freely in the moistened pulp.

For the purpose of studying the life cycle of the worm, all that is necessary is to take a small portion of this pulp, place it in a covered glass dish, adding to it a small quantity of any vegetable tissue, preferably strips of onion leaf, and keeping the culture in a slightly moist condition. If there is too much moisture, development is retarded. The same observation holds good if the culture is too dry. The young worms will, in a few hours, be found attacking the new material; the embryos, which are about one-fourth the adult size, as soon as they are liberated from the eggs, make their way from the old onion pulp to the fresh food supply. In a few days, these worms become sexually mature, conjunction of the sexes takes place, and in a comparatively short time the fecundated females begin depositing their eggs in large numbers. These eggs in their turn are very soon hatched, and the embryos set free to begin a new generation.

Sterile Soil.

A quantity of infected soil was placed in an ordinary flower pot and heated in a steam sterilizer for one hour. The temperature of the soil on removal registered 187° F. After it had cooled, onion seed was sown. It germinated freely and none of the young plants were attacked by the eel-worm. Before this seed was sown, a quantity was tested by placing it on moist blotting paper, and allowing it to germinate. On microscopical examination of the young plants, no nematodes were found. Some of this sterilized soil was placed in a Petri dish, moistened, and strips of onion laid on its surface. No worms were found in any of the strips. This method of obtaining a pure seed bed by steam sterilization is frequently used by nurserymen, a special plant for the purpose being erected for the treatment of a large quantity of soil at one time.

As showing the immense importance of the scientific study of nematodes to the farmer and horticulturist generally, the Bureau of Plant Industry of the United States established a Station at Miami, Florida, some years ago, under the charge of Dr. Bessey, for the sole purpose of investigating and collecting information regarding the life history, habits, and the ravages caused by the various forms of eel-worm on plant life. For it is known and recorded that not only are onions attacked by nematodes, but the allied species of this family may be found attacking vines, peaches, figs, oranges, lemons, cotton, potatoes, tomatoes, beet, cabbage, parsnips, lettuce, melon, maize, coffee, sugar cane, bananas, tobacco, clover, peas, oats, barley, most bulbs, and many of the grasses. Various kinds of weeds are also attacked. Lavergne found, in Chili, that the roots of the bitter orange were resistant, and by grafting the sweet orange on a bitter stock, succeeded in producing a plant immune from its ravages. According to the *United States Year-Book of Agriculture*, 1907, a tobacco plant possessing resistant qualities has been produced.

SUGAR BEET AS A CATCH CROP.

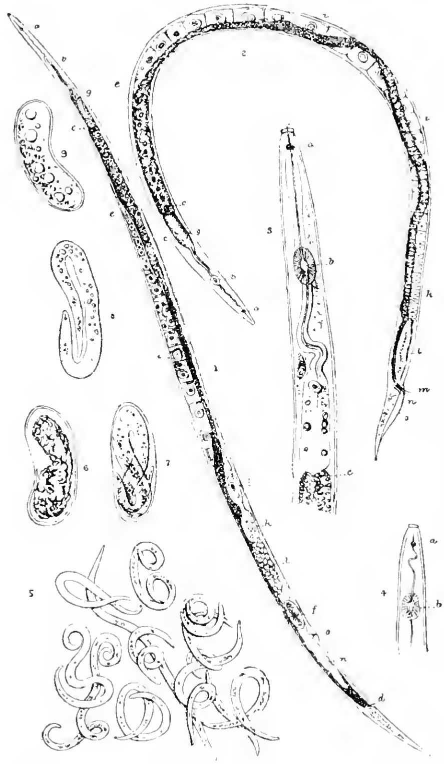
Sugar beet suffers severely from the presence of eel-worm on the Continent of Europe (Massee), and in the event of the much-discussed project of sugar-beet cultivation being again realized in this State, a sharp look out should be kept for the appearance of eel-worm disease, which is recognised by yellowing and wilting of the foliage, and by the presence of small knots or galls on the root fibres, which are produced in excess in such cases. Sugar beet having been suggested by certain observers as a means of freeing the land frcm nematodes, special attention is directed to the foregoing.

ROTATION OF CROPS.

The destruction caused by eel-worms is much more serious where there is no rotation of crops, as it is seen to a much greater extent where the so-called intensive cultivation is practised, or where the same crop is grown year after year. In fact, the horticulturist is suffering to a much greater extent than the farmer, simply because he ignores the fundamental agricultural law, rotation of crops. Eel-worms, in common with other animals, are to a certain extent restricted in their choice of food, and if a crop of oats, say, is attacked and the soil consequently infected, the eel-worms usually perish for lack of food before oats are again sown on the same land.

If an examination be made of onion plants growing on infected land, many will be found showing a peculiar stunted and distorted appearance, well seen in the photograph on page 164. If a small piece of these stunted onion plants be taken, placed in water in a watchglass, teased out and examined under a low-power microscope, immense numbers of worms and eggs will be seen, the worms wriggling to and fro in the fluid.

Onion-growers are specially recommended to keep a look out for plants similar in appearance to those illustrated. They should immediately be pulled up and destroyed by burning. This is a wise precaution, for if allowed to remain in the soil, on the decay of the plant, the eggs fall into the ground and may thus spread over a considerable area to further propagate the disease.



NEMATODES AND EGGS. (AFTER RITZEMA BOS.)

1. Female Eel-worm.
   (*a*) Spear at head end. (*b*) Median sucking bulb. (*c d*) Intestine. (*e*) Commencement of ovary, with numerous ovules of egg.
2. Male Eel-worm.
3. Anterior portion of Eel-worm not fully developed. (*a*) Spear. (*b*) Median sucking bulb. (*c*) Beginning of intestine
4. Anterior portion of same, taken from wheat plant.
5. Eel-worms from Hyacinth, dried and rolled together.
6 and 7. Egg with young Eel-worm.
8. Young Eel-worm newly hatched.
9. Egg before formation of embryo.

The onion eel-worm *Tylenchus devastatrix* has been so frequently described that a short review of the principal points of its anatomy and life history is all that is required here. *T. devastatrix* belongs the family *Anguillulidæ*, of the sub-order *Nematoda*. It is filiform in shape, and of small size, averaging only 1-25th of an inch in length, and 1-500th of an inch in width. It lives and reproduces in leaves and stems (never in roots, except in the case of hops).—(Percival.) In damp soil they also multiply, provided there is a sufficiency of decaying vegetable matter. The mouth is provided with a spine or spear, which works to and fro and assists the animal to bore into the tissues of a plant. The sexes are distinct, the males being slightly smaller than the females. The females are viviparous and oviparous. The number of eggs deposited varies; compared with the eggs of other members of this family they are comparatively large, measuring 1-300th of an inch in length and 1-800th of an inch in width. The eggs are surrounded by a semi-transparent membrane of a chitinous nature, which is extremely resistant to chemicals, drying, and changes of temperature, though a moist heat of 150° F. completely destroys their vitality.

Summary.

The heavy rains which occurred during the period of treatment greatly militated against the success of the experiments, the chemicals being washed out of the soil or rendered so dilute as to become useless for killing the young worms. Though the experiments were of little value from a grower's stand-point, still the information gained as to the life and habits of the worm are of great importance, and should further experiments be carried out will prove of much value.

The chemical treatment of land is both laborious and expensive. Chemical substances can be made to destroy worms that are free in the soil but none of the substances tried can be depended on to disinfect soils while still occupied with living infested plants. The eggs are not destroyed by chemicals unless they are very concentrated.

Freezing kills the worms very quickly, but to prevent the eggs hatching out, considerable time is required; consequently, nematodes are not the menace to the agriculturist in cold countries they are in Australia.

We would advise that in future experiments much smaller plots be used, say of 6 square yards, a small trench being made between each plot.

All weeds on infested land should be collected and destroyed by burning.

Infested land is a distinct menace to a whole district, the eggs and embryo worms being carried by water, wind, and many other agencies.

Unlike the potato, the disease is seldom carried away by the plant itself, those affected rarely becoming marketable.

Two methods of raising onions are practised extensively by onion-growers, in different parts of the world. They are known as the "Old onion culture," and the "New onion culture." The new method consists in sowing in sterile soil and transplanting. Where this method is used, little damage is caused by eel-worms.

AN ABNORMAL SIX-ROWED BARLEY.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in the Melbourne University.

In June, 1908, Messrs. Barrett Bros., maltsters, forwarded some abnormal heads of barley with the following letter:—

> The enclosed two heads of barley have been sent to us by Mr. Hardwick of the Swan Brewery, Perth, as per enclosed letter which explains itself. We would be much obliged if you would be good enough to answer the following questions:—
>
> 1. Are the six-rowed heads enclosed abnormal in containing only two rows with awns on the grain, and four rows without?
> 2. Is this peculiarity likely to lead to any infertile condition of the barley?
> 3. Is it likely to tend to make its quality worse or better?
>
> We may point out the barley appears to us to be a development from what we know as Cape barley, or another variety Oregon, which is a superior Cape, or even the French barley Escurgeon, all of which we believe are six-rowed.
>
> The barley as you see it is of a very poor type, and we should think likely to be abnormally low in starch content.

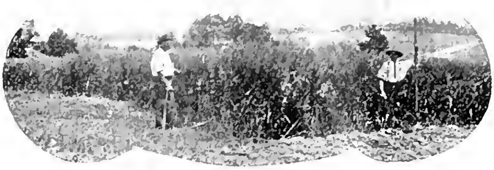
The heads proved to be a form of six-rowed barley (*Hordeum sativum* var. *hexastichon*). In this variety the spikelets are in threes arranged on opposite sides of the axis so as to form six vertical rows, all the spikelets being fertile. Frequently, however, the awn or bristle of the central grain in each set of three is longer and stouter than in the two lateral ones. In the specimens sent, this peculiarity was intensified by the reduction of the lateral awns to mere points, while the central one was strongly developed. Now experiments have shown that, when the awns are cut off or destroyed, the grain is longer, thinner and weaker when ripe, than the untouched awned grains. From this it has been concluded that the awn favours transpiration and so aids in drawing soluble food materials to the ripening grain where they are deposited as starch, aleurone, &c.

Conclusions derived from the results following extirpation usually need some confirmatory evidence, however, since the removal of an organ may excite many disturbances of the normal functions. In these specimens, the absence of the awns was normal, so that the disturbing influence of an operative injury did not come into play. Hence, the awned and awnless grains were separated from the heads, their germination was tested and the seedlings were planted in separate plots covered with wire netting.

The awned grains were distinctly plumper and gave 95 per cent. germination. The thinner awnless grains gave only 84 per cent. germination, the seedlings were weaker and after three weeks only averaged half the size of the seedlings from awned grains. Later on, however, they slowly caught up the stronger seedlings, and when adult no appreciable difference could be noticed between the two sets of plants, either as regards size or yield.

All the plants developed heads of approximately equal size, and of exactly the same kind as before, *i.e.*, with two rows of awned grains and four rows without fawns. The peculiarity is therefore evidently an hereditary one inherent in the grains, whether awned or not. Since the awned and awnless grains from the new heads showed exactly the same difference of size, shape, and germination power as before, it is evident that such a barley would not be good for malting purposes, the greater proportion of the grain being low in germination and poor in starch. For seed purposes, however, there would be no difference between the awned and awnless grains, except that the seedlings from awnless grains being weaker, would be more apt to suffer injury from unfavourable climatic and other conditions. The variety does not therefore appear to have any advantages which would render it specially suitable for cultivation, but rather the reverse, since although apparently hardy, it is not more so than other six-rowed forms. In any case, the observations are of some interest, since they confirm the conclusions drawn from the results of the experimental removal of the awns as to their function in aiding the ripening of the grain. Evidently, also, the awn has the same function in a dry climate where the rate of transpiration is usually high, as it has in the moister climate of England where transportation is on the whole less active.

The two-rowed barleys, which include the finest malting varieties, are generally considered to represent the original form, but the present variety may possibly represent a stage in the degeneration of a six-rowed to a two-rowed form.



THE SUPPLY OF BUTTER BOXES.

The producers of Victoria, considering the present price for butter boxes made of New Zealand pine to be unreasonably high, recently waited upon the Hon. the Minister for Agriculture (Hon. Geo. Graham, M.L.A.), and asked that steps be taken to secure a supply at lower rates. They suggested that an officer should be sent to Queensland to ascertain whether there was sufficient timber of suitable quality available, so as to admit of boxes being obtained at prices satisfactory to the producing community. The Minister acquiesced, and deputed Mr. R. V. Billis to furnish a report which is published below. For the photographs, we are indebted to the Queensland Department of Agriculture.—Editor.

Sir, Melbourne, 18th January, 1910.

I have the honour to report having visited Queensland, under instructions from you, for the purpose of ascertaining whether there is sufficient hoop pine (*Araucaria Cunninghamii*) available in Queensland to supply the butter box requirements in Victoria for some time to come; and if so, to find out if it is practicable for the producers here to obtain an adequate supply.

The Honorable the Minister for Agriculture, Mr. Paget, requested his officers to furnish me with all the information on the subject available. Mr. Scriven, Under Secretary for Agriculture, greatly facilitated my inquiries, and I also obtained information from Mr. Phillip MacMahon, Director of Forests, from Mr. Peter McLean, late Under-Secretary for Agriculture, and from various gentlemen connected with the timber industry.

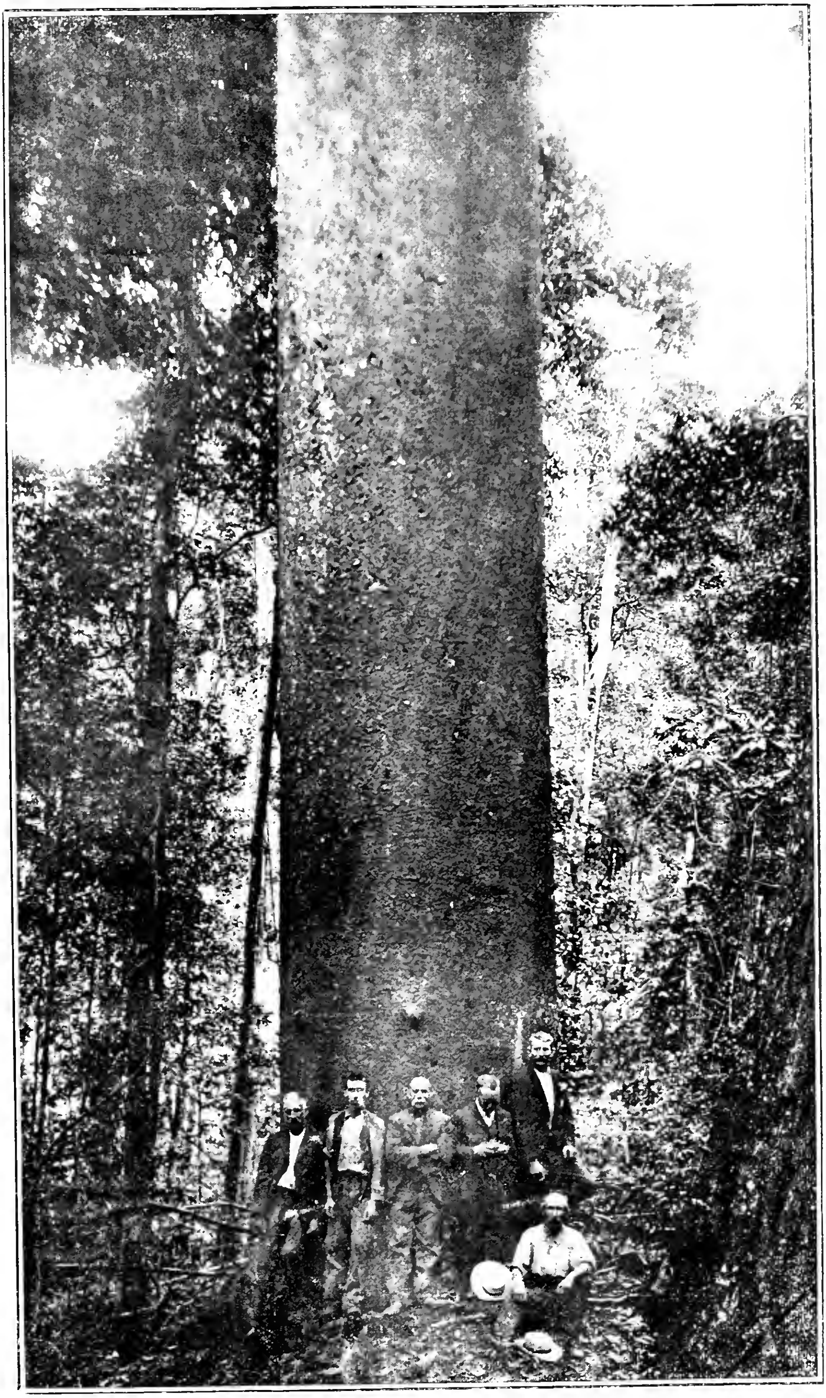
Timber Available.—Mr. MacMahon informed me that he considers there are about 3,000,000,000 superficial feet of hoop pine ready to be cut, that is, available timber, in the State. I understand he refers to State reserves, and confines his estimate to the popular pine country, namely, from Brisbane to Gladstone. The following statistics, from a report by Mr. MacMahon, issued in 1909, will be of interest:—

SOME OF THE TIMBER RESERVES IN QUEENSLAND AT 31ST DECEMBER, 1908.

District.	Area of Reserve. Acres.
Brisbane ...	211,336
Bundaberg ...	165,946
Gayndah ...	210
Gladstone ...	211,178
Gympie ...	338,873
Ipswich ...	107,228
Maryborough ...	112,274
Nanango ...	140,410
Stanthorpe ...	14,800
Toowoomba ...	30,522
Warwick ...	46,700
Total ...	1,388,607

It will be seen that the counties dealt with in this table are those from Brisbane to Gladstone. It was not easy to approximate the average quantity of pine to the acre. The Departmental estimate is slightly under 2,000 superficial feet in certain forests, but one merchant told me that there were about 8,000 feet in a good forest. I also heard of other estimates ranging from 2,000 to 8,000 feet to the acre. Taking, however, 2,000 feet to the acre, it will be seen that there should be, approximately, 3,000,000,000 feet in the reserves referred to above. There is also a large

HOOP PINE (*Araucaria Cunninghamii*).



HOOP PINE (*Araucaria Cunninghamii*).

amount of pine on private property, much of which is near railways and can be purchased reasonably. Moreover, north of Gladstone, other forests exist; in fact, areas of pine may be found all along the Queensland coast as far as Cairns.

Several new railways are in course of construction, or are projected, which will tap new forests of pine hitherto too far from railways to be marketable. The following is a schedule of timber reserves affected by the extension of the railway line from Kannangur to Black Butt and an approximate estimate of the quantity of timber thereon:—

Approximate Area in Acres.	Distance from probable Station.	Approximate Pine.
30,000	Line crosses reserve	25,000,000 feet
5,000	About 5 miles	16,000,000 ,,
10,240	About 6 miles to centre of reserve	13,000,000 ,,
610	About 4 miles	100,000 ,,
14,700	About 14 miles to centre of reserve... ...	12,000,000 ,,
1,400	About 16 miles	1,000,000 ,,
14,800	About 25 miles to centre of reserve... ...	74,000,000 ,,
Totals ... 76,750	1,838 feet to acre	141,100,000 feet

It is estimated that there are 23,350,000 feet of other timbers, besides pine, on the above areas. Kannangur is 83 miles from Brisbane, and Black Butt probably 40 miles further. The estimate as to the quantity of timber on the reserves is a Departmental one, which is considered by timber merchants to be very conservative.

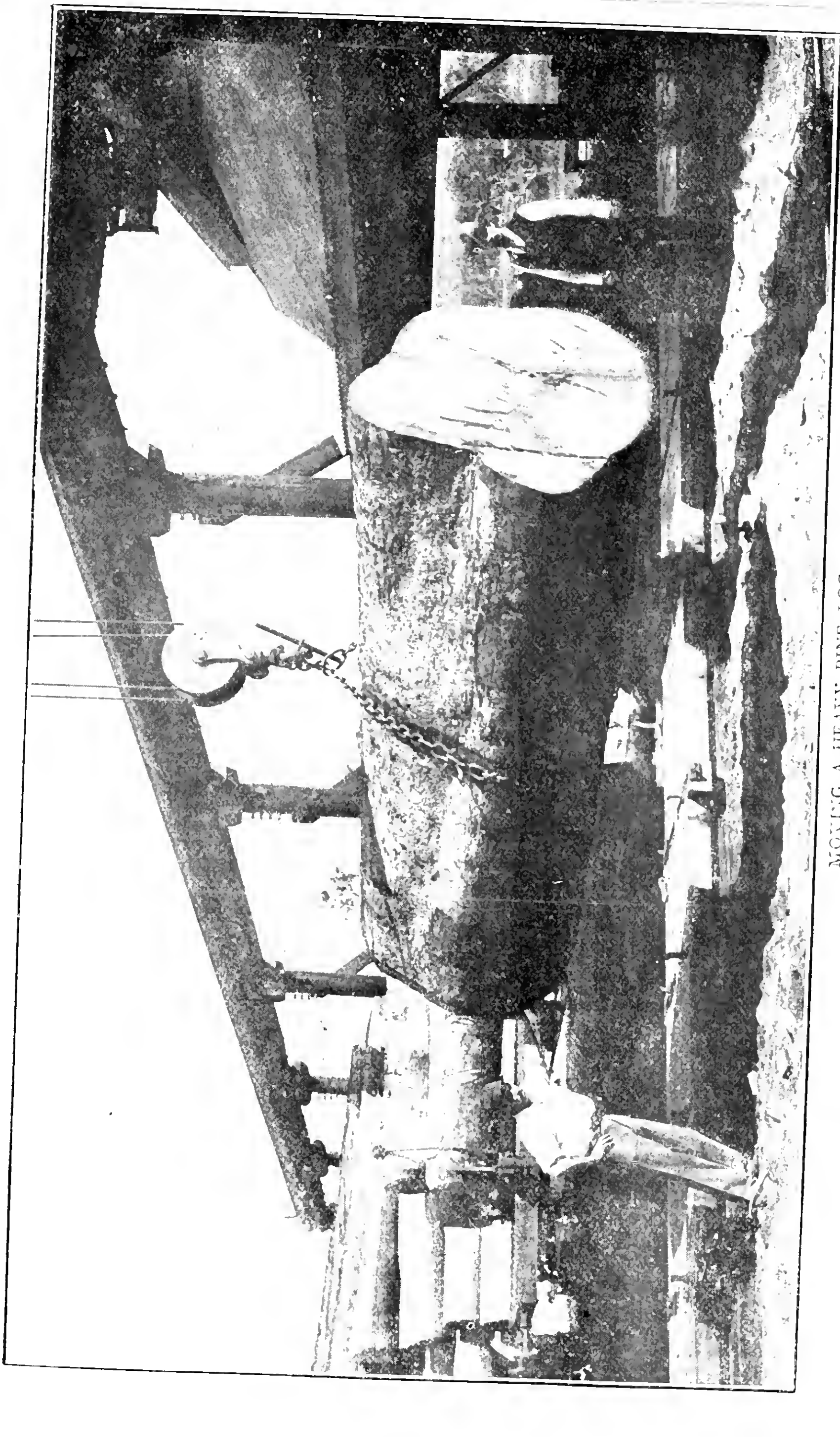
It does not seem necessary to furnish further particulars to satisfy one that there is sufficient timber in Queensland to supply all the butter boxes Victorian producers require. One gentleman, who is familiar with the timber resources of the State, and also with the dairying industry, said: "There is enough hoop pine along the Queensland coast to supply all the butter boxes wanted in Australia for many years to come."

Means of Obtaining a Supply of Boxes.—To appreciate the conditions with respect to the butter box industry, it is necessary to recall what took place some two years ago in Queensland. At that time there was, and is still, a Timber Merchants' Association there. The Queensland producers were then charged as much as 1s. 5d. for boxes by the members of the Association, and even at that price it was not easy to get supplies. It was necessary to apply to the Secretary of the Association for boxes.

The producers at last realized that there was plenty of timber available, and they resolved to erect their own mill if merchants would not reduce their price to a reasonable figure. One merchant, however, arranged to supply boxes at 1s. 0½d. each, and large contracts at this price over a number of years, were entered into. The producers, therefore, decided not to proceed with the erection of their mill.

With the exception of one or two box makers, most of the timber merchants have, I understand, practically gone out of the butter box industry, partly, it is said, because the profits obtainable from box making under present conditions are not attractive, but chiefly I believe, on account of the existing activity of building operations in Brisbane.

With a view to ascertaining whether the Queensland merchants could cater for our requirements, I commenced to interview representatives of the



MOVING A HEAVY PINE LOG.

various firms, but I soon found that the best plan was to see Mr. J. Gore, the Secretary of the Timber Merchants' Association. I explained the position in Victoria, and asked if, in the event of the Victorian producers desiring to obtain butter boxes from Queensland, the timber merchants could supply up to 1,000,000 boxes a year. He said they could, but that they could not, he believed, supply at less than 1s. 4d. f.o.b. Brisbane; 1s. 4d. was, he stated, the price producers in Queensland who had not contracts were then paying, and it was intended at the meeting of the Association that day to increase the price to 1s. 5d. I afterwards received a letter from the Secretary of the Association, which practically amounts to a quotation, and is a considerable reduction on the present price of butter boxes in Victoria.

If the producers here would be satisfied with the price quoted, I am of opinion that contracts could be arranged, and that there would be no doubt as to the merchants supplying the necessary quantity. The merchants require ample time to execute orders as it takes about seven weeks to properly season the timber.

Suitability of Queensland Hoop Pine for Butter Boxes.—Although the suitability of hoop pine for butter box purposes appears to be now firmly established, I made some inquiries as to how it really compared in Queensland with the New Zealand grown box. The dairy expert, Mr. Graham, who is familiar with both the New Zealand white pine and the hoop pine, informed me that he preferred the latter. The New Zealand timber, he said, showed dirt more quickly, and was more easily stained. The Queensland hoop pine he found to be of a closer grain, harder, and more difficult to break.

Very few complaints are received as to breakages of boxes made from hoop pine. On the other hand the following passage is an extract from a letter dated the 21st December, 1909, by Sir John Taverner, the Victorian Agent-General, in London:—"The general condition of this butter was fairly good, but I found many boxes broken." Sir John Taverner, of course, refers to butter boxes made from New Zealand timber.

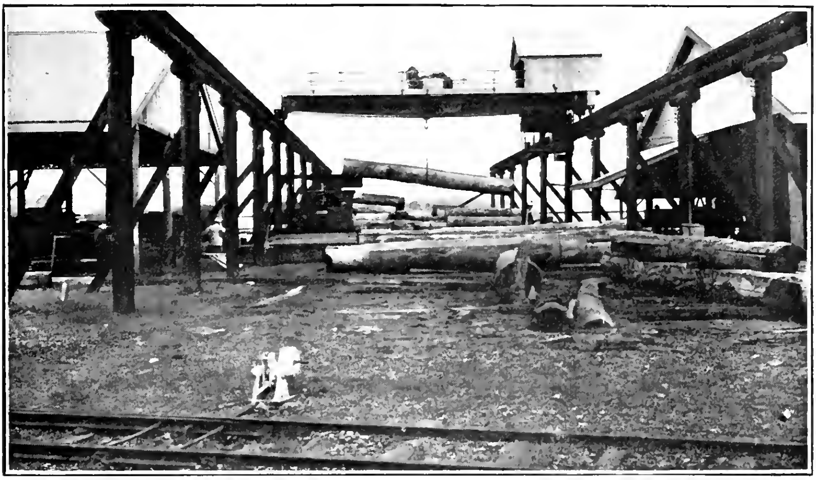
The hoop pine may be heavier than the New Zealand timber, but it is well within the weight stipulated by the shipping companies. The high prices and first prizes that Queensland butter has won in England have perhaps, more than anything else, removed prejudice against the hoop pine box. Attached is a copy of the Departmental Chemist's report on the Queensland timber as compared with that grown in New Zealand; a perusal of Mr. Brunnich's report should dispel any remaining objection to the hoop pine butter box.

SAWMILLS IN QUEENSLAND AND THEIR YIELDS.

Number of Mills.	Annual Produce in Sawn Timber.
2	Over 5,000,000 super. feet
1	From 4,000,000 to 5,000,000 super. feet
2	" 3,000,000 " 4,000,000 " "
6	" 2,000,000 " 3,000,000 " "
14	" 1,000,000 " 2,000,000 " "
29	" 500,000 " 1,000,000 " "
117	Under 5,000 super. feet
4	Planing and moulding mills
Total .. 175	

General Remarks.—At the present time, the building industry in Brisbane and in many of the Queensland towns is very prosperous. The existing sawmills are, therefore, fully taxed, and it is not easy for them to supply the demand for timber, but I believe the erection of several new mills is projected. I might mention that Wages Boards are continually extending in Queensland, and these may have an influence on the price of timber.

I also inquired as to the practicability of obtaining timber in the log shipped to Melbourne, but was informed that the Government will probably prohibit the exportation of timber in the log, in order that the work of cutting up may be provided within the State. It might be advisable, however, to make sure whether such prohibition would be allowed under Commonwealth law.



SCENE AT A QUEENSLAND MILL.

While in Brisbane I was impressed with the possibility of our producers co-operating and erecting their own mills, as was intended by the Queensland producers some time ago, but on further inquiry some difficulties presented themselves. Still, it is a matter for you to decide as to what action you will recommend the producers to take, and perhaps the following information may be of use to you in arriving at a decision.

The very best part of a tree is necessary for butter box purposes, and I was given an estimate that only 33 per cent., at most, of marketable timber could be used for boxes. The co-operative millers might not always find it easy to dispose of the balance of the timber, and in that case the boxes might cost much more than they anticipate.

In some cases, when the Government sells a quantity of timber it is required that wood distillation works shall be erected in addition to sawmills. The producers may not consider it advisable to associate themselves with the manufacture of naphtha, &c.

It should also be remembered that, in wet weather, the state of the roads is sometimes so bad that bullock teams and traction engines, used for carting timber to the mills, are often idle for a long time, during which period no haulage can be done, but this of course would apply to all mills. Further, it might be necessary to erect more than one mill, for while there is plenty of timber to be had, it might happen that some difficulty would be experienced in finding a forest large enough to provide timber for one mill to turn out the required number of boxes per year.

GRADING AND WEIGHING BUTTER FOR EXPORT.

If private enterprise will not supply the demand for a reasonable return, and if the price quoted by the Association cannot be reduced, it

BRANDING EXPORT BUTTER BOXES.

may still be worth the producers' while to go deeper into the matter, with a view to erecting their own mills.

I attach a copy of a contract with respect to a recent sale of Government timber. The timber is on 10,000 acres, part of a forest of 30,000 acres.

The Department estimates that there are 40,000,000 feet of pine on the 10,000 acres, but I understand this is a low estimate. It will be noted that the miller may not cut a tree less than 80 inches in girth, 5 feet from the ground. He must also erect a wood distillation mill costing £5,000 in addition to a sawmill costing £5,000.

I also enclose two maps, a number of photographs, copy of the last report issued by the Director of Forests, a list of the principal timber merchants in Queensland, and a number of other particulars, all of which are self-explanatory.

I feel sure that those engaged in the dairying industry in Victoria would be well advised to obtain butter boxes made of Queensland hoop pine, and that a considerable saving would thereby be effected.

I have the honour to be, sir,

Your obedient servant,

R. V. GILLIS.

The Hon. the Minister for Agriculture, Melbourne

* * * * * *

QUEENSLAND TIMBER FOR BUTTER BOXES.

Analyses by J. C. Brunnich, Agricultural Chemist, Brisbane.

—	Queensland White Pine.				New Zealand White Pine.	
	Half Dry.		Dry.		Dry.	
% of moisture in the wood	10·53		10·34		8·81	
% .. ash in wood	·60		·64		1·57	
% .. watery extract from the wood ..	1·10		·75		1·21	
Weight of wood, lbs. per cubic foot ..	38·2		40·3		30·0	
.. water absorbed, lbs. per cubic foot	8		9·5		9·3	
	lbs.	%	lbs.	%	lbs.	%
Weight of water evaporated per cubic foot in 2 hours	3·1	31·6	3·9	41·1	3·6	38·7
.. .. evaporated per cubic foot in 6 hours	6·6	67·1	6·2	65·3	6·5	69·9
.. .. evaporated per cubic foot in 24 hours	8·8	89·8	7·9	83·2	8·3	89·3

The watery extracts were obtained by letting sawdust of the timbers soak for twenty-four hours in water. They were almost tasteless, that is, the extracts had only the very slightest woody taste and there was no difference between the samples. The extracts of the Queensland timber were quite colourless and that of the New Zealand of a light yellow colour.

The amounts of extractive matters taken up by the water, of special importance in the use of these timbers for butter boxes, are the lowest in the Queensland timber, particularly in the second well seasoned sample which is to be considered in its favour.

Another point of importance is the amount of water absorbed by the timbers, and again the manner in which such water is given off when timbers are exposed to the air, as a criterion of the porosity and capillarity of such timbers. The experiments show that no difference exists in regard to these properties between our Queensland and the New Zealand pine.

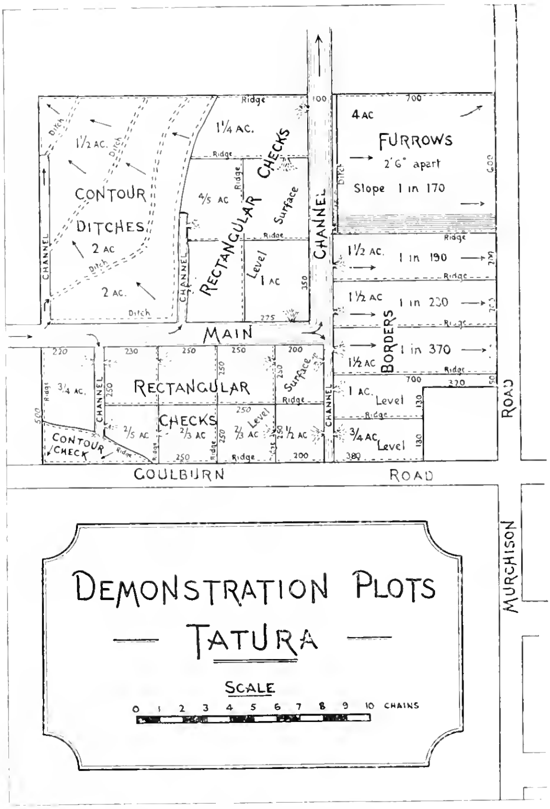
The second sample of the Queensland timber, a well seasoned wood, was heavier than the first half seasoned sample; it was a much closer grained wood from a different locality.

These experiments conclusively contradict any objection that Queensland pine could give a peculiar flavour to the butter.

IRRIGATION OF LUCERNE.

Elwood Mead, Chairman, State Rivers and Water Supply Commission.

The law defining the duties of the State Rivers and Water Supply Commission requires it to instruct occupiers of land in Irrigation and Water Supply districts "in the best methods of irrigated culture and the utilization of water applied to agriculture." In the performance of this duty the Commission intends to publish, from time to time, bulletins giving practical information, as an aid in the improvement of irrigation practice.



MANNER OF GRADING AND APPLYING WATER.

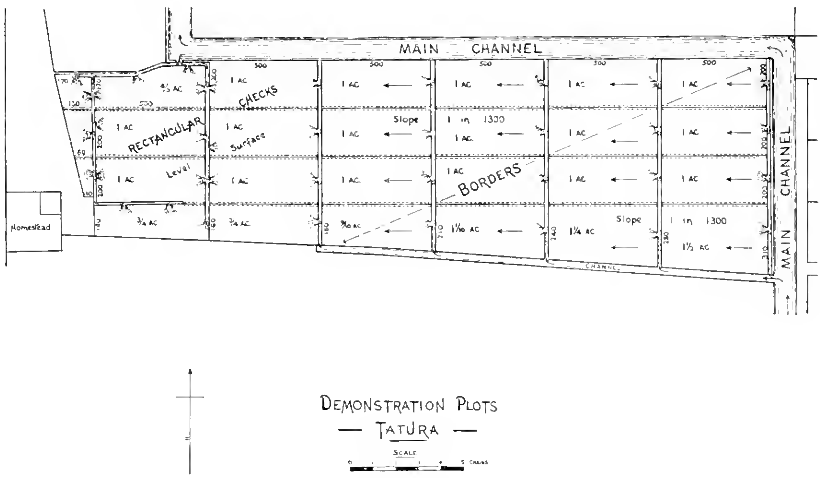
(First Field Prepared—Tatura Demonstration Farm.)

The first of these bulletins deals with the irrigation of lucerne, because it is regarded as the most useful crop which can be grown in Victorian irrigated areas, and the one destined in time to become the most valuable and important. The irrigated areas must be the chief reliance of the

State in protecting the pastoral districts against the vicissitudes of dry seasons. No fodder crop equals lucerne for this purpose.

The irrigation districts of Victoria must, in the near future, become the principal dairying districts of the State. Lucerne is one of the best fodder crops for this industry because it contains all the ingredients of which milk is made. The greatest value of lucerne, however, arises out of its influence in improving the character of the soil. Much of the irrigable land of Victoria, which has a clay soil, needs more nitrogen and humus. Lucerne, because it draws its nitrogen from the air, because its roots strike deeply into the subsoil and bring to the surface the stores of fertility from below, cannot fail to improve the mechanical condition of the soil, and hence promote the success of irrigation in growing all kinds of crops.

Thus far, the growth of lucerne has been neglected, in part because of the belief that it would not grow on clay soils. The failures which have occurred have not, however, been due to the soil, but to the bad treatment which the crop has received. Scarcely any of the land is graded. When irrigated, the water fails to reach the high spots and drowns out the low ones. Very little lucerne is grown for hay. This has been due in the past to the lack of labour-saving implements used in harvesting, and to the present practice of pasturing the crop. While



MANNER OF GRADING AND APPLYING WATER.

(Second Field Prepared—Tatura Demonstration Farm.)

pasturing at certain seasons of the year may not be injurious, all authorities agree that to pasture lucerne grown on clay soil, in wet weather, is ruinous.

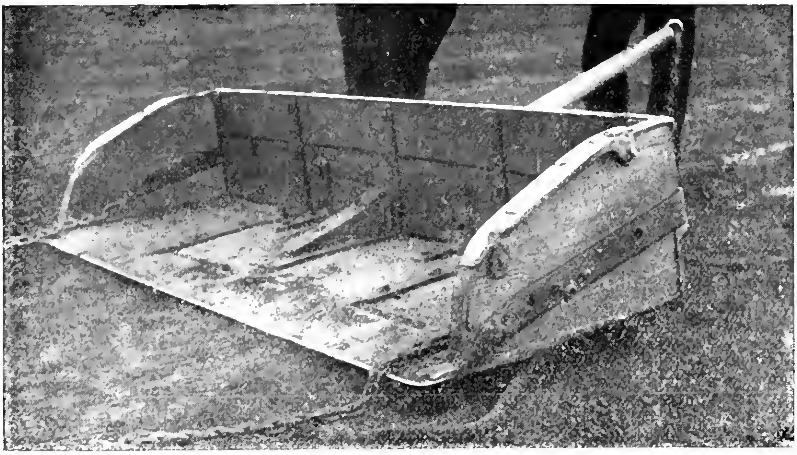
The belief that profitable crops of lucerne cannot be grown on clay soils has been the greatest obstacle to its extension in the irrigated districts of the Goulburn Valley. Yet these soils are not nearly so difficult to cultivate as the gumbo soils of many of the lucerne districts of the United States. The following statement of Joseph E. Wing, an expert agriculturist of America, is a fair presentation of the results of American experience, which Victorian experience has confirmed.

Soils on which it is difficult to grow Lucerne.—It is more difficult to grow lucerne on some soils than others, and on some of them it is not wise to make the attempt. First, any soil that is not more than $2\frac{1}{2}$ feet above the water line is too shallow for continual lucerne growth. It needs a depth of at least 3 feet to water, and if the distance is even greater all the better. In laying tile underdrains for a foundation to a lucerne field seek, then, to get the level of the water line down at least 3 or 4 feet.

On peaty soils with little clay or sound earth within them it is not often that lucerne will thrive. There are some exceptions to this rule, though they are not well understood.

On nearly barren sands it is doubtful if it is worth while trying to establish lucerne fields. They must be continuously fed in order to produce this forage, so rich in mineral elements, and it must be remembered that these mineral elements must come from the soil.

Clays.—While the most luxuriant growth of lucerne is usually from a porous soil, a loam or gravelly alluvium, yet clays drained and stored with vegetable matter are producing some of the best growths of lucerne in the United States. This is especially true of strong, tough limestone clays that, when in their natural state, hold water "like a jug," but when underdrained and well manured become more



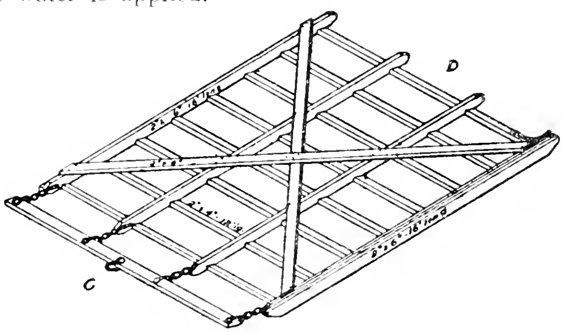
THE BUCKSCRAPER.

open and pervious to both air and moisture. On such clays lucerne revels, and when ploughed up and other crops are planted on the land it is astonishing to see with what vigour they grow, revealing plainly the very great benefit that the lucerne has been to the soil, both by adding nitrogen through the decay of its leaves and roots, and by bringing up mineral matters from the sub-soil, and by decaying and leaving the air and water passages through the clay, always before too dense to permit these helpful agents to work their will. And when lucerne is sown again upon these clays after one or two years of grain or hoed crops, manure being scattered over the land in the interval, it is found that the lucerne responds wonderfully and yields better than it did after its first seeding.

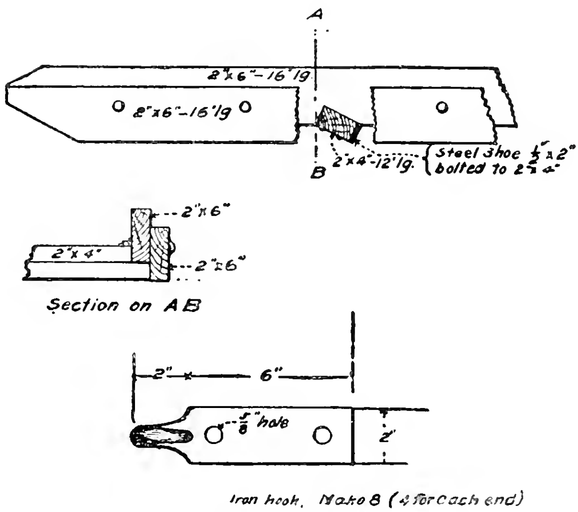
As an aid to improvement of Victorian practice and to the determination of the modifications of practice in other countries required to suit local conditions, the Commission has carried on an experimental and demonstration farm at Tatura for the past two years. One of the fundamental problems to be dealt with here was to determine what plan of preparing land for irrigation was best suited to the soils and grades of the Goulburn Valley. Other questions to be studied, were the frequency with which water needs to be applied under irrigation, and the treatment of the soil required to promote the growth of the crop.

The diagrams on pages 182 and 183 show the manner of grading and applying water adopted at Tatura.

The first field prepared was of an undulating character, giving an opportunity of testing a number of methods of applying water. The second field had a uniform slope, and here the method of applying water best suited to such slopes was adopted. The diagram shows the manner in which the water is applied.



LAND GRADER



LAND GRADER.

Using a stream of about 6 cubic feet per second, the field can be watered in one working day, if the water is turned on at about daylight and continues running until as long as one can see to handle it. The average depth of water used in one irrigation is about 3 inches, and thus far it has required from one to two waterings for each crop or from six to ten waterings a year.

The two tools used in the grading of these fields were the buckscraper, and a grader manufactured by a local blacksmith. Illustrations of both are given.

The number of tools and implements for grading land is being rapidly increased in Victoria, and the Commission desires to obtain illustrations and prices of these, and has recently issued a circular asking makers to furnish it with both.

The work of the Commission is not, however, a sufficient basis for a bulletin on the irrigation of lucerne, and the experience of irrigators is too limited to enable a manual on local practice to be prepared. In the United States, however, this matter has been the subject of careful and comprehensive study for several years, and the Office of Experiment Stations of the United States Department of Agriculture has recently issued a bulletin on the irrigation of lucerne, which applies so well to conditions here that the Commission has reprinted the greater part of it. The bulletin (*Farmers' Bulletin*, 373, issued 19th November, 1909) was compiled by S. Fortier, Chief of Irrigation Investigations, Office of Experiment Stations, United States Department of Agriculture.

For convenience in perusal, the word alfalfa, which is used instead of lucerne in the United States, has been changed to lucerne, and dollars and cents have been converted into pounds, shillings and pence.

Applications for copies of the bulletin should be forwarded to the Secretary, State Rivers and Water Supply Commission, Melbourne.

INSECTIVOROUS BIRDS OF VICTORIA.

The Bronze Cuckoo (*Chalcococcyx plagosus*, Lath.).

C. French, Jr., Assistant Government Entomologist.

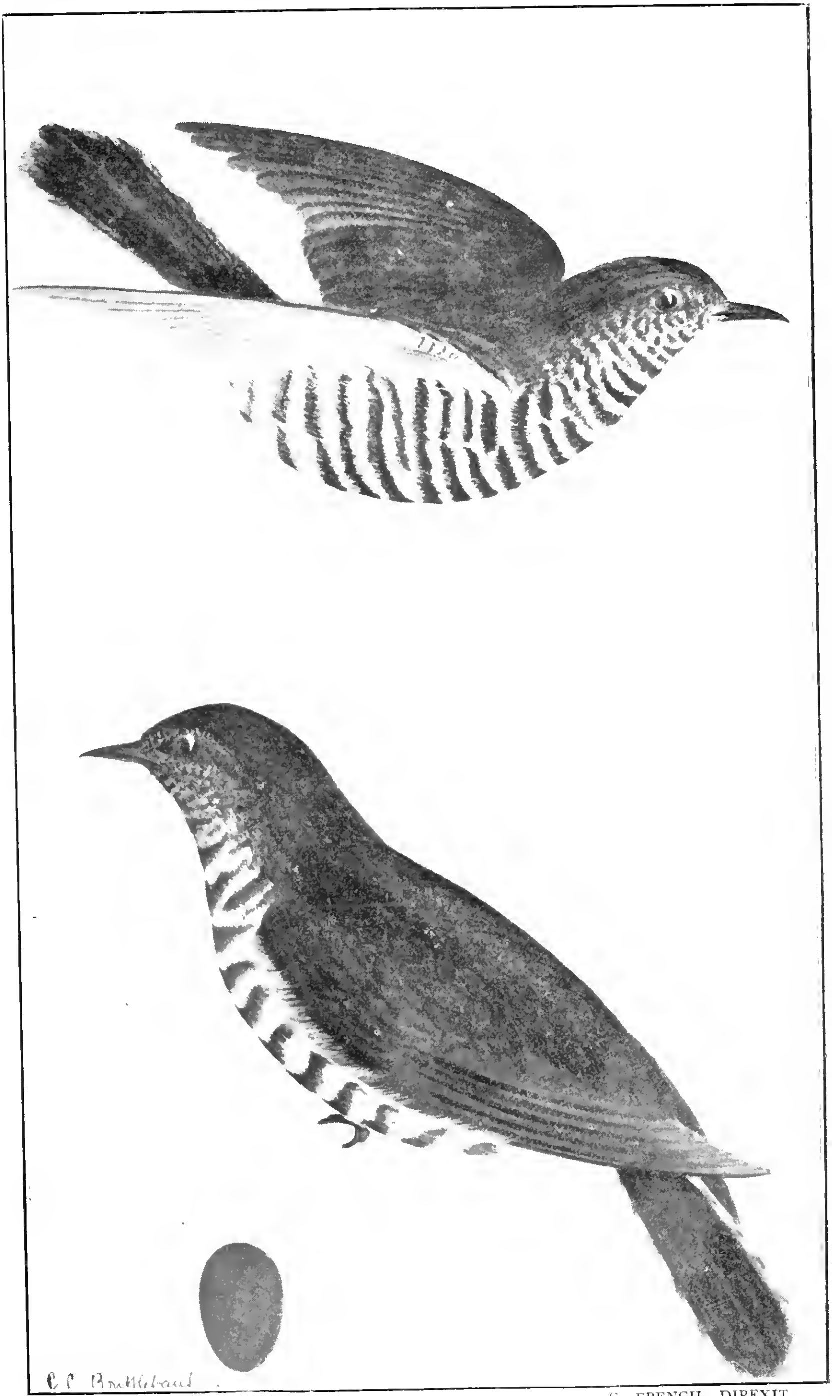
Amongst our useful insect-eating birds, the Cuckoos certainly hold a prominent place, and the above named species is one of the best. This bird is generally found in the same vicinity as the Narrow-billed Bronze Cuckoo, and it is no easy matter to separate the two species unless one has a close view of the birds. The most noticeable difference between the markings of the two species is that the Narrow-billed (*C. basalis*) has the crown dark brown, and a brownish colour in the tail. The eggs of the Bronze Cuckoo are of a bronze or olive green colour, whilst those of the Narrow-billed are of a white colour with pinkish markings.

Both of these birds deposit their eggs in the well known nests of the Yellow-rumped Tit (*Acanthiza chrysorrhoa*), and it is no uncommon thing to find the eggs of the two species in the same nest.

Bronze Cuckoos were fairly numerous in the suburbs near the city this season, and seem to be on the increase. Unfortunately, the Tits usually build their nests in the Prickly Acacia (*Acacia armata*) hedges within easy reach of boys, and many nests containing eggs of the Cuckoos are destroyed. When the Tits build in private gardens they generally remain unmolested, as this little useful insect-destroying bird is a general favourite.

The food of the Bronze Cuckoo consists of various noxious insects, and as the birds continually visit orchard after orchard in search for food, they consume a great number of insects daily.

The Pallid or Unadorned Cuckoo (*Cuculus inornatus*) is one of the very few birds that destroy the larvæ of the destructive Vine Moth.



C. C. BRITTLEBANK, DEL. C. FRENCH, DIREXIT.

THE BRONZE CUCKOO.

(*Chalcococcyx plagosus*, Latham.)

PRICKLY PEAR.

A Fodder Plant for Cultivation?

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in the University of Melbourne.

As this matter is one of some importance it will be worth while discussing the last two publications on this question by the United States Department of Agriculture. They are the work of Dr. David Griffiths, Assistant Agriculturist, and are directed to show that Prickly Pear is adapted for profitable cultivation as a farm crop. The species to which these statements apply is *Opuntia Lindheimeri*, Englm., whereas the plant naturalized in Victoria, and which has proved sufficiently troublesome and threatening to be proclaimed under the *Thistle Act* for the whole State, is *Opuntia monacantha*, Haw., a different species. It is by no means uncommon that one species of a genus may be useful while another is the reverse. For instance, in the genus *Brassica* we have included under *Brassica oleracea*, L. the cabbage, cauliflower, Brussels-sprouts, &c., which are among the most useful of cultivated plants, while under *Brassica Sinapistrum*, L. we have the Charlock, which is one of the worst weeds of cultivation.

It does not appear, however, that we have a similar instance in this case, or that *Opuntia Lindheimeri*, is markedly superior as a fodder plant to *O. monacantha*. As the two Bulletins recently issued, though slightly tinged with enthusiasm, are characterized by a strict regard for fact, it will be sufficient to give an epitome of the facts they establish and leave farmers to judge for themselves as to whether the evidence justifies them in undertaking the cultivation and spread of this or any other form of Prickly Pear.

SPINY *versus* SPINELESS FORMS.

Dr. Griffiths does not recommend the cultivation of any of the spineless forms, at present known, in preference to the spiny forms, his reasons being quoted below in tabular form as follows:—

Advantages of spiny native forms.	*Advantage of the spineless forms.*
1. They are hardy.	1. They do not require singeing.
2. They do not require fencing.	
3. They are injured but little by wild animals.	
4. They require a minimum of handling.	
5. They accomplish the distribution of the manure during the day.	

An additional disadvantage of the spineless forms is that unless fenced in with wire netting they are eaten by rabbits, &c. In regard to the spiny forms, before the plants can be eaten with safety, or in fact eaten at all, the spines must be burnt off or otherwise removed, or softened. Neither Bulletin gives any satisfactory estimate of the cost of this treatment.

Under the head of cultivation, however, it is mentioned that the labourers used were Negroes and Mexicans, and it is possible that the presence of cheap coloured labour in abundance may give this plant a value it could not possibly enjoy under white labour conditions in Australia. Thus, the wages of a man work out at 5d. an hour in the calculation of the cost of planting. Useful labour is not easy to obtain at this rate in Australia.

Resistance of Prickly Pear to Drought and Cold.

The idea that this plant will grow and thrive in the most arid districts is a common, but quite mistaken one. A generation ago, an ingenious Frenchman proposed to render the Sahara desert capable of supporting life by planting Prickly Cactus over it. Experience has shown, however, that the plant will only grow in really arid districts when irrigated, and where water is available vastly better plants can be grown. The plant does not resist frost at all well and is, in fact, a sub-tropical one. Dr. Griffiths shows only a relatively small area of land on the south-west and south coasts of North America, including California and Florida, where he considers the plant might be profitably grown. Victoria would not come under this zone, although parts of New South Wales and of Queensland, where various Prickly Pears are well known pests, would present a similar range of conditions to the zones marked for the cultivation of the plants in the United States.

The following is a quotation from page 17 of the latest Bulletin, January, 1909:—

> The writer believes that the plants will grow under cultivation, without irrigation, on the Gulf coast of Texas and in California from the Sacramento Valley south. Under the influence of the ocean, they may get along with neither cultivation nor irrigation, but in the interior valleys they will have to be carefully cultivated in order to conserve the moisture after the rains cease in the spring. Experience has proved this at Chico, California. In the great arid interior region extending eastward from the southern Sierras, the Prickly Pears will have to be irrigated before they will make any growth worth while.
>
> The statement which the writer made in a previous publication applies with equal force here and will bear repetition. The Prickly Pear plants are adapted to a region having a considerable rainfall too irregularly distributed for ordinary crops. They must have water to grow and a considerable amount of it. They are the camels of the vegetable world. They must have water, but they can get along for long periods without it.

It must be remembered that, in the matter of arid regions, the United States falls far behind Australia, having no districts which can be compared with the deserts of Central Australia, so that there is no reason to fear the plant establishing itself in pest fashion in Central Australia. In fact, districts with an average annual rainfall below 16 to 20 inches may disregard the plant as a possible serious pest, since it can never exhibit the luxuriance of growth shown in warm countries with a higher rainfall.

On page 31 of the 1908 Bulletin it is stated that "the experiments have been done on land having a rainfall of 16 to 40 inches per annum (average 28 inches), the temperature minimum averaging 22° F. and the rainfall being rather irregular" though less so than over the greater part of Australia.

Where there is a good, but somewhat irregular, rainfall, deeply-rooting perennial fodder plants which draw water from the deeper layers of the soil, will give better results than plants like Prickly Cacti which get over temporary drought by storing water and checking transpiration. Plants which check their transpiration also check their growth when the temperature is most suitable for it, whereas the deeply-rooting fodder plant will usually grow most actively during warm dry spells and so makes the most of every opportunity.

Summarizing the remaining data given by Dr. Griffiths:—The cost of planting an acre of Prickly Cactus was £1 16s. 8d., and would be at least double this in Australia. (The cost of eradicating it when once established may vary from £5 to £10 per acre.) The cost of cultivation and of preparing it for food by cutting and burning is not given.

Harvesting takes place by cutting and burning off the spines, the stock being allowed free access to the plantation and eating the plants as they are prepared for them. A plantation once established will keep good for 15 to 20 years. Harvesting should take place every two years. The fodder cannot be stored and it does not pay to cart it any distance.

For a dairy cow 140 lbs. per day are needed, for a steer, 75 lbs., *i.e.*, an average of about 23 tons per year. Under cultivation a yield of 23 tons per acre can be obtained per annum, but less than 3 tons without cultivation, the plant really being a slowly growing one.

The plant suffers from three diseases, two of them being apparently serious ones. Where the grasses are not grazed, it grows less than on grazed land.

Six pounds of Prickly Pear are stated to be equivalent to one pound of Sorghum hay, so that the proportion to Lucerne might be as 10 : 1. Hence, with a moderate yield of Lucerne of, say, 5 tons per acre per annum, the food values per acre are Lucerne, 50; Prickly Pear, 23; and this is comparing an average yield of Lucerne with a maximum yield of Prickly Pear.

To conclude, Prickly Pear will only grow in arid districts when it is irrigated, *i.e.*, in districts with an annual rainfall below 16 inches, although irregular stunted growth may of course be possible near this limit. Granted the conditions of rainfall, soil and temperature under which it thrives, better fodder plants can be grown.

It is one thing to endeavour to make use of a plant which has taken possession of the land, but quite another to recommend its cultivation and spread. Where used as a fodder by burning off the spines, it should be employed only with other more nutritious foods. It is too bulky to transport and too sappy to be worth drying or preserving.

Dr. Griffiths expressly states that it is to be regarded only as "roughage," as a stand by, or as supplementary to other feeds, and the question at once arises as to whether it is not far better and more profitable to store fodder in ricks and silos, rather than allow it to stand in the fields in the form of prickly plants like Spiny Cacti. Remember, that a dairyman with a hundred cows, in addition to the daily milking, would, if using Prickly Cactus as food, have to cut and burn the spines off more than *six tons* of the plant *per day!*

With the foregoing facts before them, farmers can conclude for themselves whether or not the plant is worthy of cultivation.

ANSWERS TO CORRESPONDENTS.

PRUNING CITRUS TREES.—C.C. inquires whether citrus trees require pruning. He also asks what amount of manure is recommended.

Answer.—(1) Citrus trees require regular pruning and thinning out, so as to relieve them of old and unnecessary wood, to admit light and air, to prevent overcrowding, and to allow the development of new wood upon which the fruit is borne. This work is very often neglected, and the trees, as a result, present the appearance described. The trees should be pruned and thinned out in spring, cutting out crowding, useless wood, and all old laterals that have carried fruit. Cut off also all dead and decaying wood. Remove upright growths from the centre of the tree, and allow it to spread as much as possible. Examine the roots and stem of the tree for root or collar rot. If either be present, cut away and destroy every trace of diseased wood or bark. Paint the wound with an antiseptic solution of equal parts of carbolic acid and water. The soil should be thoroughly drained, and the roots should never be injured by any cultivating implement. (2) From 1 lb. to 2 lbs. of sulphate of iron is a useful manure for citrus trees.

KILLING TREES WITH ARSENIC.—W.T.C. writes:—"I have been using, with success, dissolved arsenic applied immediately after ringing, for the killing of eucalypts. Before proceeding further I wish to know—(1) What form is the arsenic likely to be in when it becomes mixed with the soil, after the trees are grubbed and burnt and the land cultivated? (2) Is the presence of arsenic in this form, and in the quantity of about $1\frac{1}{2}$ lbs. to the acre, likely to materially affect the fertility of the soil?"

Answer.—(1) For the purpose mentioned, arsenic is usually applied in the form of arsenite of soda. It will remain in this form in the soil, but as it is soluble in water it will gradually disappear through the action of rain and drainage. (2) The presence of arsenic in the form of arsenite of soda, at the rate of $1\frac{1}{2}$ lbs. per acre, would not affect vegetation or the fertility of the soil, and consequently would not destroy eucalyptus trees. If $1\frac{1}{2}$ lbs. to the tree is meant, the soil in the vicinity of the tree would be affected.

INTER-CROPS IN YOUNG ORCHARD.—Merrigum states that he is planting a young orchard and would like to know what could be grown, under irrigation, in the way of inter-culture, for the Melbourne markets.

Answer.—As an inter-crop between young trees, strawberries have been grown in your district with highly payable results. The lime, manure and water necessary to strawberries would all be helpful to the young trees. Tomatoes would also be a very profitable crop, especially if the seeds were sown in March or April under glass, and planted out early. A crop of onions would probably be profitable, although your district is rather warmer than ordinary onion districts; this vegetable has, however, been grown with very good results in the Goulburn Valley. Whatever crop is grown between young trees, it should be kept out from the trees, so as to allow the growing roots to spread as far as possible. Any breaking or cutting of the young roots by cultivating implements will cause a very severe check and will inevitably dwarf the tree.

FOOD FOR CALVES.—E.J. asks for the formula of a good food for calves.

Answer.—The best of all foods for young calves is without doubt fresh milk. When this cannot be used an effort should be made to supply the constituents as near as possible. This may be done by using fresh skim milk, to which is added an oil to take the place of the butter fat removed. Possibly the best of all in this respect is cod liver oil, well shaken with the milk so as to make a fine emulsion. Some of the calf foods on the market are quite satisfactory if the directions given are properly carried out.

STACK COVER.—W.W.J. states that he has tried a mixture of sugar of lead and alum for a stack cover made of common hessian and found it good. As sugar of lead is a poison he wishes to know whether his cattle are likely to be affected if they eat the hay.

Answer.—Sugar of lead is decidedly poisonous, and the upper layer of hay would undoubtedly contain a certain amount. It would depend upon this amount as to whether injurious symptoms were produced.

POISONOUS QUALITIES OF MILLET.—J.W.H. asks whether millet has been proved effectual in poisoning rabbits. Also whether there is any danger to stock through eating millet.

Answer.—Growing millet for rabbit extermination has been tried with very indifferent results, principally on account of the presence of other food. The idea may have originated from the well-known fact that sorghums contain during the leaf and flowering stages, a variable quantity of prussic acid and cyanide of potassium, two substances of recognised poisonous qualities. It has been specially noted that if the growth of the plant is stunted, through dry weather or any other natural cause, the amount of the poisons referred to is increased. Stock should be kept away from millet until it is cut and allowed to wilt in the open for at least 36 hours, during which time the injurous elements disappear.

CONVERTING PYRETHRUM INTO INSECTICIDE.—L.C.D. inquires as to mode of converting Pyrethrum into insecticide.

Answer.—To obtain the best results from Pyrethrum it is advisable to cut the plant just as the flowers are beginning to open, as its value as an insecticide depends on its oil content, which is most abundant at this stage of growth. The oil is very volatile, so the cut portions must not be exposed during drying to direct sun heat or to a high temperature. When dry, grind into powder and place in air-tight receptacles, otherwise it will quickly lose its strength. It may be either used in solution or as a powder. The ordinary method is to mix one ounce to three gallons of water when used as a solution. As powder, dry without dilution, or mix with flour or any light material in the proportion of one part of the powder to from six to thirty of the dilutant as may be desired.

FLOOR OF SILO.—A.E.M.C. is erecting a concrete silo faced on the inside with inch of cement, and wishes to know if a cement floor is necessary.

Answer.—Such a floor would be an advantage, though not absolutely necessary. Provision should be made for weep-holes for drainage. When filling, lime-washing the walls should not be omitted.

WORKING CHAFFCUTTER.—E.W.P. asks if chaffcutter for silage could be worked by a belt from fly wheel of horseworks on to a shaft with two pulleys, and from there to the cutter, and would such an arrangement make it any harder for the horses.

Answer.—The proposed arrangement, which is simply a countershaft, is quite feasible. The additional work put on the horses is trifling in amount.

REINFORCED CONCRETE SILOS.—J.B. desires to know if the Department recommends the construction of reinforced concrete silos.

Answer.—Unless they are well made by skilled workmen, concrete silos may prove unsatisfactory, and this applies with equal force to all concrete work. For a reinforced concrete silo of 100 tons capacity—30 feet in height and 15 feet inside diameter—the thickness of wall at base should be 9 inches, and at top 4 inches. The reinforcing would consist of three No. 8 wires every 6 inches in height, for the bottom 5 feet, two wires the same distance apart for the next 15 feet, and one wire for the top 10 feet. On the bottom 5 feet, 16 vertical rods (⅜ inch) are set running into the foundation ring, 2 feet wide by 2 feet deep, which is also reinforced horizontally by three rows of three wires each. The roof may be of any design, fastened to bolts set in the concrete. Port-holes are 2 ft. x 2 ft. 6 in., lined with 6 in. x 1 in. oregon attached to bolts let into concrete. The walls should be rendered after completion, and lime-washed before filling. Complete plans and directions will be supplied upon application.

CAPONIZING TURKEYS.—J.P.M. asks whether caponizing of turkey gobblers is recommended.

Answer.—No, there is a risk of losing them. Turkeys are quite delicate enough without running the risk of losing 60 per cent. by the operation. It is a simple matter to separate the sexes by erecting a high division or enclosure. The best age to caponize is from five to six months.

BACON CURING.—H.T.L. asks for particulars regarding the mild curing of bacon. He wishes to know how the bright golden colour is obtained, and also asks whether brine pumps are recommended.

Answer.—The best way to get the mild cure is to study the weather as much as possible. Before killing, see that the pig is thoroughly cool and has rested for at least twenty-four hours. Bleed well and give it a quick scald—three parts of hot water to one of cold makes a good scald. Get it out of the water as quickly as possible after scalding; hang up and open, getting the entrails out as soon as possible. The latter is one of the principal elements of success in bacon curing. Pull the leaf lard out in order to get the animal heat out quickly; hang the carcase in a cool place for, say, twelve hours. After cutting up, place the sides, flesh side up, on the floor of the curing room; sprinkle some salt and saltpetre over the flesh side and allow them to remain there for three or four hours. This procedure allows the humours to drain from the meat and gives it a much better chance to cure. If the curing is done in pickle there is no necessity to rub the bacon when applying the salt and sugar, but, in placing in the tank, do so carefully so as not to wash the salt off. Leave in pickle for forty-eight hours. At the first shifting, move the joint of the ham and fore-hand well by pressing all the blood from the veins in the ham; press and work down from the knuckle. When placing the sides back in the tank be careful not to shake the salt off the bacon. When changing tanks, the meat at the top of the first tank should be placed in the bottom of the second tank so that the pressure throughout will be even. Always keep the bacon well covered with pickle by weighting with large stones or screw jack. Shift the sides every other day for nine days; take out and stack on floor or bench, one side on top of the other. Shift every two days for an additional six days. Then brush all salt off and thoroughly soak in cold water for twelve hours; change the water and soak for six hours more. Then wash in plenty of hot water; brush and clean well; string and hang up and wipe over with dry cloth. When dry, trim all pieces from the face or flesh side of the bacon and turn the latter flesh downwards. Take some salad soil, put a little over the skin with a cloth (not too much) and place bacon in a cool smoke of kauri saw-dust. The saw-dust must not blaze. A little saltpetre sprinkled on the saw-dust is very effective in giving the skin a nice bright appearance. After smoking, clean the skin with an oily rag and rub off with a dry cloth. Brine pumps may be obtained from Melbourne firms, but their use is not advised if they can possibly be done without, for the simple reason there are very few people who can use them to advantage. One is liable to pump air with the pickle, and when the air gets into the meat the latter goes bad. The price of a pump is £4.

Agricultural Education in Victoria.

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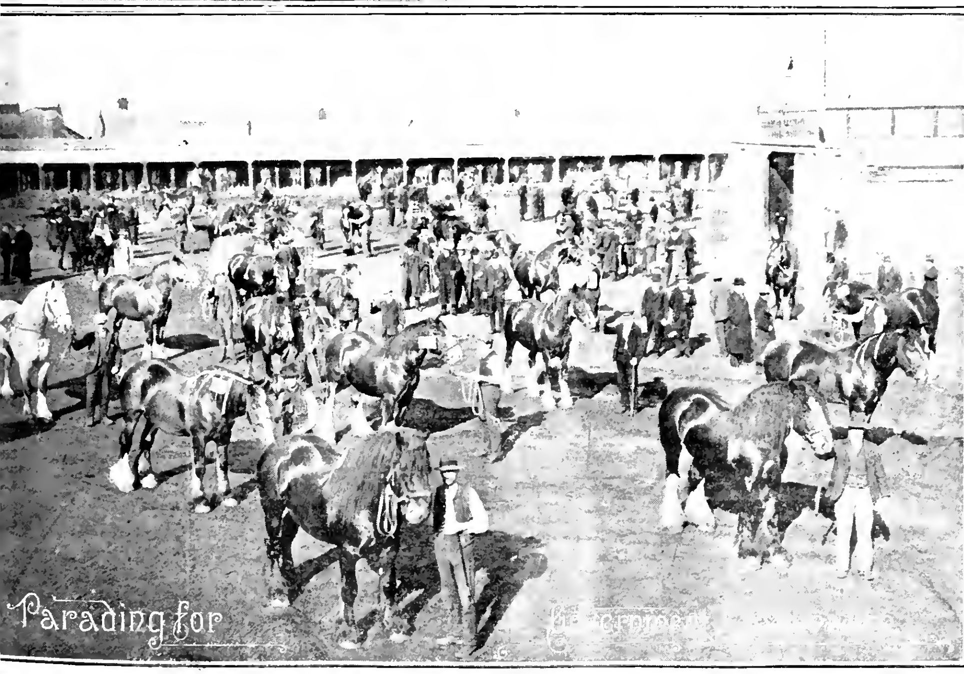

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OF
THE DEPARTMENT OF AGRICULTURE.

A. T. SHARP, Editor.

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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. VIII. Part 4. 11th April, 1910.

THE LAWS RELATING TO THE MARKETING AND EXPORT OF FRUIT, PLANTS, ETC.

J. G. Turner, Senior Inspector, Fruit Exports and Imports.

For want of information on the laws governing the sale and export of fruit, many growers are put to a great deal of trouble and expense which might be easily avoided by attention to the hints outlined herein. It is more especially in connexion with exports to ports near at home that the novice has found difficuties. Instances have occurred wherein growers have forwarded fruits to ports within the Commonwealth or to New Zealand and have been surprised to learn that the consignment has been refused admittance on account of some apparently trifling non-compliance with the regulation in force at the receiving port. Finding that there is no hope of entry at the first port, the fruit is sent on to a second, with the same result. A third port is then tried and it is perhaps found that the consignment has arrived in such a condition that, after sorting and repacking have been gone through, little or nothing in the way of profit is left for the luckless shipper.

Cases are quoted, too, where growers, for want of knowledge concerning packing, marking of cases, certification, &c., have missed good local markets or have had their shipments held back from oversea steamers, thus compelling sale elsewhere at a figure that little more than pays the cost of commission.

Much of the time of a very busy staff of State and Federal officials is taken up in explaining these matters by letter, telegram and personal interview. It is, therefore, with a view to mutual benefit that these notes are drawn up.

The following are the Acts regulating the local sale and exportation of fruit, plants, &c. :—

Vegetation Diseases Act.	Commerce Act.
Fruit Cases Act.	Health Act.

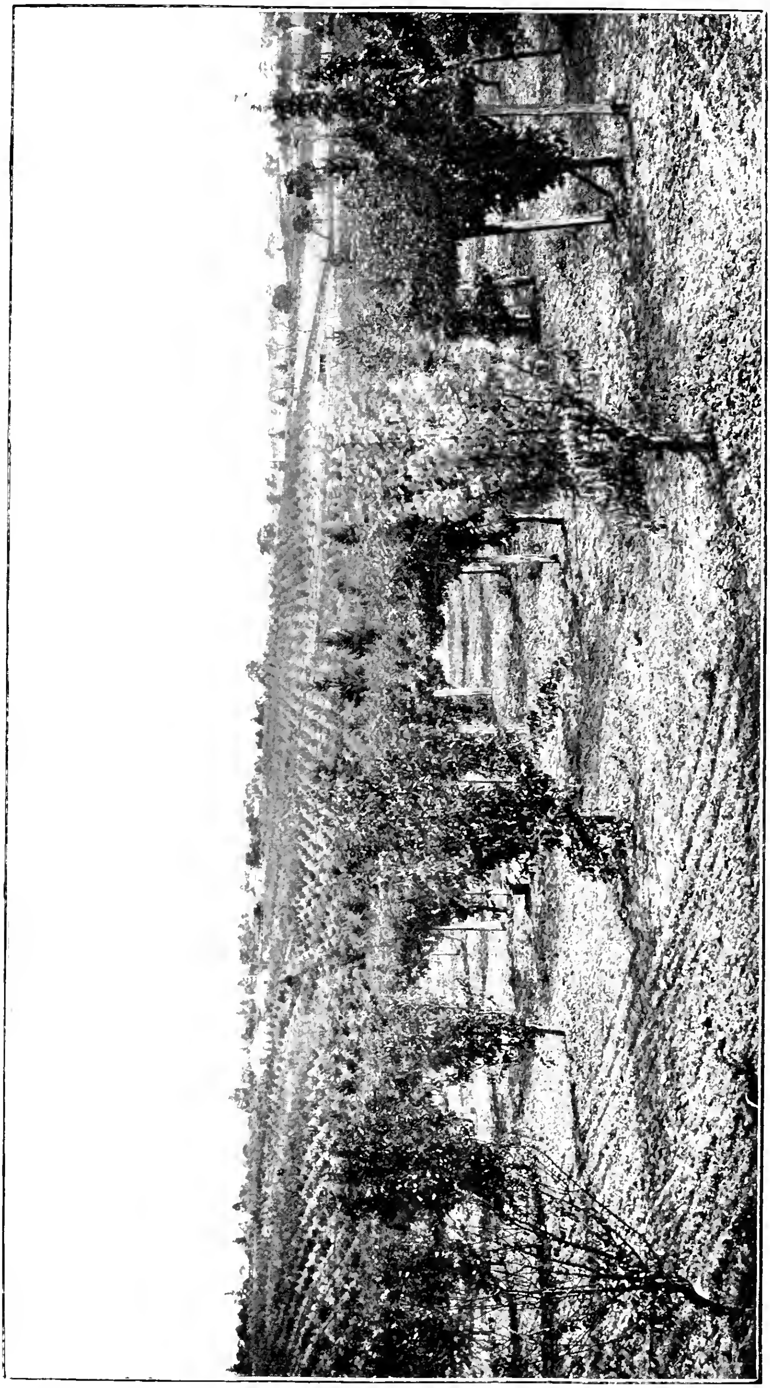
Concerning importation, it is not intended that such will be more than lightly touched upon here. The grower is, as a rule, but little concerned with the procedure governing imports. Taking then these measures in their order, as given above, the first is—

The Vegetation Diseases Act.—The original Vegetation Diseases Act No. 1432 was passed in 1896. It belonged to a class of legislation which was then in the experimental stage. Embraced within its scope, therefore, was provision only for inspection of products imported from abroad or from other States or for those grown in our own orchards. No provision was made for dealing with local market inspection or Inter-State exports. The measure was, moreover, a temporary one (being passed for three years only) in order to show whether, from results at the time of its expiration, justification would exist for its continuance. At the end of its term of probation, however, the beneficial effects of its operations were

PRELIMINARY OPERATIONS.

so manifest that a short Act to place the measure permanently upon the statutes was passed with but little opposition. In order to strengthen the work of inspection of imports (in the matter of checking the spread of disease) an amended Vegetation Diseases Act was passed on the 23rd December, 1901. This measure provided against the sale of fruits or plants infested with any insect or fungus disease, whether the same be dead or in any stage of living existence. Provision was made for a maximum penalty of £10 against offenders in this direction. Power was given the inspectors to enter any stall, market, shop or place and to examine any trees, plants or vegetables exposed for sale. The effects of this legislation have been shown in the immense improvement in the general quality of the locally-sold fruits.

Objection to this measure has been made in some quarters on the ground that it is harsh; and the argument has been adduced that an inspector may,



A TYPICAL ORCHARD IN THE BOX HILL DISTRICT.

if he think fit, condemn a whole line if he find one diseased fruit therein, and, in addition, may prosecute the vendor. The majority of growers, however, know that such is not the case and are content to rely upon the good judgment of the inspectors and the common sense of the adjudicating bench. It may safely be contended that this confidence has never been misplaced; as, although some hundreds of prosecutions have been undertaken, in no instance has it been proved that the same have been instituted against offences of a trifling nature.

There is no provision under the Vegetation Diseases Act to compel inspection of fruit, plants or vegetables prior to their being exported to Inter-State ports. As all the Australian States and New Zealand, however, have passed laws regulating the import of these products, it is necessary that the provisions of their regulations shall be complied with to insure the admission of our products. These Inter-State regulations were mutually

INSURING A CROP OF CLEAN FRUIT.

drawn up at Conferences of State Ministers held at Sydney and Melbourne during the last two years. They have since been adopted by most of the States.

Fruit Cases Act.—This measure was passed on the 28th December, 1906. Its object was, by securing uniformity in the sizes of fruit cases, to grant traders and the general public some security in the matter of receiving full value for their money when purchasing fruit. The Act did not come into working operation until six months after being passed. In order to allow vendors to rid themselves of any stocks of undersized cases, a term of two years was allowed from the passing of the Act for the sale of fruit in any sized packages, provided the same had the net weight legibly and durably marked thereon in letters of not less than one-inch in length. This provision has now expired, and all cases used for local sale of fruit must be of the standard sizes shown in the schedules to the Act.

Health Act.—Often, when inspecting at the various wharves, markets, shops, &c., officers are called upon to reject consignments of fruit which, although not affected with any of the scheduled diseases under the Vegetation Diseases Act, may be so over-ripe or in such a condition as to be unfit for human consumption. Until recently, under such circumstances, officers, for want of the necessary authority, were unable to condemn such goods, and the services of an officer of the Department of Public Health had to be requisitioned. The Board of Health therefore, some three years ago, agreed to appoint certain officers of this Branch as Inspectors under the Health Act and Pure Foods Act. These officers may now condemn any over-ripe or unsound consignment, as being unfit for human consumption.

Commerce Act.—This Act, which came into force on 1st October, 1906, was introduced for the purpose of compelling exporters to indicate in the trade description applied to packages, certain particulars in connexion with the contained goods. Briefly put, this Act demands that, as a package is marked, the contents shall agree with such marking. At the same time, it should be observed, the details of such marking are not left to the whim or fancy of the exporter, but are all set out in the Regulations to the Act, and are also shown in a subsequent paragraph of this article.

During the year 1909 the work of inspecting imported seeds and plants under the provisions of the import regulations of this Act was handed over to this Branch. The information as to what is required when importing seeds and plants will also be found in this article.

Useful Hints.

In order to avoid infringements against the provisions of the Acts mentioned, the following points should be observed by producers and merchants when exporting, importing, or locally selling fruit, plants or vegetables:—

1. When exporting fruit, plants, &c., to other States the exporter should comply with the following:—

(*a*) Pack nothing but sound produce, free from disease, damage or decay.

(*b*) Use new cases or bags.

(*c*) Stencil name and address clearly and legibly on cases.

(*d*) If forwarding to South Australia or Tasmania see that cases are of the standard sizes required in those States.

Note.—The standard sizes of cases under the Victorian, South Australian, and Tasmanian Acts are as shown hereafter. The other States have not yet legislated in this direction.

(*e*) Notify the Senior Inspector, Fruit Exports and Imports, Government Cool Stores, Melbourne, before bringing produce to wharf or rail for shipment.

(*f*) See that produce is inspected and export certificate issued prior to shipment.

(*g*) Forward certificate immediately to agent or official inspector at port of destination.

2. When exporting fruit (dried or fresh), to New Zealand or other outside ports, under the Commerce Act, the exporter should observe the following:—

(*a*) One clear working day prior to shipment of goods, Forms 2 and 5 should be obtained, filled in and given to the inspector. The first, which is printed on blue paper, is a notice to ship, the latter (Form 5) is a request to the inspector to examine and mark the goods with the Commonwealth stamp.

(*b*) The packages should be marked in legible characters with a true description of the goods, the word Australia, the name of the State in which the goods were made or produced, and the net weight or quantity. This should be placed on one end of the cases, e.g.

ONE BUSHEL
APPLES.
JOHN SMITH,
VICTORIA,
AUSTRALIA.

(*c*) The exporter may, in lieu of the above, certify to the goods himself by including the word "sound" in the trade description. Under such circumstances he need not obtain a certificate from the Inspector, but the trade description must comply with all the requirements of the Act, and must be a true indication of the goods in every particular.

(*d*) The exporter should obtain from the inspector (who will issue same after goods have been examined and stamped with the official stamp) a certificate in Forms 7 and 8 which are issued for fresh or dried fruit, as the case may be. Note.—When shipping to New Zealand, care should be taken to also obtain the certificates demanded by the New Zealand authorities. Full information regarding this matter may be obtained at the office of the Senior Inspector, Government Cool Stores, Melbourne.

3. When importing seeds or plants from beyond the Commonwealth, merchants or farmers should instruct their clients to brand consignments in accordance with the requirements of the Commerce Act regulations. These provide that seeds shall bear an indication as to their soundness, cleanness and freshness, and in the case of plants that the trade description should specify the true name of the plants and their condition as to soundness. It is not necessary that the weight be indicated in the trade description; but when such is shown it must be stated whether same is gross or net.

4. When selling locally the following conditions should be observed:—

(*a*) Pack none but clean, sound produce.

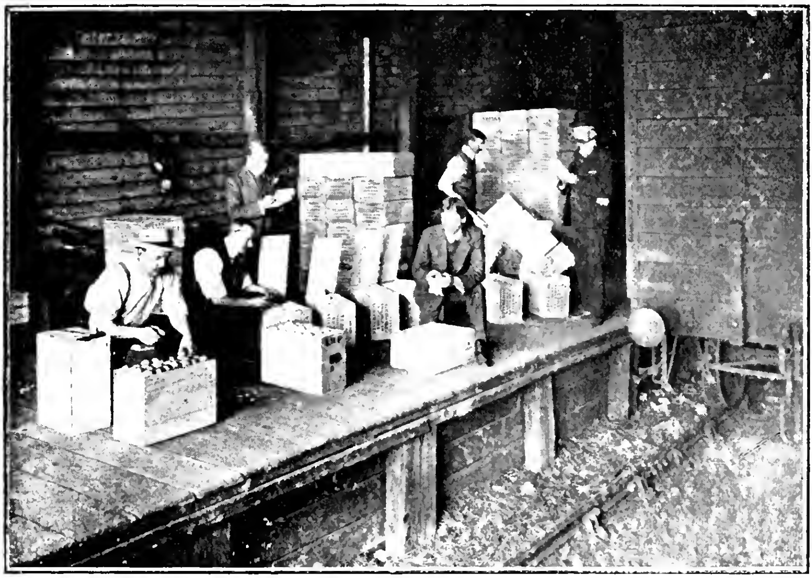
(*b*) Use no cases but those of the standard sizes bearing the maker's name, address, and guarantee.

(*c*) Legibly mark the weights or numbers of contents on trays, baskets, casks, or buckets.

(*d*) A tray must not hold more than one layer of fruit. A case with one side taken off and capable of holding two or more layers of fruit does not constitute a "tray."

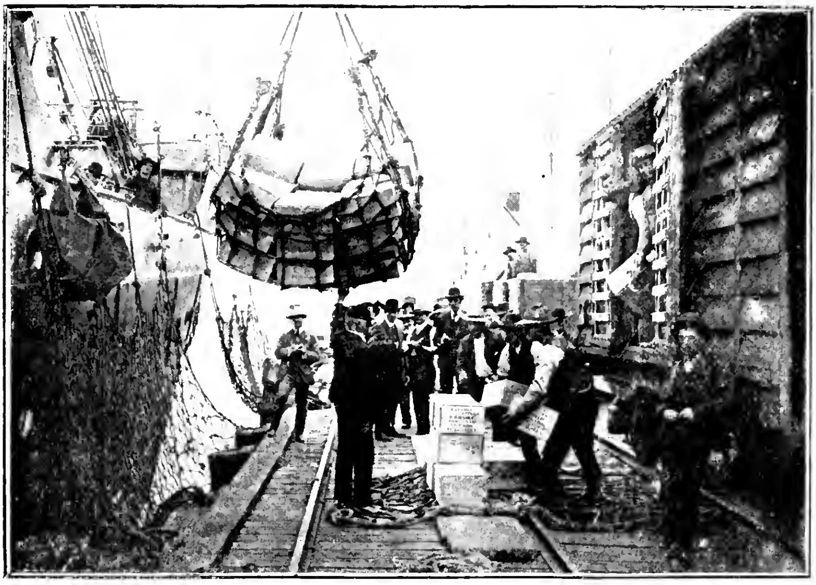
Fruit Cases.

During the past few months South Australia and Tasmania have proposed introducing legislation fixing standard sizes for fruit cases. The



INSPECTION UNDER THE COMMERCE ACT.

latter State has, in fact, already passed an Act to regulate the sizes of fruit cases, not only for the local sale, but for the export of fruit as well. Unfortunately, the sizes of these cases are not uniform with those adopted by



APPLES FOR OVERSEA MARKETS.

our own State. This will probably lead to much friction and confusion in the future, and it would be an undoubted boon to the industry if a uniform case were adopted for the Commonwealth.

The following are the dimensions of standard cases for Victoria, South Australia and Tasmania:—

Victorian Cases.—

Double case—26 inches long, 12 inches broad, $14\frac{1}{4}$ inches deep (inside measurements clear of all divisions).

Single case—26 inches long, 6 inches broad, $14\frac{1}{4}$ inches deep (inside measurements clear of all divisions).

Half case—26 inches long, 6 inches broad, $7\frac{1}{8}$ inches deep (inside measurements clear of all divisions).

Single case (export)—18 inches long, $8\frac{7}{8}$ inches broad, 14 inches deep (inside measurements no divisions allowed)

Half case (export)—18 inches long, 7 inches broad, $8\frac{7}{8}$ inches deep (inside measurements no divisions allowed).

South Australian Cases.—

Under the proposed South Australian Act the dimensions of cases will be similar to those under the Victorian Act.

Tasmanian Cases.—

Single case—20 inches long, $9\frac{1}{2}$ inches broad, 15 inches deep (outside measurements), and 18 inches long, $8\frac{2}{3}$ inches wide, and $14\frac{1}{4}$ inches deep (inside measurements).

Half case—20 inches long, $9\frac{1}{2}$ inches broad, 8 inches deep (outside measurements), and 18 inches long, $8\frac{2}{3}$ inches broad, $7\frac{1}{8}$ inches deep (inside measurements).

It is to be regretted that the cases of the various States should differ so much in point of size. An attempt has already been made by the Hon. Geo. Graham, Minister for Agriculture, to bring about a conference of the States concerned, but the response was not sufficiently encouraging and the matter has been postponed indefinitely.

In the oversea export trade, especially, the varying sizes of cases sent from the different States will undoubtedly affect our trade in an adverse direction, as buyers at the other end, being unaware of our local legislation, will be bound to arrive at the conclusion that the business is not being conducted on straight lines and that many of our exporters are trying to foist undersized cases on the British and Continental markets.

BITTER PIT OF THE APPLE.

D. McAlpine, Vegetable Pathologist.

This disease has hitherto baffled all our efforts to control it, chiefly because its exact cause is not known. It is not, as has sometimes been erroneously stated, peculiar to Australia, for it is well-known in Europe, America, and South Africa. There is neither insect nor fungus concerned in it, and although bacteria have been suspected, careful investigation has failed to prove any such connexion. It is found in quite a number of varieties of apples, as well as pears and quinces, and occurs on low-lying as well as on elevated ground.

The spotting of the fruit results from the bursting and breaking down of cells here and there, owing to too great pressure from within. This pressure is believed to be due to excessive transpiration during the day, followed by its sudden cessation during the night, even although the root action is still vigorous from the warmth retained in the soil. It is a disease, therefore, which is due to physiological causes and the final result is brought about by the abnormal flow and sudden checking of the sap, at the time when the fruit is forming. How this is to be prevented or controlled is the problem to be solved. It is highly probable that the method of pruning, the mode of cultivation, the nature of the manuring, as well as the stocks used may all help to contribute to the result. The latest pronouncement on this disease has been made to me in a letter dated 16th September, 1909, from Professor Farmer, M.A., D.Sc., F.R.S., of the Imperial College of Science and Technology, London, in which he remarks, "I had some apples sent me to ascertain whether the disease was due to fungal or bacterial action. I came to the conclusion that there was no such infection, but that the disease is physiological, *i.e.*, intrinsically due to pathological death of tissues. But it seemed to me to be useless to continue the inquiry when we could not try experiments, which in my view, alone were likely to lead to the full elucidation of the trouble."

As regards manuring, I have tried the effect of various manures for a number of years and while none have proved perfectly satisfactory, it has generally been found that a complete manure aggravates the disease. Experiments were conducted at Killara during 1906-7, with the Bismarck variety which is very liable. Each dressing was applied in August, 1906, two trees being used in each case, and the fruit was picked from the trees in March, 1907, with the results shown in the following table:—

Plot.	Manure per Tree.	Per cent. Sound.
1.	1½ lbs. Concentrated Superphosphate 1½ lbs. Sulphate of Ammonia 1 lb. Potash Chloride	13
2.	1½ lbs. Potash Chloride	13
3.	10 lbs. Gypsum	23
4.	Check	32
5.	1½ lbs. Potash Chloride 10 lbs. Gypsum	25
6.	4 lbs. Kainit	39
7.	4 lbs. Dissolved Bones	45
8.	20 lbs. Lime	36

The manure containing nitrogen, phosphoric acid and potash, as well as that consisting of potash only, yielded the highest percentage of "pit," while dissolved bones applied at the rate of 4 lbs. per tree produced the lowest. It gave 45 per cent. clean as compared with only 32 per cent. on the unmanured trees, but such a small improvement shows that further investigation and experiment are required before any definite deductions can be drawn as to the effect of different manures on the development of this disease.

It is a significant fact that the Bismarck variety of apple, which was used in these experiments on account of its great liability to the "pit," is a colonial seedling, having been reared at Carisbrook by Clarkson about 1878. While the rearing of seedlings, with a constitution adapted to withstand the inroads of bitter pit, seems foredoomed to failure, the reduction of the root system, as much as is consistent with the healthy growth of the tree, might prove a step in the right direction.

The effect of sulphate of iron and sulphate of magnesia was also tried during the past season on Cleopatra apple trees in a Goulburn Valley orchard. Each salt was used at the rate of 3 lbs. per tree and although the sulphate of iron gave a deep green healthy colour to the leaves, with an extra good yield, still there were "pitted" apples on all the trees and the disease developed further in store.

Six apple trees of the variety known as Annie Elizabeth were selected at the Burnley Horticultural Gardens for testing the amount of bitter pit present in the crop when ready for picking, and the effect of keeping the fruit which did not develop the disease externally while still on the trees.

The fruit was gathered on 4th March, 1909, and there were 237 apples altogether, of which 160 were pitted and 77 sound. The sound apples from each tree were placed in separate cases and kept in my laboratory. They were examined successively on 15th, 23rd, and 30th March when the diseased were removed, and the following is the result:—

—	4th March.		15th March.		23rd March.		30th March.	
Tree, No.	Pitted.	Sound.	Pitted.	Sound.	Pitted.	Sound.	Pitted.	Sound.
1	30	12	1	11	9	2	2	0
2	25	17	3	14	10	4	2	2
3	40	6	1	5	3	2	0	2
4	30	0	—	—	—	—	—	—
5	5	3	2	1	0	1	0	1
6	30	39	0	39	18	21	4	17
Total ...	160	77	7	70	40	30	8	22

Seven of the apples which were sound when taken from the tree developed "pit" in 11 days, 40 more in 19 days, and 8 in 26 days, so that there only remained 22 sound apples at the end of the month out of a total of 77 at the start.

The percentage of sound apples while the fruit was still on the trees amounted to 32.5, but after being picked and kept for nearly four weeks, it was only 9.2 or about 91 per cent. of the total yield was pitted. There is a row of this variety in the gardens particularly susceptible to bitter pit, and since there is an occasional individual who considers that he has a remedy for this disease, they are very convenient for practically testing such theories.

There is no doubt about the serious nature of this disease, and if a thorough investigation is to be made, it will necessitate experiments extending over several years to test the effects of different stocks, different systems of pruning, different manures, different soils, the chemical differences between pitted and sound fruit, and so forth, in addition to the continuous observation of those varieties which are least susceptible to it.

ERINOSE OF THE VINE.

G. H. Adcock, F.L.S., Principal, Viticultural College, Rutherglen.

(Adapted from a Lecture given to College Students, 21st February, 1910.)

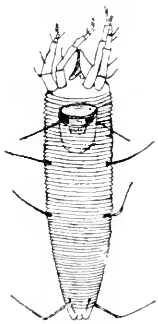
During the current season Mr. P. A. Wyatt, my travelling assistant, has brought me from time to time numbers of vine leaves obtained from young inported vines. These leaves had the peculiar galls or swellings which seemed to indicate Erinose which is common enough in Europe and California, but up to the present season was unknown in Victorian vineyards. To make absolutely sure we appealed to the microscope, and during a careful examination the acarids which are responsible for the appearance of the leaves were distinctly visible. This was further confirmed by Mr. D. McAlpine, Government Vegetable Pathologist, to whom leaves (also thought to be invaded by some fungus) were submitted for investigation.

The swellings or galls, of which an excellent figure has been drawn from nature by Mr. T. A. Brittlebank, House Master at the College, are a distingushing feature of Erinose. They are found on the upper page of the leaf, and are generally isolated, though in severe attacks the swellings may be confluent. On the corresponding position on the under surface of the leaf there are depressions, covered with what looks superficially very like the mycelium of a fungus. The microscope, however, reveals no fungus in true Erinose, and the felt-like mass is in reality but an aggregation of abnormal leaf hairs, stimulated into an irregular and unusual growth by the irritation of the tiny parasite.

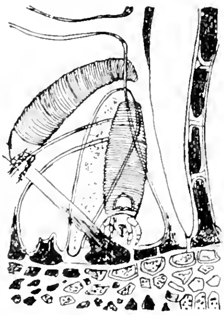
LEAF SHOWING ERINOSE.

From the appearance of these patches on the under surface of the leaf, the name Erinose has been given. It is singularly appropriate, being derived from a Greek word meaning woolly, and has reference to these apparently woolly patches. In the early stages of attack the hairs are white, but they gradually darken in colour till they become brown.

Coming now to the minute parasite that is responsible for the appearance of the vine leaves attacked, we find it is not a true insect, but a tiny mite. Though only about 1-250th part of an inch in length, it is active and vigorous in its movements. It belongs to that division of jointed animals which, from the skill of some representatives in spinning, was dedicated to the mythical Arachne. She regarded herself in her vanity as holding the world's record in this and kindred arts, and for her presumption and conceit was turned into a spider. This class (*Arachnida*) includes scorpions, spiders, ticks and mites. The two latter form an order of their own (*Acari*). Both are of more than a passing interest to the agriculturalist because they provide a large number of the animal and vegetable parasites with which he has to cope, and which eventually, if unchecked, will drain his pocket. The ticks furnish well known examples in the cattle and poultry ticks and many others, while poultry fanciers and dog breeders are often troubled with tiny parasitic mites. Of the mites that attack plants, the red spider is unfortunately too well known to the fruit-grower and gardener, both professional and amateur. Another representative of the mites was very much in evidence in the vineyards of the Rutherglen and other districts in 1899. Vine canes and even parts of the vine stakes were red with the eggs of this mite (*Bryobia pratensis*), which is considerably larger than the red spider. However, since the season mentioned, this pest has not been seen in any alarming numbers in the Rutherglen district.



ACARID CAUSING ERINOSE. (AFTER VIALA).



ACARIDS AMONG HAIRS ON UNDER SURFACE OF LEAF (AFTER FÖEX).

The group to which the acarid causing Erinose belongs includes the vermiform or worm-shaped mites. One family of the latter is an animal parasite, but the gall-mites, with which we are alone now concerned, live exclusively on vegetation. Apparently, they have no eyes, and no special breathing organs known as tracheæ, but breathe through the skin (Pocock). They are provided with piercing organs with which they attack the foliage or buds. Normally, the *Arachnida* have four pairs of legs. This provides a rough and ready way of distinguishing them on the one hand from true insects, which have three pairs, and crustaceans on the other, which are provided with five pairs of legs. However, the *Phytoptidæ*, or, as they are now more generally called, *Eriophyidæ*, have apparently lost all trace of the third and fourth pairs of legs. They have "only two pairs of legs which have no claws, but are furnished with bristles and 'feather hairs'" (Warburton). Their structure will be readily seen and understood from the accompanying figures drawn by Mr. Brittlebank after Viala and Föex.

They are known as Gall or Blister mites from their work on the leaves, buds or twigs. The scientific names *Phytoptus-Eriophyes* are in allusion to the blistered or scorched appearance of the affected leaves and to the woolly appearance exhibited by the attacked plants. About 200 species have been recorded, and each seems to favour a special kind of tree or plant. Careful observers of the more injurious kinds affirm that they are spread by means of insects, spiders, &c. Even the aphis has been credited with providing a frequent and ready means of transit for some species.

"Witches' brooms," common in the old land on birch trees, are really caused by one of these gall-mites. Another known as the currant gall-mite is more or less frequent on currant bushes in Great Britain and elsewhere. Still another variety forms galls on plum twigs in American orchards. We are all familiar with the Blister gall-mite of the pear (*Phytoptus pyri*), or at least familiar with the appearance of the leaves attacked. An excellent description, with coloured plate, may be consulted in Mr. French's *Handbook of the Destructive Insects of Victoria*, Part I.

Another parasite that has special interest to us is the Rust-mite (*Phytoptus oleivorus*), which punctures the oil cells and causes the appearance popularly known as "Maori" on oranges. This name is doubtless due to the discolorations or markings on the rind being fancifully compared to the tattoo marks on the Maori skin.

The acarian that causes Erinose of the vine is known as *Phytoptus (Eriophyes) vitis*. In countries where it is common it is not now regarded with much concern. Sulphur dressings during the vegetative season usually keep it down as readily as is the case with red spider. When the invasion is more than ordinarily severe, treating the vine stocks during the dormant season with kerosene emulsion, or any insecticide, or even with hot water, has proved efficacious in ridding the vineyard of this by no means formidable invader. While it will be wise to destroy them, and prevent their further distribution, yet their presence need give no cause for unnecessary alarm.

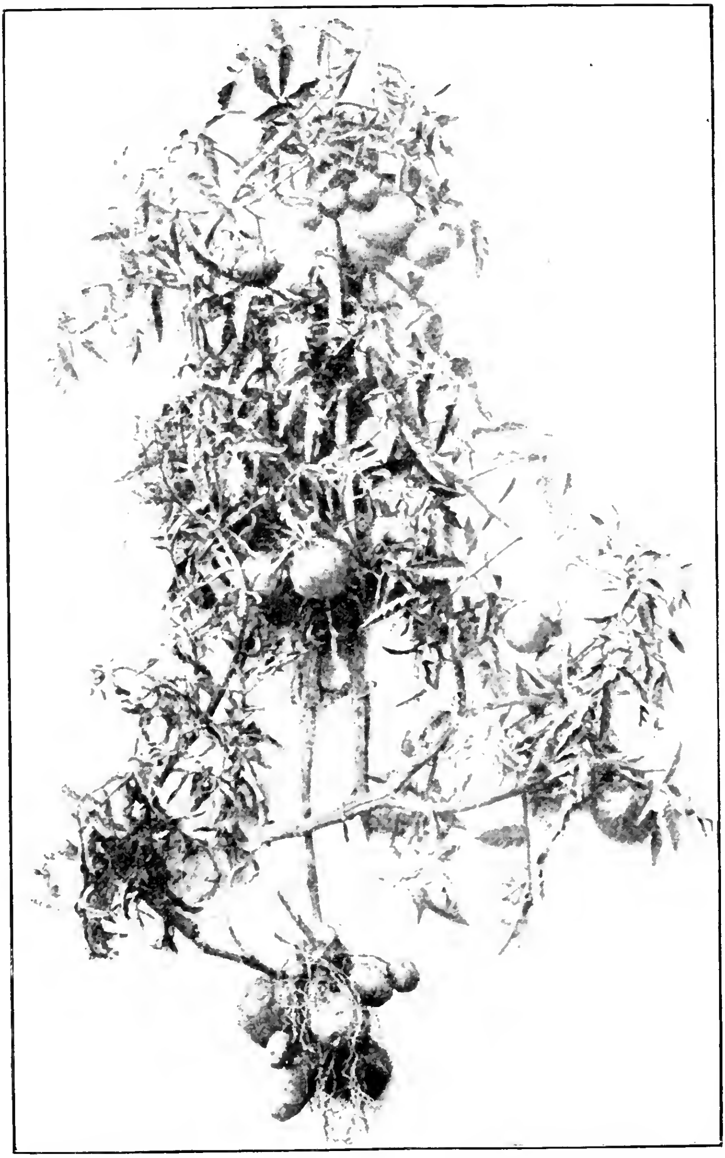
POTATOES AND TOMATOES ON THE SAME PLANT.

D. McAlpine, Vegetable Pathologist.

In the article on "Irish Blight in Tomatoes" which appeared in the January number of the *Journal*, it was stated, as showing the close relationship existing between potatoes and tomatoes, that a tomato plant could be grafted on to a potato plant, with the result that both tubers and fruits would be produced. This is a well-known fact, although I have not carried out the experiment myself, but a clear photograph of such a plant has recently appeared in the *Deutsche Landwirthschaftliche Presse* of December, 1910, for a copy of which I am indebted to Mr. Percy Wilkinson, Commonwealth Analyst. The accompanying illustration shows the potatoes below and the tomatoes above, and the history of this plant may here be given as recorded by Dr. Karl Snell.

Potatoes were planted in pots on 1st June, and on 19th June one of the young potato haulms which had developed three shoots was cut across and each of the shoots had a young tomato plant grafted on to it. The grafting was done in the usual manner by cleft-grafting. On 4th July, the plants were removed from the pots and planted out in the garden where they remained until they ripened. The photograph shows one of the plants as it appeared at the end of October, bearing 18 tomatoes and 11 potatoes.

From the illustration it may be seen that the foliage was almost exclusively that of the tomato and these leaves supplied the nourishment, not only for the tomato, but also for the potato. Thus, from the same nutritive material, two quite different parts of different plants were nourished—the succulent fleshy fruit of the tomato and the firm starchy tubers of the potato. There was no blending of the properties of the two. Just as in the case of a peach shoot grafted on the rooted stem of a plum, the shoot continues to develop only leaves, flowers, and fruits of the peach,



DOUBLE PLANT WITH TOMATOES ABOVE AND POTATOES BELOW.

as long as it lives; and, if a shoot of the plum stock were allowed to grow, even after twenty years' union with the peach, it would be found to produce only the normal leaves, flowers, and fruits of a plum.

BUILDING HINTS FOR SETTLERS.

VIII.—WIRE NETTED FENCING.

A. S. Kenyon, C.E., Engineer for Agriculture.

As several requests have been received for information with reference to the erection of wire netted fences, the following notes on the general principles and cost of construction may be of service. There are many different types of fence, but as suitable timber is becoming scarce, the wire fence is now almost universally used. This is the type of fence which it is intended to deal with.

Posts may be of wood, iron, or reinforced concrete, and require an article to themselves. In nearly every case, however, the ordinary split bush post will be the most easily obtained. It is advisable to get the best timber procurable, as inferior timbers, such as stringy bark, in some localities have a very short life. For the beginner, it is well to have a look around the district and see which are the best fences.

Opinions differ as to the spacing of posts. An essential feature of the rail fence is the short panel, but where wire takes the place of rails, there is no doubt that fewer posts can be used. Posts spaced approximately as follows have been found to give very good results :—

A. Posts, 8 ft. 3 in. centres ...	640 to mile	
B. Posts, 16 ft. 6 in. centres ...	320 to mile ...	1 dropper between posts.
C. Posts, 22 ft. centres ...	240 to mile ...	2 droppers between posts.
D. Posts, 33 ft. centres ...	160 to mile ...	3 droppers between posts.

At times, spacing of over a chain—up to 81 ft.—for divisional fences for sheep is used.

The difficulty, or otherwise, of obtaining good fencing posts must be the guide as to which pattern will be used. Any one of these patterns would make an efficient and durable stock-proof fence. It is chiefly a question of maintenance, which fence will prove the cheapest.

All posts when erected should have the outer edges in line, and should be upright. They should line along their tops and not follow the lesser irregularities of the ground. The earth should be put back round them and well rammed. The timber must be sound and barked, and all posts sawn square on top.

Split posts (8 in. x 4 in. to 7 in. x 3 in.), 6 ft. 3 in. long, 2 ft. in ground, one edge roughly dressed. Corner posts, 12 in. diameter, 8 ft. long, 3 ft. 6 in. in ground. Gate posts, 12 in. to 15 in. diameter, 8 ft. 9 in. long, 4 ft. in ground, should be quite separate from fencing posts and have no wire strained from them and have a sill log level with surface checked into them. Straining posts, 10 in. diameter, 7 ft. 6 in. long, 3 ft. in ground at distances of about $7\frac{1}{2}$ chains.

In pattern A every 60th post will be a straining post.
In pattern B every 30th post will be a straining post.
In pattern C every 22nd post will be a straining post.
In pattern D every 15th post will be a straining post.

Permanent struts on two sides of posts must be placed at all angles, corners of fences and at every second straining post. The top end of strut is to be cut wedge shape and let 2 in. into side of posts 22 in. from the top of post and securely butted against the adjoining posts, or preferably against a short post sunk 2 ft. in the ground and situated at least 10 ft. away from the bottom of the post which they are supporting. Struts are to be not less than 4 in. in diameter. It is important that the strut should not be placed too near the top of the post. The result of placing the strut too high is to lift the post out of the ground when the wire is strained. The strut should not be lower than half way between the top of the post and the ground.

When the posts are more than 10 ft. apart, droppers are required, one dropper for spaces up to 17 ft., two droppers for spaces from 16 ft. to 22 ft., and three for spaces from 22 ft. to 33 ft. Three droppers are the maximum number advisable no matter how big the span. It seems better in practice to have an uneven number of droppers between the posts so that a dropper may come exactly in the centre. Wooden droppers of 2 in. x 1 in. hardwood, 3 ft. 9 in. long, are secured to the plain wires with staples which pass over the wire through a hole in the dropper and are then clinched on the opposite side of the dropper; they are to be tied to the barbed wire with No. 12 gauge galvanized tying wire which is to pass through a hole in the dropper about 1½ in. from the top of it. Metal droppers of plain or crimped wire may be used in place of hardwood droppers. These are secured to the wires with loops and clamps and are supplied with the droppers. There are also other forms of metal droppers which make very satisfactory fences and require very little labour to fix, no loops, staples, &c., being necessary to secure them.

The wire netted fence should preferably have 5 wires, including one galvanized barbed wire firmly fixed in a groove bored in the top of the posts and secured with two 2½ in. nails to each post. Another way of fixing the barbed wire to the top of the posts is with No. 12 gauge galvanized tying wire which is to pass through a hole in the post about 2 in. from the top. The barbed wire is not essential where no other stock but sheep are grazed; but for all other stock, it cannot be dispensed with. The other four wires are No. 8 or 9 gauge steel galvanized or black wires spaced at the following distances from the ground: 12 in., 24 in., 36 in., and 43 in. The plain wire is secured to the outside of the posts with 1 in. galvanized staples, or ⅝ in. holes may be bored through posts 2 in. from the outside edge and wires tied on with No. 12 gauge wire. The barbed wire is thus not in line with the plain wires, being in the centre of the posts while they are on the outside. All the wires to be thoroughly strained. The wire netting of the desired gauge, width and mesh—17 gauge, 42 in. wide, and 1½ in. mesh is recommended—is to be erected so that the straight selvedge is at the top. Great care must be taken in straining the netting. Six in. of the netting should be placed without bending under the ground (a trench the required depth having previously been dug) so that the top of the netting can be fastened to the third wire from the ground, to which it is secured with 24 clips to each chain length; the netting is also secured to the bottom wire with 16 clips to each chain length. The bottom 6 in. of the netting may be tarred by dipping the roll to the required depth in a pot of boiling tar to which a proportion of kerosene has been added.

Specification for a 33 ft. Span.

Excavating.—The ground to be excavated to a depth of 2 ft. for 8 in. x 4 in. or 7 in. x 3 in. split posts, spaced 33 ft. centre to centre; every fifteenth hole to be 3 ft. deep for 10 in. diameter straining posts. Holes for 12 in. diameter corner posts to be 3 ft. 6 in. deep, and for 15 in. diameter gate posts 4 ft. deep. A trench 6 in. deep to be dug outside of fence for wire netting. All earth put back round posts to be well rammed and trench filled in when netting is fixed.

Strainers.—Strainers 10 in. diameter, 7 ft. 6 in. long to be spaced 165 yds. centre to centre and sunk 3 ft. in ground.

Permanent Struts.—All corner posts, angles and strainers to be strutted on two sides with struts 4 in. diameter by 10 ft. long; the top end of strut to be cut wedge shape and let 2 in. into side of posts 22 in. from top of posts. The bottom end of strut to be butted against the bottom of a post 2 ft. long by 6 in. diameter, sunk in the ground.

Split posts.—Split posts 8 in. by 4 in. or 7 in. by 3 in. by 6 ft. 3 in. long to be spaced 33 ft. centre to centre between strainers. Outside face of post to be roughly dressed and posts sunk 2 ft. in the ground. Posts to be bored 5/8 in. diameter at 8 in., 15 in., 27 in., and 39 in. from top of posts for No. 8 wires, and 1 in. diameter at top of posts for barbed wire.

Corner Posts.—Corner posts to be 12 in. diameter by 8 ft. long and sunk 3 ft. 6 in. in the ground.

Droppers.—Three hardwood droppers, 2 in. by 1 in. by 3 ft. 6 in. long, to be spaced 8 ft. 3 in. apart between posts. Holes bored in dropper with ½ in. augur to be spaced as follows, measuring from bottom of dropper:—3 in., 15 in., 27 in., 34 in., and 40½ in.

Wire Netting.—Wire netting No. 17 gauge, 42 in. wide by 1½ in. mesh is to be erected so that the straight selvedge is at the top. The bottom 6 in. should be sunk in the ground without bending which will bring the top on a line with the third wire from the ground to which it is to be secured with 24 galvanized netting clips to every chain in length. The netting is also to be secured to the bottom wire with 16 clips to every chain length.

QUANTITIES AND COST PER MILE.

Material.	Posts, 16 ft. 6 in. Centres.				Posts, 22 ft. Centres.				Posts, 33 ft. Centres.			
	Quantity.	Cost.			Quantity.	Cost.			Quantity.	Cost.		
Wire, plain, galvanized steel, No 8 gauge ...	13 cwt.	£6	16	6	13 cwt.	£6	16	6	13 cwt.	£6	16	6
Wire, barbed, galvanized, No. 12 gauge...	4 cwt.	3	2	0	4 cwt.	3	2	0	4 cwt.	3	2	0
Wire netting, No. 17 gauge, 42 in. x 1½ in. mesh	1 mile	27	0	0	1 mile	27	0	0	1 mile	27	0	0
Staples for droppers, 1½ in. ...	10 gross	0	5	0	15 gross	0	7	6	15 gross	0	7	6
Staples for posts, 1 in.	10 gross	0	5	0	7 gross	0	3	6	5 gross	0	2	6
Tying wire, galvanized, No. 12 gauge ...	¼ cwt.	0	4	0	¼ cwt.	0	4	0	¼ cwt.	0	4	0
Netting clips ...	23 gross	1	4	6	23 gross	1	4	6	23 gross	1	4	6
Split posts, 8 in. x 4 in. x 6 ft. 3 in. ...	310	9	6	0	230	6	18	0	150	4	10	0
Straining posts, 10 in. diameter x 7 ft. 6 in.	11	1	5	0	11	1	5	0	11	1	5	0
Struts, 10 ft. x 4 in. diameter	22	0	16	6	22	0	16	6	22	0	16	6
Droppers, 2 in. x 1 in., hardwood	320	3	4	0	480	4	16	0	480	4	16	0
Labour	—	11	15	0	—	10	10	0	—	9	10	0
Total	—	£65	3	6	—	£63	3	6	—	£59	14	6

Barbed Wire.—The top wire to be 12 gauge galvanized barbed wire firmly secured to top of posts and droppers with 12 gauge galvanized tying wire which is to pass through holes in tops of droppers and posts.

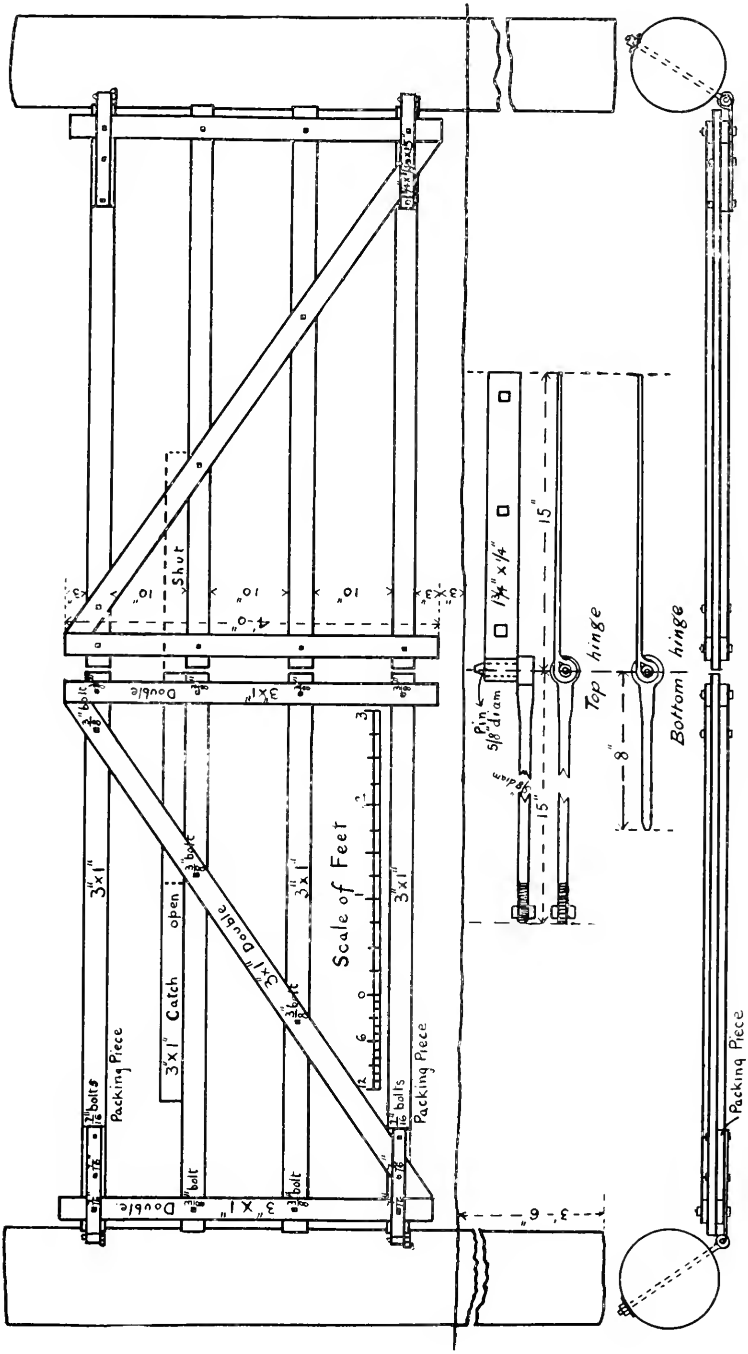
Plain Wire.—Below barbed wire are four No. 8 gauge steel galvanized or black wires spaced as follows measuring from the ground:—12 in., 24 in., 36 in., and 43 in. Wires to be secured to outside of posts with 1 in. galvanized staples or with No. 12 tying wire and to the droppers with 1½ in. galvanized staples which pass over the wire through the hole in dropper and are clinched on the opposite side of dropper.

GATES.

The most unsatisfactory thing about most farms are the gates. Rarely do they appear to be in good order or working satisfactorily. Ranging from the Mallee lightning gate of one-barbed wire and a stake to the most elaborate mortice-framed iron-stayed structure, it is generally a bother when driving to open or shut them. Defective design, both in undue weight and in framing, is, as a rule, responsible for this state of things. Lightness and stiffness are the essentials, and, leaving out the iron gates now coming into general use, but beyond the ordinary farmer's ability to make, there is none better than the double-batten gate. It is no novelty, having been often described and long in use. There are, however, some points where improvement can be made, and these are incorporated in the drawing herewith. In a gate there are rails, angle braces, and stiles; the stiles to which the hinges are attached are termed hanging stiles, and those with the catch falling stiles. The materials for one pair of 3 in. x 1 in. double-batten gates for an opening of 12 feet are:—

8 rails, 3 in. x 1 in. and 6 ft. long—48 ft.
8 stiles, 3 in. x 1 in. and 4 ft. long—32 ft.
4 angle braces, 3 in. x 1 in. and 6 ft. 6 in. long—26 ft.
1 catch, 3 in. x 1 in. and 4 ft. 6 in. long—4 ft. 6 in.
4 packing pieces, say, 3 ft. 6 in.
  Total 114 running feet, 3 in. x 1 in. hardwood.
4 pairs hinges and gudgeons, as shown.
4 cuphead square-shoulder bolts, 7-16 in. x 3¼ wood length.
8 cuphead square-shoulder bolts, 7-16 in. x 2¼ wood length.
18 cuphead square-shoulder bolts, ⅜ in. x 3 in. wood length.
  All with nuts and washers.

The method of construction is of the simplest. Lay two stiles hanging and falling, on the ground at the proper distance apart and square; lay the angle brace so that it comes to the ends of stiles; mark it and cut several, as many as required; lay it between the stiles; place the rails in position, as many as desired, and projecting beyond the stiles at each end, and on top of them lay the remaining stiles and the angle brace. A nail or two will hold them in position while holes are bored through for the bolts, and the latter inserted and screwed up. A pair of gates should not occupy in making much over one hour. If many are wanted, a frame should be made and set on the ground, for convenience and saving of time. The points to be borne in mind are to keep the bolt holes as far as possible from the ends of the battens to avoid risk of splitting. This is done by carrying the angle braces to the ends of the stiles, and not to the crossing of the rails and stiles as usual, and by extending the rails beyond the stiles at each end. If the farmer is the proud possessor of a forge and stock and dies, he can make the ironwork for himself. If not, recourse must be had to the local blacksmith. The cost, however, should not exceed about seven shillings for the two pairs of hinges.



A SERVICEABLE GATE.

In erecting, the gates should be hung to posts independently of the fence. A gate post with wire strained to it will never prove satisfactory. Between the posts a sill log should be set, chocked into each post and just at or a little below the surface of the ground. It serves to keep the posts fixed in position, and is necessary if it is intended to wire-net the gate against rabbits. The gudgeons should be so put in that the gates swing back clear of the posts, leaving the latter to stand any collisions with waggons or implements, which they are better fitted to do than the light gates. The catch consists simply of a piece of 3 in. x 1 in. batten, sufficiently long to extend from one angle brace to the other, between them and the double stiles, and resting on one of the rails. This catch stiffens up the gate so that it is practically one panel. More or less rails may be put in. If fewer than shown, wire-netting stretched over the gate makes it proof against sheep. In positions where the work is light, the top and bottom rails only, with wire-netting between, will be sufficient. Soft wood is, on the whole, preferable to hard wood, as it is about as strong and is considerably lighter. The gates shown weigh about 70 lbs. each in hardwood, and about 50 lbs. in soft wood. The projecting ends of the rails at the falling stiles give room for adjustment when hanging. By the aid of a handsaw they may be made come together as closely as desired, even if the gates are not hung quite true. Never put the angle braces running down from the hanging to the falling stiles; always place them as shown in the drawing. Keep the gates screwed up—once a year at first, and less frequently afterwards. Do not strain wire to your gate posts and expect the gates to hang true. Gates are better painted both to preserve them and for the more ready identification at night time. Cold water paint, Washington whitewash, &c., are better than nothing.

General Notes.

The holes in the posts should be bored after they are put in the ground so that the wire may run true.

Straining may be done by any of the ordinary means though any one of the patent strainers working in the middle of the span between the straining posts is recommended.

Should straining be done at the post itself, it will be found advantageous to bore double holes and put a loop through about 10 ft. in length to which the ordinary wire is tied.

The strainer should have two holes to catch the double wire, and fastening, whether permanently or temporarily, is done by twisting the strainer around, thus twisting the double wire and saving any trouble in wedging.

The extra cost involved in buying a special wire will be repaid in the extra life of the fence. The ordinary wire in the market is at times of inferior quality and will not stand restraining.

Galvanized wire is advisable with wire-netted fences, and in all cases near the sea or in swampy areas.

Always start unwinding the wire from the centre of the coil; there is less chance of kinks and tangles.

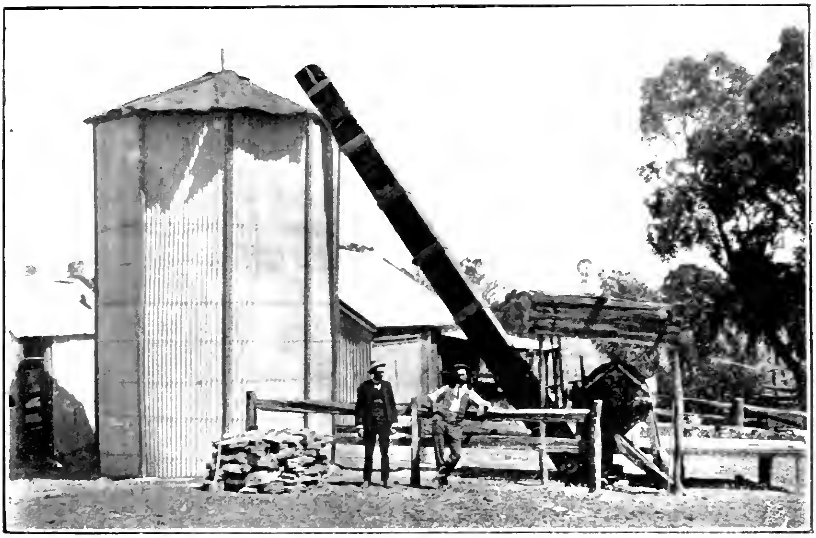
The barbed wire is essential to prevent heavy stock slackening the wires by bearing them down. Paddocks with valuable young stock running in them should have rails on top instead.

Woven wire fences are largely used in the States; but have not sufficiently proved themselves here to warrant their adoption. Besides, they do not fit in well with rabbit-proof fencing.

A HOME-MADE SILO.

T. Gemmell, Dairy Supervisor.

A typical example of what can be done by the exercise of a little energy is shown in the results that have accrued from the erection of a home-made silo on Mr. Frederick Boddy's farm at Seymour. Mr. Boddy's silo, which was built two years ago, is of 50 tons' capacity, and was constructed almost entirely by himself (see illustration). He used 44 sheets of corrugated galvanized iron, fastened to wooden upright supports with ½-inch bolts, 13 bolts to the sheet. There are 9 uprights (4 in. x 4 in.) 22 feet in length, with a few bands of fencing wire wound around. Over all a bark roof was constructed. The whole structure rests on a cement floor.



GALVANIZED IRON SILO, MR. F. BODDY'S FARM.

The crop for ensiling is conveyed to the silo by means of an ordinary elevator, after it has been chaffed by a cutter driven by a 6-h.p. Tangyes' oil engine. The cost of the silo and elevator was about £20, whilst that of engine power works out at about 1s. per working hour. The silo is filled in about seven days, the stuff being well trampled during the filling, and finally weighted with about 2 tons of stone.

As to the results from feeding his dairy herd on silage, Mr. Boddy is emphatic. He says he immediately noticed an increased supply of milk. He had as good a supply of milk and cream in March through feeding his cows with silage as he had in the middle of spring under ordinary conditions. All his cows took to the new food readily. The crop for the silo consists of 4 parts oats, 2 parts Cape barley, 2 parts tares, 2 parts tick beans, and 1 part rye.

The silo is erected close to the milking sheds, and the fodder needs to be carried but a few yards to the cows. Thus, regular feeding is facilitated, and instead of taking the herd half a mile away, each cow is fed in the bail and gets her proper supply. Mr. Boddy states there is little, if any, waste when the silage is properly made. He considers the time is rapidly approaching when the silo will be considered as indispensable on the dairy farm as the chaffcutter or the plough.

BERWICK FODDER CROP COMPETITION.

J. S. McFadzean, Dairy Supervisor.

Following on an application received from the Mornington Farmers' Society I judged the Fodder Crop Competition held under its auspices. The competition was for the best five acres, cropped with four acres of maize and one acre of pumpkins. Messrs. Wanke and Kirkham, both of Narre Warren, were the only competitors, the first-named being awarded the prize offered.

Mr. Wanke's crop was on a creek flat; the soil being a dark loam of good quality. Rather more than half of his four acres of maize was sown with Sydney Flat Red seed at the end of September. The balance was put in about two weeks later; about a quarter of it being with Flat Red seed, and the remainder with Hickory King, the latter variety making rather the better growth. The earlier sowing was about seven feet high when seen; and was estimated to cut about 14 tons 11 cwt. per acre of green fodder. The later sowing was about $4\frac{1}{2}$ to 5 feet high, and would then cut about 11 tons $8\frac{3}{4}$ cwt. per acre. The earlier sown crop had flowered, and was beginning to go off in colour, but the second sowing was in full growth. Both had been sown rather heavily; which, as well as being a waste of seed, prevented a proportion of the stalks from making their proper development. The crop was in rows three feet apart, and the inter-cultivation had been fairly well attended to. No care, however, had been given to clearing the weeds from the headlands or among the maize in the rows. Neglect of these items means a loss of points in such competitions, for one of the objects of drill-sowing maize in rich ground is to enable the land to be cleared of weeds; and a weed-fouled crop is not indicative of careful farming.

A mixed fertilizer had been used over the most part of the land; but a few rows of the earlier sown crop had been put in with stable manure below it in the furrows. These rows made exceptionally good growth at first, but during the late spell of dry weather this part of the crop went off in colour very fast, and, at time of judging (28th February), it had stopped growing altogether. The mistake made here was in not having the ground manured earlier, so as to allow the coarser material to rot before the seed was sown. Had there been more rain, in all probability this part would have more than held its own to the finish. But, under dry weather conditions, the effect of the unrotted manure was to keep the soil excessively loose, and allow the moisture to dry from it; and the maize plants consequently suffered. The same condition sometimes obtains on fresh stubble land turned down and sown in the early summer; when, if there is not a sufficiency of rain to assist in rotting down the dry stalks and roots, the young crop on it will make little headway.

The acre of pumpkins on this farm was a mixed seeding, including a majority of Mammoth and Ironbark. They were sown in rows five yards apart, with rows of maize between to shelter and hold the vines. The plants were making good headway, the whole of the space between the rows being covered with the runners, and the crop had set well. It, however, was not nearly matured, the vines being green throughout, and not more than 10 per cent. of the pumpkins had reached their full weight. Several of those that were ripening would run to 60 lbs., and the crop, when seen, would yield about 7¼ tons to the acre.

Mr. Kirkham's crop was not so favourably located, being on lighter ground, and on a small rise. It was in three paddocks. The best portion of the maize crop was about 2¼ acres near the dwelling on the top of the rise. This averaged about 6 feet high, and was estimated to cut 8 tons 3 cwt. of green fodder. It was in rows three feet apart, and kept clean; but the seed had been sown too thickly, and the crop was beginning to dry off. The rest of the maize was in a paddock on the slope of the rise. This had been sown late. It was in drills 18 inches apart; and it had also been too thickly seeded, there being about 80 per cent. more plants on the ground than could be expected to properly mature; also, being closely drilled, it could not be horse-hoed, and much of it was drying off at less than 18 inches high.

The pumpkins on this farm had been sown rather late. They appeared to have made good headway, and a lot of fruit had set; but the majority of it was so small that unless extra favourable weather ensued within the next few weeks, the yield would be very light. At its present stage it would run about 1½ tons to the acre.

This is a good maize-growing district; and, as some very fair crops were seen on other farms, the competition should have been greater. Pumpkins, however, while a good yielding crop in some places, do not find favour with every farmer, and they do not suit every locality so universally as maize. I therefore would suggest that, in future competitions in this district, the crops be kept separate, and prizes be awarded for each, or for whichever may be considered the more important.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

Fruit.

With the exception of the very late varieties, all fruit has been now gathered, and the fruit rooms and stores are all filled with the produce of the orchard. The fruit room should be well ventilated and aired; but all direct currents of air should be avoided, as these will certainly shrivel and dry the fruit. The store room should also be kept as cool as possible. Every care should be taken to keep out of the store room all fruit infested with any pest or disease. Such fruits should be immediately destroyed, preferably by being cooked for animal consumption.

The fruit rooms this year will need very close attention, and a lookout kept for the development of bitter pit. The season's climatic conditions have been so variable, that, if the irregular flow of sap be the cause of this undesirable condition, then bitter pit will be very prevalent. As a matter of fact, this disease is more than common in some districts just now, probably owing to the alternating changes of heat and cold.

Cultivation.

The heavy rains of February and March have made cultivation very easy this season, and growers are enabled to get in early crops for green manuring. As soon as the fruit is off the trees, the land should be well ploughed and left in a rough condition until the spring ploughing. If at all practicable, a crop should be planted for green manure. No better method of feeding the trees and of improving the soil has yet been devised.

Land may still be prepared for the reception of young trees, suggestions for this work being given in last month's *Journal*. It is advisable to get all ploughing done as early as possible. In addition to having the soil loose and open for the reception of autumn and winter rains, it gives the grower a chance to thoroughly cleanse his orchard from all pests during the winter time.

Pests and Diseases.

All codlin moth bandages should be removed after the ploughing, and burned. It is not advisable to remove them before ploughing, as some larvæ certainly shelter under clods, and in the soil; the cultivation disturbs them and causes them to find a fresh hiding place.

All second-hand and old cases should be thoroughly overhauled. It is preferable to do this work now, instead of leaving it till spring, when the rush of other duties will certainly prevent it being carried out. The cases, if not bad enough to be destroyed by fire, should be dipped for some time in boiling water. And this is not only for the killing of the codlin larvæ, but also to destroy larvæ or eggs of any scale or aphis; and also any spores of fungus diseases that may have found lodgement therein.

As soon as the trees have shed their foliage, they may be sprayed with red oil emulsion for woolly aphis, peach aphis and the bryobia (red spider) mite. And this should be done before pruning, so that in handling and carrying the prunings, the pests will not be carried about the orchard to infect the clean portions.

Pruning.

Mr. Geo. Quinn, of the South Australian Department of Agriculture, has re-issued his work on Fruit Tree Pruning, and has brought it thoroughly up to date by means of fresh experience and illustrations. In anticipation of the coming pruning season, growers should thoroughly master this work, as the instruction given is invaluable. No modern orchardist can afford to be without it.

The Wonderberry.

A number of correspondents have written in regard to this fruit, and some have been good enough to forward specimens of the plant and its berries. The plants at the Burnley School of Horticulture have now ripened their fruit. Judging from this, and from the specimens received, we find no reason whatever to alter the opinions expressed in the February number of this *Journal*. Botanically, the plant is identical in every part with that useless weed, the Black Nightshade, *Solanum nigrum*, and the flavour of the fruits of both plants is exactly similar.

Vegetable Garden.

This is about the best month for the removal, transplanting and subdivision of such kitchen garden plants as rhubarb, mint, horse radish, thyme, &c. Before planting out, the ground should be deeply stirred, and well mixed with old decomposed manure. The deeper the working, the more profitable will be the results. Topp's Winter, Stone's Ever Bearing Ruby, and Early Albert rhubarbs are popular and profitable varieties to grow.

Asparagus beds should be attended to, and the tops cut off before the seeds have a chance to drop on the ground. If allowed to do so, they will germinate and grow, and so the seedlings will become a nuisance in the later season, and the worst weed in the bed. The tops should be removed as soon as the seeds are ripening. The ground should then receive a good manurial dressing. Well rotted stable manure is very beneficial; or, if obtainable, a good top dressing of sea-weed is also valuable. Formerly, a heavy dressing of salt was given on all asparagus beds; but experience has shown that the presence of salt is not at all necessary to the development and growth of the plant. Further, later analyses of asparagus show that, of all ingredients in the composition of this plant, salt is in the lowest percentage.

The most perfect fertiliser for asparagus is a mixture of $2\frac{1}{2}$ cwt. sulphate of ammonia, 2 cwt. sulphate of potash and from 4 to 5 cwt. of bonedust per acre. This will supply a fair amount of nitrogen, potash, and phosphoric acid in the proportion required by the plants. Asparagus is a gross feeder, and the plant requires abundant food, in an available form, and within easy reach, during its growing period. The most successful practice in manuring asparagus is to top dress with stable manure in the autumn, and then to feed with chemical fertilisers in early spring. In preparing new asparagus beds, the ground should be very deeply dug, a depth of from two to three feet being not at all excessive. A good rich friable soil is required; and a good mixture of well rotted stable manure should be thoroughly worked into the bed, which must be well drained. It is not essential to place large quantities of manure in the bottom of the bed or of the trenches. This is a wasteful practice; the plant will thrive far better in a fairly compact soil, which has been well worked with manure, and fertility and productiveness will be maintained by the regular top-dressings.

Onion seeds may now be sown for transplanting in the winter; the most useful varieties are the Brown Spanish and the Early Golden Globe. Specimens of the latter variety, if well grown and given plenty of room, may easily be obtained up to one pound in weight.

Continue to plant out cabbage, cauliflower and other seedlings. Plant also early peas and broad beans.

Flower Garden.

The copious rains of February have brightened up the flower gardens wonderfully, and just at this time they should be bright and gay with autumn flowers and foliage. The garden can generally be depended upon to make a good show in the autumn months, provided that the plants have been previously kept in a healthy state by watering, mulching and feeding. The question of plant foods should be given far more consideration in autumn than at any other time of the year. Not only because the most popular flowers—roses, chrysanthemums and dahlias—are then in vogue; but more because the soil requires a stimulus and an addition, after the trying, heating weather of summer, and also after the leaching or soil washing effects of the frequent summer waterings. So that, in order to impel our rose bushes, our chrysanthemums and other plants to give their best results, they should be fed weekly with liquid or chemical manures up to the time of blooming. Then the feeding should cease, as the plants require no further stimulus. For liquid animal manures, one pound of well rotted manure per gallon of water should be used; the directions for preparing this as given in the last month's *Journal* should have given this quantity, the omission of the words "per gallon" being accidental.

The removal of permanent shrubs and palms, and the planting out of evergreen trees, shrubs and herbaceous divisions should not be delayed any longer. The nursery section of this class should be cleared out into the garden at once. It is a mistake to wait, as many growers do, for the removal of such plants until the winter season. If planted out now while the ground is warm, the roots of the plants have a fair chance to grow, to take a considerable hold of the soil, and to establish themselves in their new location, before the growth period ceases. Then, after the winter's rest, they are ready to break away into new growth, both in the roots and crown, with the advent of the first spring weather. When planted in winter, they have no chance to grow, the roots remain as when planted, and with every chance to rot in the cold wet soil; the foliage becomes yellow and debilitated; and the plant, if it does not succumb, often takes the whole ensuing season to recover its general health. And then, of course, the season that has been lost can never be regained.

Gardens should now be well drained or trenched. This is a feature more often overlooked than otherwise. And yet no garden will produce the results it should produce unless one or both of these very necessary operations be carried out. There is a wealth of plant foods and food supplies below the usual digging depth, and gardeners should never neglect to dig down deeply, so that the roots of their plants may have an increased area in which to revel for food and moisture. Deep working is an absolute essential in every garden. It means a saving of water and manures for the grower, and it also means increased growth, health, and blossoms for the plants. The ground should always be well dug to the full depth of the soil once a year, and an occasional stirring of the sub-soil is also invaluable. A mistake often made is that the clay is brought to the surface, and the top soil buried beneath it. Nature's order should never be reversed, and the relationships of top soil, and then sub-soil, should always be recognised. After the autumn digging, the ground may be left in a fairly rough state, as the usual climatic conditions will result in a gradual weathering down of the surface. The autumnal dressing of lime is always beneficial.

Bulbs, tubers, and corms should now all be planted. As they appear above ground, they should be protected from the ravages of snails and slugs; as these pests have a very great liking for such succulent growths. A good surface dressing of broken leaf, or dust tobacco will effectively deal with these pests. In fact, the gardener who constantly uses tobacco, either in the leaf, stem, or dust form, will very soon be in the happy position, that slugs and snails will cause him no anxiety whatever. Besides, as previously stated, the tobacco has manurial properties which also are valuable.

Pansy and any other seedlings, also rooted layers and cuttings, may now be planted out into their permanent positions.

Sowings may also be made of any hardy annuals, such as antirrhinum, aquilegia, correopsis, Canterbury bell, cornflower, dianthus, everlastings, foxglove, gaillardia, hollyhock, larkspur, leptosyne, lobelia, marigold, pansy, petunia, stock, sweet peas, verbena, wallflower, &c.

Artificial Manures Acts.

SUPPLEMENTARY LIST OF UNIT VALUES OF MANURES IN THE VICTORIAN MARKETS DURING 1910 SEASON.

Description of Manure.	Moisture. Percentage.	Nitrogen. Percentage.	Nitrogen. Estimated value in One ton of the Manure.	Phosphoric Acid. Water Soluble. Percentage.	Phosphoric Acid. Water Soluble. Estimated Value in One ton of the Manure.	Phosphoric Acid. Citrate Soluble. Percentage.	Phosphoric Acid. Citrate Soluble. Estimated Value in One ton of the Manure.	Phosphoric Acid. Insoluble. Percentage.	Phosphoric Acid. Insoluble. Estimated Value in One ton of the Manure.	Phosphoric Acid. Total. Percentage.	Phosphoric Acid. Total. Estimated Value in One ton of the Manure.	Estimated Total Value of the Manure per ton.	Price asked for the Manure per ton. Delivered at the Local Railway Station.	Where Obtainable.
Mainly Phosphoric, Phosphoric Acid readily soluble.			£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Superphosphate (Belgium)	7.84	..	..	17.55	3 19 0	1.97	0 7 10	0.43	0 1 2	19.95	4 8 0	4 8 0	4 7 6	P. Rohs, Bendigo.

Description of Manure.	Moisture. Percentage.	Nitrogen. Percentage.	Nitrogen. Estimated Value in One ton of the Manure.	Phosphoric Acid. Percentage.	Phosphoric Acid. Estimated Value in One ton of the Manure.	Mechanical Condition. Percentage of Fine Bone.	Mechanical Condition. Percentage of Coarse Bone.	Mechanical Condition. Nitrogen. Percentage in Fine Bone.	Mechanical Condition. Nitrogen. Percentage in Coarse Bone.	Mechanical Condition. Phosphoric Acid. Percentage in Fine Bone.	Mechanical Condition. Phosphoric Acid. Percentage in Coarse Bone.	Estimated total Value of the Manure per ton.	Price asked for the Manure per ton. Delivered at Local Railway Station.	Where Obtainable.
Containing Phosphoric Acid and Nitrogen, Phosphoric Acid difficultly soluble.			£ s. d.		£ s. d.							£ s. d.	£ s. d.	
Bonedust	4.29	3.90	2 6 10	20.35	3 17 10	86.00	14.00	3.36	0.54	17.51	2.84	6 4 8	6 7 6	A. H. Hasell, Melbourne
"	4.85	3.36	2 0 4	19.50	3 9 9	66.40	33.60	2.25	1.11	12.97	6.53	5 10 1	5 10 0	E. T. Hoskin, Bairnsdale

P. RANKIN SCOTT, Acting Government Analyst and Chemist for Agriculture.

Melbourne, 15th March, 1910

THE WINE INDUSTRY IN SOUTHERN FRANCE.

(*Continued from page 78.*)

F. de Castella, Government Viticulturist.

The Department of Hérault.

Space will not permit the description of the whole of the Midi—the four departments of Hérault, Aude, Gard and Pyrenees Orientales—with its million acres under vines. Besides, the first named of these, in addition to being the most important, may well be taken as typical of the whole region. It was, also, the one in which my time in southern France was mainly spent, and concerning the viticulture of which I was able to collect most information.

It is proposed, in the next few articles, to describe the viticulture of this department with its several distinct types of vineyards. With the exception of the port-like Rancio wines of Banyuls and Collioure in Pyrenees Orientales, Hérault produces all descriptions of wine turned out in the Midi; not that there is any very great variety though, seeing that the great bulk of the wine grown is the "vin ordinaire" or current consumption wine described at considerable length in the February issue of the *Journal*.

In old days, several special *Crus* or growths were known, which, though not equalling the celebrated wines of Bordeaux, Burgundy, &c., nevertheless enjoyed a certain amount of local fame. Such were *St. Georges D'Orques*, a red wine, and *Marseillan* and *Pomerols*, full bodied dry whites of the type known as *Picardan*. Since the vineyards have been reconstituted, the production of these wines has lost much of its former importance; the varieties cultivated in olden days, which contributed to the special character of the wines, were poor, or only moderate bearers. In the early days of reconstitution, the large profits to be made by the production of "vin ordinaire," at that time scarce, and consequently, at a premium, led to these vineyards being replaced by heavy bearing, "vin ordinaire" varieties. The principal sort grown at St. Georges was the Cinsaut, a grape we have long cultivated in Victoria, under other names, as we shall see when dealing with the ampelography of the region.

In addition to these dry wines, a certain number of well known sweet wines were formerly made in fairly large quantities, chief amongst which were the Muscats of Frontignan* and Lunel. Though excellent wines of this type are still produced they are not now grown in nearly the same quantity as formerly. The same decrease is to be noted in the wines which formed the basis of the *Vin d'imitation* trade, of which the headquarters was the town of Cette.

Nowadays it is "vin ordinaire" which the department produces in enormously greater proportion than anything else; "vin ordinaire," which varies in strength from a 6° to 6½° wine (10.5 to 11.5 per cent. proof), yielded at the rate of 2,500 to 3,500 gallons to the acre, in the rich

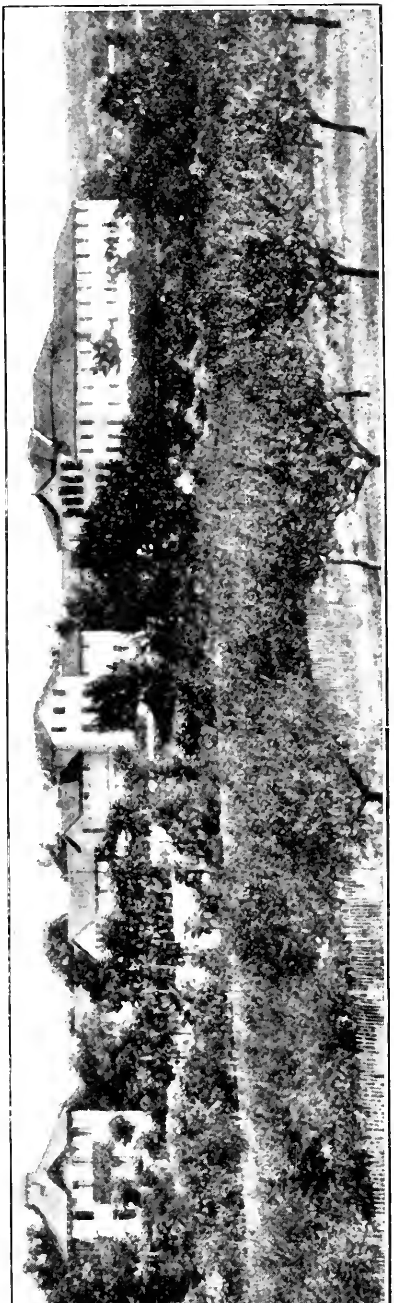
* The name Frontignac, commonly used in Victorian wine circles, is a corruption of Frontignan, the name of a village a few miles S.W. of Montpellier, where the wine of this name is grown. Lunel is a small town 20 miles east of Montpellier.

alluvial flats, to the fuller "ordinaires" known as *Vin de Montagne*, such as Ville-Veyrac and Cers; wines containing as much as 11° or 12° (19.3 to 21 per cent. proof), and which chiefly serve to increase in colour and body, and thus to improve, the lighter wines known as *Vin de Plaine*.

Occupying, as it does, the position of most important viticultural department in France, the vine would naturally be expected to occupy a very large place in its agriculture, but the enormous lead viticulture has taken will, no doubt, astonish those who have not realized the importance of this industry to the French nation.

The total area of the department, which is roughly 70 miles long by 35 wide, is something over a million and a half acres (622,300 hectares); of this *nearly one-third is under vines.* The vineyards of Hérault totalled in 1907, according to official figures, 446,000 acres (178,657 hectares).

It is difficult to realize the extraordinary way in which the vine has ousted other cultures from much of the land fit for cultivation. Land formerly devoted to the cultivation of cereals, has, during the past few years, been converted into vineyards. Olive orchards have been rooted out, and the land devoted to the same purpose, so that, at the present day, the whole of the land fit for the growth of the vine is now an almost continuous vineyard. This is clearly shown in the very fine map drawn up by the Societé Centrale d'Agriculture de l'Hérault. It was, unfortunately, not possible to here reproduce this map, but a few figures may be quoted which illustrate the preponderating importance of the vine. As early as 1824

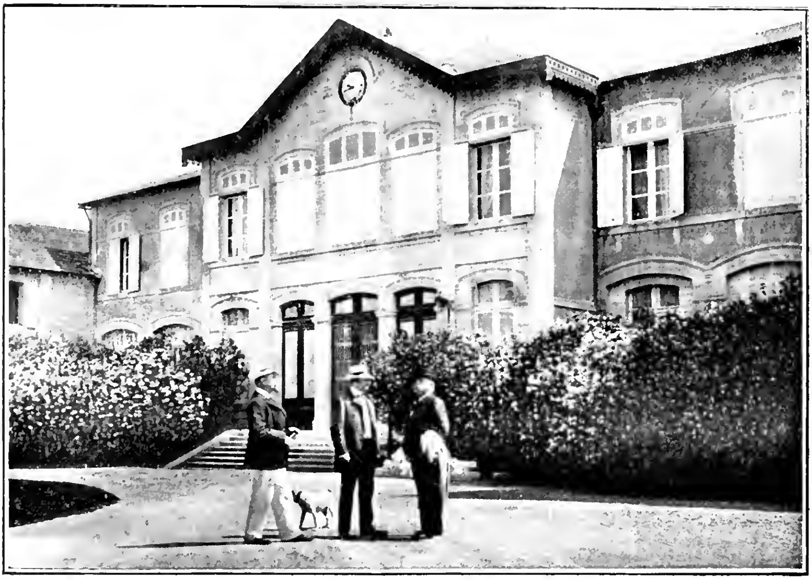


1. GENERAL VIEW OF THE ECOLE NATIONALE D'AGRICULTURE DE MONTPELLIER.

Baron Hippolyte de Lesser classed the different lands of the department as follows :—

	hectares.		acres.
Rocks, rough country (*terres vagues*), &c. ...	259·612	=	649,030
Land fit for plough	154·457	=	386,142
Vineyards	96·787	=	241,967
Forests	59·301	=	148,252
Roads, streams, ponds	33·871	=	84,677
Olive orchards	7·222	=	18,055
Fields (permanent pastures)	7·610	=	19,025
Gardens	1·518	=	3,795
Salt works	1·808	=	4,520
Buildings	1·153	=	2,882
Navigation canals	555	=	1,387
Irrigation canals	4	=	10
	623·898	=	1,559,742

Since that time, the area under vines has considerably increased. It, of course, underwent a large reduction owing to the ravages of Phylloxera, but the ground then lost has since been regained, with the result that the



2. THE MAIN BUILDING, MONTPELLIER SCHOOL.

vine now occupies 459,582 acres (183,833 hectares) or nearly one-third of the total area of the department and nearly two-thirds of the total arable land. There is no other region in the world where the culture of the vine occupies so exclusive a position. From the river Aude, on the west, to the Vidourle, on the east, a distance of nearly 70 miles, the country is one continuous vineyard, varying in width, but, as seen from the railway line which connects Marseilles with the Spanish frontier, presenting, during the summer months, a continuous mass of green, only broken here and there by occasional barren rocks or patches of land unfit for any culture.

In October last, the 459,582 acres under vines in the department were made up as follows:—

1. Resistant vines (grafted) ... ... 442,705 acres.
2. Ungrafted vines ... ... 16,877 acres.

These ungrafted vines include vines growing in sand (6,687 acres), vines protected from Phylloxera by submersion or flooding (7,102 acres), by irrigation (585 acres), and by sulphide of carbon (56 acres). These figures show most conclusively the part played by reconstitution on resistant stocks, and its immense superiority over all other solutions of the Phylloxera problem.

Before describing the methods of culture and wine making, by means of which the enormous yields already referred to are obtained, the conditions under which the vine is grown, as regards situation, soil and climate, must be considered.* These have a most important bearing on the cultural methods and differ, in some respects, considerably from those prevailing in Victoria.

THE MONTPELLIER SCHOOL.

AGRICULTURAL EDUCATION.

In the neighbourhood of Montpellier, science and practical skill go hand in hand, co-operating to an extent rarely met with in practical agriculture. A factor which has powerfully contributed to this very desirable result is the world-famous institution known in all vine-growing countries as the Ecole National d'Agriculture de Montpellier.

Agricultural education in France is very thoroughly organized, theory and practice receiving equal attention. The present system is said to date from 1848; but it has undergone so many transformations since, owing to various causes, that it cannot be said to have been placed on a really satisfactory basis until its reorganization in 1876, since when but few changes have been made. At the present day, the complete system may be briefly resumed as follows:—

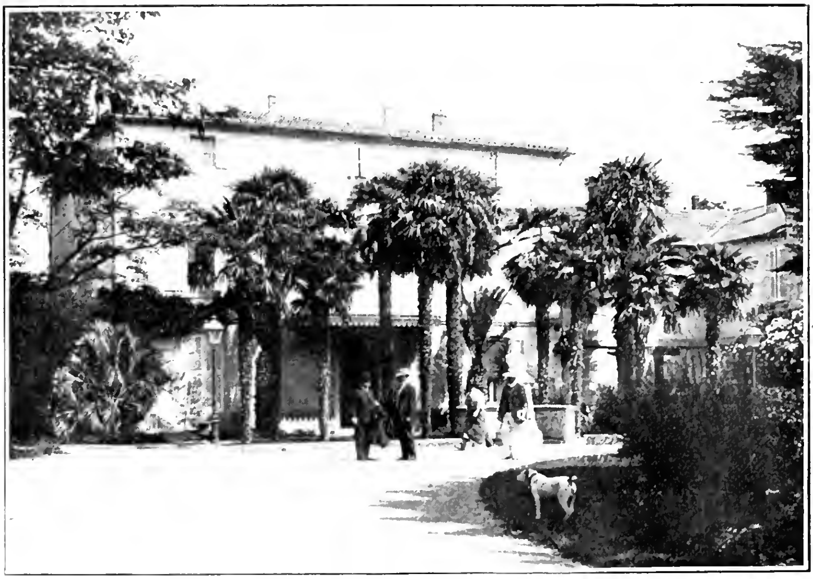
1. The NATIONAL INSTITUTE in Paris.
2. NATIONAL SCHOOLS to the number of 6—Grignon, Montpellier, Rennes, for general agriculture of the regions in which each is situated; the Douai National School of Agricultural Industries, such as sugar extraction, distilling and brewing; the Versailles School of Horticulture; the Mamirolle School of Dairying.
3. PRACTICAL SCHOOLS, of which there are 45, devoted to agriculture, viticulture, horticulture, dairying, &c. In these, though theory is also taught, the training is essentially practical.
4. FARM SCHOOLS, of which there are 27, where the teaching, though essentially practical, includes a few lectures.
5. AGRICULTURAL LECTURERS, who deliver regular series of lectures on agricultural subjects. There are 270 of these in different parts of the country, 90 of whom are known as *Professeurs departementaux*, and 180 as *Professeurs speciaux*.
6. RESEARCH ESTABLISHMENTS, or experimental stations, devoted to general agriculture, viticulture, sericulture, &c. There are 63 of these in all.

*Owing to pressure of matter, it has been found necessary to alter the sequence of this article. The description of situation, soil, and climate must therefore be held over until next issue.—EDITOR.

The Montpellier School, though it teaches agriculture generally, devotes itself in a more particular manner to the cultures of greatest importance

3. THE VITICULTURAL BUILDING, MONTPELLIER SCHOOL.

in the Mediterranean region, such as vines, olives, and silk worms. The vine, being of such preponderating importance in this part of France, it follows that this school is by far the most important establishment for



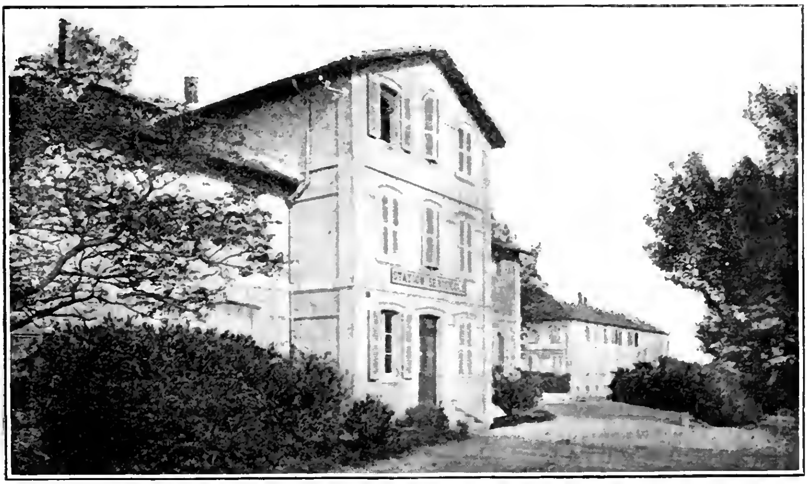
4. DIRECTOR'S RESIDENCE, MONTPELLIER SCHOOL.

the teaching of scientific viticulture and wine-making in France, and consequently in the whole world. It may, in fact, be looked upon as the viticultural university of the world. From 1872, when this school was founded, to 1899, 1,470 regular students had passed through it, in addition to 635 *Auditeurs Libres.*

Though a full description of it is not here possible, brief mention must be made of the great part it has played in placing modern viticulture on a truly scientific basis, and especially in assisting in the great work of the reconstitution of the vineyards of France on resistant stocks.

It was founded in 1872, or shortly after the first outbreak of Phylloxera in France (1865), and just about the time that the trouble was reaching an acute stage. The now historic struggle with the terrible insect lasted nearly 30 years, for it is only in the "nineties" of the last century that victory crowned the efforts of the vine-growers of the Midi, who have always led the way in the pioneer work of reconstitution.

In the final victory, so slowly and laboriously gained, the Montpellier School has played a foremost part. Nor has its influence been confined to France—it has been world wide, students from all parts have flocked



5. THE SILK BUILDING, MONTPELLIER SCHOOL.

to Montpellier in search of most recent viticultural knowledge. In every part of the world where the vine is grown, one meets its graduates. We have several in Australia who occupy leading positions in the viticultural world, either as teachers or growers.

The late G. Foex, whose remarkable *Cours Complet de Viticulture* will long continue a standard work, was Professor of Viticulture here from 1882 to 1897, and for a good many years Director. He was succeeded in 1897 in the Chair of Viticulture by Professor L. Ravaz, well known to Victorian growers. Since 1885, the Chair of Technology (chiefly dealing with Œnology in this vine-growing region) has been occupied by Professor Bouffard. The staff includes 11 professors and 15 lecturers, assistants and practical instructors, in addition to the supervisional and clerical staff.

The photographs reproduced will give some idea of the outward appearance, at least, of this remarkable institution. No. 1 is a general view of the group of buildings of which the school is composed. To the extreme right is seen the main building, shown again in greater detail in No. 2. On the extreme left is the viticulture building (laboratories, &c.,

the cellars are not visible in the photograph), shown again in No. 3 in which is to be seen, at the angle of the building, one of the Eucalypts often cut down by severe winter frosts. In this photograph, as well as in No. 4, which shows the Director's (M. Ferrouillat) residence, are to be seen some palms (*Chamærops excelsa*), plants which constitute an unusual feature in most other parts of France.

No. 5 shows the silk building (*Station Sericicole*) also visible in the centre of photograph No. 1. It bears testimony to the importance of the silk industry in southern France; an industry which will some day also prove a source of wealth to our Commonwealth.

Past failures have caused us to regard sericulture as an industry for which there is no hope of success under Australian conditions. It is at best only an auxiliary industry, but one which, in these days of closer settlement, merits attention. By a little extra work during five or six weeks in the year, the women and children of a settler's family could easily earn their £20 or £30 cheque—a sum surely worth considering. The importance given to this branch at Montpellier proves the value of the industry to France and, incidentally, its potentialities in Victoria.

(*To be continued.*)

ANSWERS TO CORRESPONDENTS.

Building for Bacon-curing.—W.H. asks what class of building is recommended.

Answer.—A brick building with brick and cement tanks is preferred. The tanks should be built 3 feet under the floor level of and 3 ft. 6 in. above, the inside measurement to be 4 feet square. One tank will hold seven pigs. The front of the building should face the south, and there should be ample provision for ventilation. Bank up the wall on the north side so as to keep out the north winds.

Milk for Pigs.—W.H. asks whether sweet or curdled milk is the better food for pigs.

Answer.—Sweet milk.

Ascertaining Pregnancy.—W.H. wishes to know if there is any way of ascertaining whether a milking cow is in calf.

Answer.—There is no very reliable way until the cow is somewhat advanced when an examination may be made. Some men by constant practice become rather expert.

Tympanitis.—R.M.V. writes, "My neighbour tells me that he has lost a cow through her eating pears. She was 'blown' and he blamed the pears. Is that possible?"

Answer.—An excess of almost any succulent food when a cow is not used to it may produce Tympanitis, so it is quite possible the pears were the cause in the case stated by you.

Pony Pawing.—X.Y.Z. asks what is the cause of a pony pawing. Her pony, when standing, soon makes a hole in the ground through pawing. He also trips frequently when travelling.

Answer.—Without an examination, it is hard to state the cause of your pony pawing. It may be merely habit, or it may be owing to some soreness in the limbs and an effort to get his feet on the side of a hole to rest them. More than likely it is habit only.

Castor Oil Plant.—J.C.W. inquires whether the seeds of the Castor Oil plant are injurious to stock.

Answer.—The seeds of the Castor Oil plant (*Ricinus communis*) are poisonous, and castor oil cake is generally regarded as injurious to cattle. Cases are known of cattle being injured or killed by fresh seeds, or the oil cake, and 3 to 20 seeds have been recorded as killing human beings. The pure cold drawn oil is not poisonous, and is only a mild purgative.

GROWTH OF HAIR IN MANE AND TAIL.—W.C. inquires as to best means of improving the growth of hair in the mane and tail of a stallion.

Answer.—A mixture of castor oil and methylated spirits in equal parts, well rubbed into the roots of the hair, will be found useful.

BLACKLEG.—R.R. writes, "Recently, one of my calves seemed to go suddenly mad, tearing around the yard and running against the fences. This lasted for only a few minutes when it dropped down in severe convulsions and died in a few seconds. Another calf has died in exactly the same way to-day. I opened the last one. All organs seemed healthy, except one kidney, which was very much enlarged and congested and nearly black. The intestines were much distended with wind. In the event of others taking bad, can anything be done for them?"

Answer.—The symptoms as stated are not inconsistent with Blackleg. The convulsions and death may, however, have resulted from the presence of indigestible material in the stomachs or intestines. Treatment is of little avail when death supervenes so suddenly, but if time permits a laxative dose of castor oil should be given, four to six ounces according to age.

DEATH OF PONY.—W.R. inquires as to cause of death of pony. In the morning, the pony was as usual fed on chaff, and afterwards he had a drink of water. He was then driven 24 miles, being seven hours in harness before taking bad. When the harness was removed, the pony laid down, and although given purgatives, died on the following day. When opened, there was a little inflammation and a certain amount of bots, but not enough to cause death. The intestines were full of wind and water.

Answer.—The cause of death would be impaction colic induced by watering after feeding and then driving a journey. A horse should be watered *before* feeding, and such conditions would then be rare.

PLOUGHING IN STUBBLE.—W.M. asks whether land is more benefited by burning off the stubble or by ploughing it in.

Answer.—Ploughing in is recommended. When stubble is burnt off it is practically lost from a manurial point of view, with the exception of a small percentage of ash. On the other hand, if ploughed in, the dead vegetable matter of the stubble becomes exposed to the moisture and warmth in the soil and breaks down to a form called humus, the factor making for soil fertility.

LUCERNE GROWING.—N.S.W. is anxious to put in 200 acres of lucerne, and would like to know whether it is advisable to sow in new ground. The latter has never been ploughed, and is a light loam with a clay subsoil.

Answer.—Preparation of seed bed plays an important part in the successful growing of lucerne. This cannot be too strongly emphasized. If possible, a paddock should be selected with a sufficient slope to effect thorough surface drainage and sufficiently open or porous to provide good under-drainage. Roots will not thrive in a water-soaked soil or in soil with the water level only a few feet from the surface. It is always advisable to sow lucerne seed in ground that has been previously well tilled, is free from weeds, and is in good tilth. Write to the Secretary, State Rivers and Water Supply Commission, Melbourne, for a copy of the bulletin on "Irrigation of Lucerne" recently issued by the Commission.

RAPE CULTIVATION.—W.T. desires information concerning the cultivation of rape.

Answer.—Rape is generally successful if sown in time to benefit by the first autumn rains. It may be fed down from May till August. For sheep feeding, sow ½ lb. of mustard seed with 4 lbs. of rape per acre. The mustard minimises scouring of lambs. The easiest manner in which to sow the crop is to mix it with 60 lbs. of superphosphate per acre and sow through the manure box of an ordinary grain drill.

LIMING OF LAND.—W.S.B. asks a series of questions relative to the liming of land.

Answer.—(1) 5 cwt. of quicklime per acre would not be considered excessive. (2) It would not be a sufficient quantity to injure the micro-organisms of the soil. (3) From three to four weeks, according to the weather, should elapse before sowing seed. (4) Koo-wee-rup soils are very poor in lime. (5) Gypsum would not give better results than the caustic form on land which has hardly lost the effects of swamp conditions.

ONION SEED.—W.H. asks how to harvest onion seed.

Answer.—The seed heads are allowed to remain on the plant until they are thoroughly dry. They are then cut down and the seed is lightly threshed out. The "chaff" and portions of the seed vessels are then easily blown or winnowed away from the seed.

Tree Lucerne.—S.Y. writes:—"Please inform me as to the proper time to sow Tree Lucerne (*Medicago arborea*). I wish to plant 2 or 3 acres with it to use for cattle feed when the snow is on the ground. Last year I put in about 1,000 plants, but now find I have got *Tagasaste*, a shelter tree, and not the fodder plant I required."

Answer.—The seed, which is best soaked before planting, can be planted at any time the soil is moist and warm, preferably in autumn, but spring planting is also good if not delayed too long. Hoeing to keep down weeds and to keep the soil loose is the only treatment necessary. Seed can be purchased for 3s. per lb.

Plants for Identification.—L.T.R. forwards three specimens of weeds for identification. He states that he has had 300 crossbred ewes in a 100-acre paddock for over two months. During the three weeks previous to writing they have been feeding on a "spring," about 2 acres, where twelve have died. He thinks the plants forwarded are the cause.

Answer.—They are as follow:—(1) *Isotoma fluviatilis*, F.v.M. (2) *Hypericum japonicum*, Thunb. (3) *Dichondra repens*, R. and G. Forster. All are native plants. No. 1 is the only one known to have poisonous properties. It belongs to the *Lobeliaceæ*, and all species of this order contain a sharp burning or even narcotic milky sap, which, taken internally in excess, causes inflammation of the alimentary canal and even death. An allied species, *I. longiflora*, is deadly to horses in South America, large doses producing death and small ones violent purging, very small doses merely acting as a tonic stimulant. *I. fluviatilis* is less poisonous, but is not a plant to encourage on pasture land. The plant should be hoed up or pulled up after rain, before seeding, and stock should be kept from land where it is abundant, especially if other feed is scarce. Drainage and liming appear to aid in suppressing it.

Sorrel.—C.J. asks how to eradicate sorrel.

Answer.—The growth of sorrel indicates poor land. Good dressings of lime, or of manures like basic slag containing lime, help to keep it down. The free use of the hoe is advised in ground which cannot be cultivated.

French Beans.—J.A.F. requests information relative to bean culture. During the past season much of his seed did not germinate. The soil is a rather stiff greyish loam and inclined to be cloddy, requiring a good deal of working to get it into a fine condition. He has no water for irrigation, but depends on dry culture, scarifying, &c.

Answer.—The Canadian Wonder is the best variety of French bean you can grow. Have the soil well and deeply dug, and before digging give it a good dressing of lime in the autumn. When preparing it for sowing, dig in deeply some well rotted stable manure. Make the first sowing of seed in September when all danger from frosts has gone, planting the seed no deeper than two inches. Sow the seed in double rows a few inches apart, and keep the rows at least two feet apart, so that you can cultivate frequently.

"Vin Ordinaire" Varieties of Grapes.—H.B. (Ruby) asks where he could obtain rooted cuttings of "Vin ordinaire" varieties.

Answer.—The main varieties grown for "Vin ordinaire" in Southern France are Aramon and Carignane. These vines are only suited to the warmer regions of the State. Ruby is too cool for them. Other sorts would give better results there, especially the Gamay. Unfortunately, this sort is not obtainable in quantity in Victoria as yet. Ruby, being a clean district, cuttings or rooted vines cannot be sent to it from Rutherglen.

Analysis of Water.—H.B. asks where he could get water from a well analyzed. He desires to know whether it is suitable for stock and for irrigation.

Answer.—Forward a quart of the water in a clean bottle to the Government Analyst, Public Offices, Melbourne. The fee is 10s. 6d. per sample.

Potatoes Attacked by White Ants.—D.P. forwards some specimens of potatoes which he thinks have been attacked by white ants. They were grown near an old stump.

Answer.—It is a common thing for potatoes to be attacked by white ants when planted in newly cleared forest land. Injury is also done by them in passion fruit gardens where they attack the vines. These insects are generally found in places where trees, stumps, and log fences have been removed. When clearing land, all parts of the stump and its roots should be removed, as they harbour the ants. Remove the timber and they will soon disappear. When a small area, such as the site of a stump, is affected, it could be treated with carbon bi-sulphide—3 oz. per square yard.

GRANT TO AGRICULTURAL SOCIETIES.

CONDITIONS TO BE CARRIED OUT DURING 1910 BY AGRICULTURAL SOCIETIES RECEIVING A GRANT FOR THAT YEAR.

A.—That the awards of prizes in all classes for stallions three years old and over at the Society's Show must be subject to the possession by the exhibit of a Government certificate of soundness.

The examinations of stallions for the Government Certificate of Soundness will not be made at Shows in the future. Stallion Inspection Parades will be held at different centres throughout the State prior to the commencement of the Show season (see Time Table of Stallion Parades for 1910). The parade centres are so arranged that all owners of Show stallions have the opportunity of submitting them for examination for the Government Certificate of Soundness before the closing of entries for the Show. Show Secretaries will require to obtain evidence of the possession of the Government Certificate in respect of exhibits at the time of entry, and should not accept entries of other than certificated horses.

Immediately after the Show, Secretaries of Societies are required to forward the names *of all the horses* that have won the prizes in stallion classes, together with the names of the owners.

B.—That the Society arrange for:—

(1) The holding of agricultural students' classes; or
(2) The holding of a series of at least four lectures or demonstrations on agricultural or live stock matters.

(B.1) AGRICULTURAL CLASSES.—The agricultural classes will last a fortnight, a demonstration being given each morning and afternoon, and four limelight lectures on evenings to be arranged for by the Secretary of each Society. Thirty students at least must be enrolled before a class can be held. The rent of hall and all local charges are to be paid by the Agricultural Society; all other expenses by the Department. Arrangements must be made to insure the uninterrupted use of the hall during the time the lectures are going on. The conditions under which medals and prizes are awarded to the students are to be subject to approval by the Department.

A roll of attendances at lectures and demonstrations shall be kept.

At the conclusion of each class, a written examination of about 1½ hours duration shall be held, a medal to be awarded by the Department to the student obtaining the highest number of marks for examination work and regular attendance combined. Two-thirds of the maximum marks obtainable will be given for examination work and one-third for regular attendance.

A special examination for the Gold Medal offered by the Australian Natives' Association shall be held and only winners of Departmental medals will be eligible to compete thereat.

Subjects of First Week.

The Principles of Agriculture.
Veterinary Science and Live Stock.

Subjects of Second Week.

Two or more of the following, to be selected by the Department:—(*a*) Sheep Breeding and Management (including Wool Classing and Lambs for Export); (*b*) Dairy Farming (including Management and Breeding of Pigs); (*c*) Poultry Breeding and Management; (*d*) Orchard and Garden Work.

SYNOPSIS OF LECTURES AND DEMONSTRATIONS.

Principles of Agriculture.

1. The plant food of the soil.
2. Cultivation methods and management.
3. Principles of manuring.
4. Valuation of artificial manures.
5. The management of the farm.
6. Experimental plots and their lessons.

Veterinary Science and Live Stock Subjects.

1. The structure and care of the horse's foot (lantern).
2. Brood mares and breeding mishaps (lantern).
3. Colic, constipation, and other bowel complaints.
4. Ailments of dairy cows—milk fever, impaction, udder complaints.
5. Contagious diseases of stock—abortion, blackleg, tuberculosis, anthrax, pleuro pneumonia, &c.
6. Ailments of swine, or ailments of sheep.
7. Unsoundness in horses (lantern).
8. Principles of stock breeding.

Sheep Breeding and Management.

1. The breeding of sheep for wool.
2. Wool sorting and classing, No. 1.
3. Wool sorting and classing, No. 2.
4. Raising fat lambs.
5. Management of flocks.

Dairy Farming.

1. Breeding and management.
2. Dairy buildings.
3. Dairy management.
4. Milk testing.
5. Foods and feeding.
6. Pig breeding, feeding, and management.

Poultry Breeding and Management.

1. The poultry industry: its importance. Locality—suitability or otherwise.
2. Housing (construction of, materials, insect proof, aspect, &c.). How to select stock.
3. Breeds: payable or otherwise, eggs and table. Breeds adapted for export—modes of crossing.
4. Turkeys: their care and management. Chicken raising and care.
5. Foods and feeding.
6. Common ailments of poultry. Incubation—natural and artificial.

Orchard and Garden Work.

1. Fruit growing: sorts and localities.
2. Manuring and cultivation.
3. Pruning and management.
4. Insect pests.
5. Fungus diseases.
6. The farmer's garden.

(B.2) Lectures on Agricultural and Live Stock Subjects.—Many of the lectures are illustrated by limelight views. The hall, advertising, &c., must be provided locally, free of cost, but all other charges are borne by the Department.

The course shall consist of at least four lectures or practical demonstrations during the year (dates to be fixed by the Department); **and the Society must take sufficient interest in the matter to insure a good attendance,** otherwise the lectures will not count for the grant conditions. It is requested that application be made as early as possible, so as to permit of a complete syllabus being drawn up, and the subjects of most interest to the district are to be mentioned. The Department will arrange for the lecture to be delivered as nearly as possible on the date mentioned by the Society, but modifications may be necessary in order to carry out the complete programme. The day of the week and hour most suitable for each locality should be given.

Societies may arrange for lectures by experts other than Departmental officers, but the subject and lecturer must be notified to and approved of by the Department. Any of the following subjects may be chosen:—

Subjects and Staff.

Principles of Agriculture—The Director and Mr. Temple Smith.

Veterinary Science, Stock Management, Dairy Sanitation and Education—Dr. S. S. Cameron, Messrs. Robertson, Kendall, Griffin, Strong, and Cother.

The Dairying Industry and Export Trade—Messrs. Crowe, Archer, and Carroll.

Orchard and Garden Work—Messrs. Carmody and Pescott.

Sheep Breeding and Management—Mr. H. W. Ham.

Lambs for Export—Dr. Brown.

Flax Culture and Demonstrations at Shows—Mr. Knight and staff.

Poultry Breeding and Management—Messrs. Hart and Hawkins.

Potato Culture—Mr. G. Seymour.

Tobacco Culture—Mr. Temple Smith.

Pig Breeding and Management—Mr. W. Smith.

Fruit Industries—Mr. J. G. Turner.

Insect Pests—Mr. C. French, Junr.

Plant Diseases and Pests—Mr. D. McAlpine.

C.—That the Society—

(1) arrange for the carrying out of field experiments on an area and in a locality to be approved by the Department; or

(2) provide and offer a substantial prize (the amount to be approved by the Minister of Agriculture, but not less than five pounds) for improvements in farm practice and management, or the cultivation of special crops in the district.

(C.1) Experimental Plots.—The plot of land should be about 5 acres in extent, so that the amount of produce may be of value to the Society. It is desirable also that arrangements be made for the use of the land for a number of years, so that a definite scheme can be worked out; the Society to furnish the land, with a written guarantee from the owner that it will be available free of charge to the Department. The Department will supply the manures and the seed free of cost, and superintend the sowing and harvesting, two-thirds of the produce to belong to the Society, and one-third to the Department.

(*a*) No site shall be approved until reported upon by an officer of the Department.

(*b*) No person whose farm equipment of teams and implements is insufficient, or out of date, shall be accepted as a proper person to conduct an experiment.

(*c*) The preparation of the land shall be wholly carried out by the experimenter, and, if not considered in proper order at the time of sowing, any further work desired shall be done promptly.

(*d*) Every Society shall appoint a sub-committee to consult with the Departmental officer, as to the class of experiment and the best means of carrying out the same.

(*e*) Every Society shall arrange for regular visitation of the experimental plot during growth and for a "field day" and lecture upon the plot towards its maturity.

It is suggested that one or more experimental plots should be developed in each district. Three main lines of investigation may be carried out: first, the determination of the manurial requirements of the district; second, the introduction of new methods of management and of new crops; third, by introducing new varieties of crops not already grown in the district. The area of land selected should be typical of the district, if anything, rather on the poor side. The location of the plot should be such that it can be seen by as many farmers as possible. An area adjacent to the principal town, or close to the railway station of the district, is therefore suggested. The details of the experimental work carried on by the Department are published from time to time in the *Journal*, and will be furnished for the information of members on application to the Secretary for Agriculture.

(C.2) SPECIAL PRIZE.—In carrying out this section, the words, "substantial prize" are to be interpreted in proportion of the income and prize list of the Society. It should amount to from 2½ to 5 per cent. of the total amount distributed in prizes at the show. The objects aimed at should be to make a distinct advance in farming methods as carried on in the district, and it will therefore be advisable to state the amount of the prize and the purpose for which it will be awarded several years in advance. Several Societies at present award prizes for the best-managed farms under and over 200 acres; others for the best farm under irrigation. These Societies fulfil all the conditions required. Suitable subjects are—(*a*) The best 10 acres irrigated by a private scheme; (*b*) The best 5 acres of lucerne, maize, or other fodder crops grown with or without irrigation; (*c*) The best-managed dairy herd of ten cows or upwards; or (*d*) The best 5-acre crop of flax or beans, &c., &c. Two or three objects should be suggested by each Society in taking up this condition. The Department will, as far as possible, assist by arranging the details of the competition, give instruction as to the best methods in attaining the object sought, and, if required, an officer of the Department will judge the competition, and a full report, with criticisms and suggestions for improvement, will be forwarded along with the award.

(*a*) The Society shall take steps to make the details of the competition widely known, and shall fix a date upon which entries close.

(*b*) Not less than four entries shall constitute a competition.

(*c*) If the entries are insufficient, the Society shall immediately notify the Department, and make other arrangements at once to comply with the grant conditions.

GOVERNMENT CERTIFICATION OF STALLIONS.

THIRD ANNUAL REPORT (SEASON 1909).

ON THE VETERINARY EXAMINATION OF STALLIONS FOR THE GOVERNMENT CERTIFICATE OF SOUNDNESS AND APPROVAL.

With a *resumé* of particulars covering the three years' working of the scheme, 1907-8-9.

S. S. Cameron, D.V.Sc., M.R.C.V.S., Chief Veterinary Officer.

In 1907, the then Minister of Agriculture (the Hon. Geo. Swinburne, M.L.A.) approved of the establishment of a system of Government control in respect of stallions standing for public service, directed primarily towards insuring the soundness from an hereditary stand-point of all stallions in the State, and also that such stallions should conform to a reasonable standard of excellence as regards breed, type and conformation. The system has now been carried out through three seasons, and it is proposed to review its operation and administration during that period.

It may be said at once that, in this review of the work of the past three years, it will not be claimed that a definite and measurable improvement has already been attained. It will be some years more before the real benefit of this three years' work will be appreciable. It is true that about one-fourth of the stallions examined have been refused the Government Certificate, but it will not be possible to estimate the improvement that can be effected until power is given by legislative enactment to prevent or limit the use of rejected stallions. What may be claimed, however, is that in the three years, examinations have shown :—

(*a*) That unsoundness of an hereditary character exists to a considerable extent in the stallions standing for public service. (The figures in the Table of Totals herein show 15.83 per cent. of rejects for hereditary unsoundness.)

(*b*) That there is a considerable proportion of sires at present in use unfit for the purpose by virtue of their mongrel characteristics.

These two features having been demonstrated, there need be no hesitation in affirming the necessity of completing the scheme by legislative enactment.

During the first season (1907) the scheme was on a voluntary basis. It provided for the purely voluntary submission of stallions for examination. The Agricultural Societies throughout the State were requested by circular to organise parades at local centres at which the veterinary officers of the Department would attend for the examination of horses brought forward by owners. Fifty-six societies in different parts of the State responded to the invitation, and 78 parades and shows were attended by the examining officers. A total of 918 horses were submitted for examination, representing about 50 per cent. of the stallions standing for public service in the State. Of these, 215 (23.42 per cent.) were rejected and 703 certificated. That such a large number of horses should have been voluntarily submitted in the face of the rejections that were continually being experienced by owners. was in a great measure due to the pressure upon stallion owners of horse breeders. The owners of mares apparently realised that the scheme was for their ultimate benefit; and, very shortly after the outset, the bulk of them apparently decided to patronize certificated stallions only.

In the following table is set out the number of horses examined in 1907, the numbers of each breed, the number and percentage of horses rejected and certificated, and the number of horses affected with the particular unsoundnesses dealt with :—

Analysis of Defects of Stallions Refused Certificates, 1907.

Defects	Draughts.		Lights.		Ponies.		Totals.	
	No. Examined. 403	No. Certificated. 271	No. Examined. 301	No. Certificated. 246	No Examined 214	No. Certificated. 186	No. Examined. 918	No. Certificated. 703
	No. Rejected. 132	Per cent Rejected. 32·75	No Rejected. 55	Per cent. Rejected. 18·27	No. Rejected. 28	Per cent. Rejected. 13·08	No. Rejected. 215	Per cent. Rejected. 23·42
Unsoundness.								
Sidebones ...	82	20·35	3	·99	...	...	85	9·35
Ringbones ...	9	2·23	4	1·32	2	·93	15	1·63
Spavin (Bone)	3	·74	15	4·95	1	·46	19	2·06
Bog Spavin & Thoroughpin	2	·49	4	1·32	..		6	·65
Curb ...	...	...	6	1·99	6	2·80	12	1·30
Cataract (eye)	...	...	...	...	1	·46	1	·10
Totals Unsoundness	96	23·82	32	10·63	10	4·67	138	15·04
Below standard for approval ...	36	8·93	23	7·64	18	8·41	77	8·38
Grand totals	132	32·75	55	18·27	28	13·08	215	23·42

In 1908, certain modifications of the scheme, dictated by experience gained during the first season, were adopted. As stated, the scheme was on a purely voluntary basis in 1907. There was no obligation on the part of an owner to submit his horse, and the regulations did not provide any disability in respect of horses not submitted, nor indeed of horses rejected. The possession of the Government Certificate was no protection at shows against competition from uncertificated horses. A number of cases occurred in which a rejected horse was placed first by the judges over certificated animals. To overcome this anomalous state of things, it was made a condition of the Government grant to agricultural societies that a

Government Certificate should be held by all stallions three years old or over competing. The imposition of this condition made the scheme compulsory in respect of all horses it was desired to show, inasmuch as practically the whole of the agricultural societies throughout the State were receiving a Government subsidy. Along with the introduction of the compulsory condition to the extent mentioned, it was provided that any owner who felt aggrieved at the rejection of his horse should be given an opportunity of appealing against the decision of the examining officer. (See Regulation V., July, 1909, *Journal.*) Since the regulations providing for an appeal were adopted, 486 horses have been rejected, and in no instance has the opportunity to appeal been taken advantage of.

In 1908, 118 inspection parades were attended by the Departmental officers, at which 995 horses were submitted for examination. Of these 742 were certificated and 253 (25.41 per cent.) were rejected. The following table sets out detailed particulars as regards the 1908 season :—

ANALYSIS OF DEFECTS OF HORSES REFUSED CERTIFICATES, 1908.

Defects.	Draughts.		Lights.		Ponies.		Totals.	
	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.
	501	341	295	242	199	159	995	742
	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.
	160	31·92	53	17·96	40	20·10	253	25·41
Unsoundness.								
Sidebones ..	99	19·76	1	·33	...	...	100	10·05
Ringbones ...	20	3·99	7	2·37	3	1·50	30	3·01
Spavin (Bone)	3	·59	8	2·71	...	...	11	1·10
Bog Spavin & Thoroughpin	15	2·99	3	1·01	...	...	18	1·80
Curb ...	...	...	8	2·71	2	1·00	10	1·01
Roarer ...	...	...	2	·67	...	...	2	·20
Totals Unsoundness	137	27·33	29	9·83	5	2·50	171	17·17
Below standard for approval ...	23	4·59	24	8·13	35	17·58	82	8·24
Grand totals	160	31·92	53	17·96	40	20·10	253	25·41

Although, strictly speaking, the 1909-10 season has not been altogether completed, the bulk of the work has been got through, and it has been deemed advisable in this report to submit the figures up to 31st December, 1909.

The number of horses examined this season totalled 751, of which 528 were certificated and 223 (29.69 per cent.) rejected. The increase in the percentage of rejections has been due to a somewhat higher standard being adopted as regards breed, type and conformation. The rejections under this heading account for 14.65 per cent. this year, as against 8.38 per cent. and 8.24 per cent. in 1907 and 1908 respectively.

The following table applies to the season 1909, and gives particulars identical with those furnished in the previous tables as regards the two previous years:—

ANALYSIS OF DEFECTS OF STALLIONS REFUSED CERTIFICATES, 1909.
(Up to 31/12/09.)

Defects.	Draughts.		Lights.		Ponies.		Totals.	
	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.
	408	273	191	147	152	108	751	528
	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.
	135	33·08	44	23·04	44	28·94	223	29·69
Unsoundness.								
Sidebones ...	84	20·59	...	...	...	...	84	11·18
Ringbones ...	11	2·69	3	1·57	1	·66	15	1·99
Spavin (Bone)	1	·24	2	1·04	1	·66	4	·54
Bog Spavin & Thoroughpin	...	...	1	·52	...	...	1	·13
Curb ...	...		6	3·14	3	1·97	9	1·20
Totals Unsoundness	96	23·52	12	6·27	5	3·29	113	15·04
Below standard for approval ...	39	9·56	32	16·77	39	25·65	110	14·65
Grand totals	135	33·08	44	23·04	44	28·94	223	29·69
New Zealand Examinations (Certificated but not included in above figures)	32	..	1	...	...	...	33	..

AGGREGATE RESULTS TO DATE—1907-1908-1909.

Up to 31st December, 1909, 2,664 stallions had been examined, 1,973 having been certificated (74.07 per cent.) and 691 rejected (25.93 per cent.). Of these, 442 (15.83 per cent.) were rejected on the ground of hereditary unsoundness and 269 (10.10 per cent.) were disapproved as being below a reasonable standard for Government certification. As regards unsoundnesses, detailed particulars concerning the grounds for rejection are given in the following table :—

Analysis of Defects of Stallions Refused Certificates for Seasons 1907, 1908, 1909 (to 31/12/09).

Defects.	Draughts.		Lights.		Ponies.		Totals.	
	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.	No. Examined	No. Certificated.
	1,312	885	787	635	565	453	2,664	1,973
	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.
	427	32·54	152	19.31	112	19·82	691	25·93
Unsoundness.								
Sidebones ...	265	20·20	4	·51	...	...	269	10·10
Ringbones ...	40	3·05	14	1·77	6	1·06	60	2·24
Spavin (Bone)	7	·53	25	3·18	2	·36	34	1·27
Bog Spavin & Thoroughpin	17	1·29	8	1·02	...	.	25	·94
Curb ...	...	...	20	2·54	11	1·94	31	1·16
Cataract (eye)	..	...	...	...	1	·18	1	·04
Roarer ...	...	...	2	·25	...	..	2	·08
Totals Unsoundness	329	25·07	73	9·27	20	3·54	422	15·83
Below standard for approval ...	98	7·47	79	10·04	92	16·28	269	10·10
Grand totals	427	32·54	152	19·31	112	19·82	691	25·93

Rejections for Unsoundness.

Of all horses examined, 15.83 have been refused certificates on the ground of hereditary unsoundness solely. This percentage is comparatively small when compared with the results that have been published as regards hereditary unsoundness in some other countries. But any ground for congratulation in this respect is removed, when it is realised that in respect of draught horses no less than 25.07 per cent., or practically one-fourth of all horses submitted, have been rejected as being affected with one or other of the hereditary unsoundnesses. The position as regards draught horses cannot thus be considered as other than serious ; but hope, as regards a quick improvement from the continuance of the present system of examination, may be gathered from the results that have followed on the similar action which was taken 25 years ago by the Royal Shire Horse Society of Great Britain as regards unsoundness. At that time, about 30 per cent.

of the horses shown had to be rejected for unsoundness. The weeding out process has been going on ever since, with the result that certain families which were then predominant have been practically obliterated, and the families now responsible for the show stock of horses do not contain more than 5 per cent. of horses still carrying the taint of hereditary unsoundness.

Complete records have been kept of the unsoundnesses for which individual horses were rejected and of the family pedigrees and histories of such horses. It was realised shortly after the commencement of the scheme that the collection of such information would prove extremely interesting as time went on, as tending to prove or disprove, as the case may be, the hereditary character of the unsoundnesses in respect of which rejections have been made. In point of fact, a study of these records has proved of greater interest and more importance than was at first anticipated. By them I have been able to set forth information of a character such as has not been published in detail before. In a contribution to a thesis which I presented to the Melbourne University I was able to furnish particulars of a most interesting character concerning the incidence of unsoundnesses as regards breed and the age period of development of the various hereditary unsoundnesses, as also tables and family histories showing completed evidence of the hereditary character of sidebone, ringbone, curb, and bog spavin. As this University paper will be published as an addendum to this report there is no necessity to here repeat the details and conclusions set forth in it.*

As compared with the draught horses, it is satisfactory to find that only 9 per cent. of light horses have been rejected, and in the case of ponies the rejections for unsoundness have been particularly low, namely, 3.5 per cent.

REJECTIONS AS REGARDS STANDARD.

On the other hand, more ponies (16.28 per cent.) and light horses (10 per cent.) have been rejected as being below a reasonable standard for Government approval than in the case of draught horses, of which only 7.4 per cent. have been rejected for this reason.

On this aspect of the working of the scheme, it is opportune to again draw attention to the necessity (which, in my opinion, is urgent if the quality of the horse stock of the State is to be improved) of strengthening this side of the scheme. I have previously pointed out that the veterinary officers engaged in the work of examination have had no desire to undertake the function of judging as regards breed, type and conformation, and it may be said that they have only exercised this function in respect of stallions presented to them, which it would have been for them a matter of shame to have signed a certificate in favour of. With a staff of competent judges to deal with this aspect of the matter as firmly as the veterinary officers have dealt with the unsoundness aspect, much needed weeding out of inferior sires would be brought about in the course of two or three years. It is idle to say that in respect of type, breed and conformation, matters should be left in the hands of breeders themselves to determine. It is to such a drifting policy that, in a large measure, may be attributed the deterioration as regards quality that is being complained of on all hands. If quality of progeny is to be maintained, the standard of sires must be kept up. Even with the use of the best sires, there is always a sufficiency, if

*Want of space precludes the publication of the paper this month. It will appear in the next issue.—EDITOR.

not a redundancy of mis-fits. Mediocre horses, as regards quality, type and power may be, and are, bred in sufficiently large numbers, even when the best sires are used on mediocre mares; and to add to the trouble by using also a mediocre sire will inevitably result in a still further deterioration. The present position of affairs indicates plainly that the matter cannot be safely left in the hands of breeders. It is too true that many breeders are too prone to patronize inferior stallions, because of their cheapness; and to save them from themselves, it has become necessary that an efficient method of Government control should be fearlessly carried out.

EXTENSION OF THE SCHEME TO OTHER STATES.

The system adopted three years ago in Victoria has been put into force in the three neighbouring States of New South Wales, Queensland and South Australia. Each of these States commenced to carry out examinations under regulations practically identical with those which have been operative in Victoria. So far, however, the system in the sister States has been confined to examination of stallions at shows. Consequently, the numbers that have been examined in the States named have been comparatively small. Figures are not to hand from South Australia, but tables of results have been published as regards examinations made to date in Queensland and New South Wales. For purposes of comparison, I append a table setting out the numbers of stallions examined and rejected in Victoria, Queensland and New South Wales respectively during the season 1909. They are as follows:—

Class.	Number Examined.			Number Rejected.			Percentage Rejected.		
	Victoria.	Q'land.	N.S.W.	Victoria.	Q'land.	N.S.W.	Victoria.	Q'land.	N.S.W.
Draughts	408	55	13	135	27	7	33·08	49·09	53·84
Lights ...	191	78	14	44	13	2	23·04	16·64	14·28
Ponies ...	152	32	9	44	3	1	28·94	9·37	11·11
Totals ...	751	165	36	223	43	10	29·69	26·06	27·77

RECIPROCAL ARRANGEMENTS WITH OTHER COUNTRIES.

Prior to the commencement of the 1909 season, it was arranged, in order to meet the convenience of importers of horses from New Zealand, that the Victorian Government would issue the Government Certificate of Soundness without examination in respect of horses imported from New Zealand which had been there examined by a Government Veterinary Officer and certificated under the conditions laid down in the Victorian Regulations. Altogether, under this departure, 33 New Zealand certificates were accepted and exchanged for the Victorian Government Certificate. Doubtless, prior to the commencement of the forthcoming season, similar arrangements will be entered into with the Governments of New South Wales, Queensland, and South Australia, whereby a horse certificated in one State will be accepted by the Government of every other State as qualified for certification in such State. Before this can be arranged, however, it will be necessary that the States concerned shall be satisfied as to the uniformity of standard of examination and as regards the unsoundnesses constituting a bar.

English Examinations.

In order to insure that only sound horses are imported from Great Britain in the future, and to avoid disappointment and loss on the part of importers, it was decided before the commencement of last season that certificates issued by certain societies in England, Scotland and Ireland would be accepted here as a basis for the issue of the Victorian Government Certificate of Soundness, without further examination at this end. The societies asked to co-operate in this matter were the Royal Shire Horse Society (England), Royal Agricultural Society (England), Royal Dublin Society's Horse Show (Ireland), Highland and Agricultural Society (Scotland), and the Glasgow and West of Scotland Agricultural Society. To this end the societies named were written to some time ago and asked to authorize and undertake the duty. So far, replies have been received from th Royal Dublin Society, the Highland and Agricultural Society, and the Shire Horse Society. The two former letters intimate that those societies are to take the matter into consideration shortly, and the Shire Horse Society, in its letter, states that its Council has decided to accede to the request of this Government, and has authorized for the purpose examination by their Senior Veterinary Inspector (Professor Penberthy). Certificates will be accepted from Professor Penberthy not only in respect of shire horses, but in respect of horses of any breed, as also certificates from the veterinary inspectors of the other societies named, provided such certificates are issued officially on behalf of the societies.

Regulations and List.

Regulations governing the examination of stallions, together with list of certificated stallions, have been published each year at the close of the season, and may be had on application to the Secretary.

During the season 1907, 56 parades and shows were attended; during 1908, the examinations were conducted almost wholly at parades, of which 118 were arranged for and attended. During the last season (1909), 124 parades have been carried out.

Examining Officers.

So far as possible, the desire has been in this State to make the examinations uniform. To that end, not more than four officers have been engaged each season on examinations. After the first year, however, Mr. Norman McDonald, G.M.V.C., retired from the service of the Department to visit England. During the second season I ceased conducting examinations personally, in order that my position on the Court of Appeal might not be prejudiced. Messrs. W. J. Colebatch, M.R.C.V.S., and W. A. N. Robertson, G.M.V.C., have been examining officers throughout, and for the past two seasons Mr J. Lyons, M.R.C.V.S., and Mr. E. A. Kendall, G.M.V.C., completed the staff. It is to be regretted that, in future, the scheme will not have the valued assistance of Mr. W. J. Colebatch or Mr. J. Lyons, both of whom have recently retired from the Government service in this State to undertake more lucrative positions in South Australian and New Zealand respectively. The examining staff has, however, been increased by the addition of Mr. R. Griffin, M.R.C.V.S., and Mr. W. J. Cother, G.M.V.C. It is not too much to say that the success that has attended the carrying out of the scheme so far, has been in a great measure due to the high qualifications possessed for this class of work by the officers concerned, whereby the fullest confidence of both the Government and the horse-breeding public has been established.

TIME TABLE.

Stallion Parades, 1910.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
METROPOLITAN.				
25th, 26th, 27th, 28th and 29th July	City Horse Bazaar	10 a.m. daily		
Every Saturday from the 2nd July to 17th December	Agricultural Offices	10 a.m. to 12 noon		
WIMMERA. No. 1.				
—— July ..	Horsham ..	10 a.m.		
Wednesday, 3rd Aug.	Murtoa ..	2 p.m. ..	12.10 a.m. ..	3.32 a.m. (4th)
Week ending 13th August.				
WIMMERA, No. 2.				
Tuesday, 9th Aug. ..	Ararat ..	2 p.m. ..	1.29 p.m. ..	9.37 p.m.
Wednesday, 10th Aug.	Goroke ..	3 p.m. ..	1.40 p.m. ..	6.30 a.m. (11th)
Thursday, 11th Aug.	Edenhope ..	3 p.m. ..	12 noon ..	2.30 p.m. (12th)
WIMMERA. No. 3.				
Tuesday, 9th Aug. ..	Hopetoun ..	10 a.m. ..	10.15 p.m. (8th)	11.30 a.m.
Tuesday, 9th Aug. ..	Beulah ..	2 p.m ..	12.25 p.m. ..	4 p.m., driving
Wednesday, 10th Aug.	Warracknabeal	11 a.m. ..	8 p.m. (9th) ..	2.55 p.m.
Thursday, 11th Aug.	Minyip ..	2 p.m. ..	4.8 p.m. (10th)	4.8 p.m.
Friday, 12th Aug. ..	Stawell ..	11 a.m. ..	8 p.m. (11th) ..	2.40 p.m.
MALLEE, No. 1.				
Tuesday, 9th Aug. ..	Donald ..	2 p.m. ..	5.15 p.m. (8th)	6 p.m.
Wednesday, 10th Aug.	Watchem ..	2 p.m. ..	7.27 p.m. (9th)	10 a.m. (11th) driving
Thursday, 11th Aug.	Birchip ..	2 p.m. ..	12 noon ..	8.35 p.m.
Friday, 12th Aug. ..	Mildura ..	2 p.m. ..	5.50 p.m. ..	6 p.m. (15th)

* At centres where the Examining Officer remains overnight after the Parade, arrangements may be made for a Lecture on some veterinary or stock subject if application is made to the Chief Veterinary Officer before 1st July.

Time Table, Stallion Parades—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Week ending 20th August.				
MALLEE, No. 2.				
Tuesday, 16th Aug. ..	St. Arnaud	11 a.m. ..	7.11 a.m. ..	2.10 p.m.
Wednesday, 17th Aug.	Maryborough	2 p.m. ..	5.25 p.m.(16th)	6.5 a.m. (18th)
Thursday, 18th Aug.	Inglewood ..	10 a.m. ..	8.40 a.m. ..	1.57 p.m.
Friday, 19th Aug. ..	Charlton ..	10 a.m. ..	5.10 p.m. (18th)	12.25 p.m.
MALLEE, No. 3.				
Tuesday, 16th Aug. ..	Quambatook	10 a.m. ..	6.45 p.m. (15th)	11.10 a.m.
Wednesday, 17th Aug.	Sea Lake ..	2 p.m. ..	12.25 p.m. ..	7 a.m. (18th)
Thursday, 18th Aug.	Wycheproof	10 a.m. ..	10.5 a.m. ..	11.10 a.m.
Friday, 19th Aug. ..	Boort ..	10 a.m. ..	4.55 p.m. (18th)	12 noon, driving
WIMMERA, No. 4.				
Tuesday, 16th Aug. ..	Kaniva ..	2 p.m. ..	2.28 a.m. ..	12.42 a.m. (17th)
Wednesday, 17th Aug.	Nhill ..	2 p.m. ..	1.24 a.m. ..	7.42 a.m. (18th)
Thursday, 18th Aug.	Rainbow ..	2 p.m. ..	1.15 p.m. ..	3.30 p.m.
Friday, 19th Aug. ..	Jeparit ..	10 a.m. ..	4.40 p.m. (18th)	11 a.m., driving
Friday, 19th Aug. ..	Dimboola ..	2 p.m. ..	2 p.m., driving	2.18 a.m. (20th)
Week ending 27th August.				
NORTH-WESTERN, No. 1.				
Tuesday, 23rd Aug. ..	Swan Hill ..	2 p.m. ..	7.10 p.m. (22nd)	10.25 a.m. (24th)
Wednesday, 24th Aug.	Kerang ..	2 p.m. ..	12.4 p.m. ..	12.29 p.m. (25th)
Thursday, 25th Aug.	Pyramid ..	2.30 p.m.	2.11 p.m. ..	2.11 p.m. (26th)
CENTRAL, No. 1.				
Monday, 22nd Aug. ..	Beaufort ..	2 p.m. ..	12.27 p.m. ..	6.29 a.m. (23rd)
Tuesday, 23rd Aug. ..	Castlemaine	2 p.m. ..	12.30 p.m. ..	7.5 p.m.
Wednesday, 24th Aug.	Bendigo ..	2 p.m. ..	8.20 p.m. (23rd)	6.50 p.m.
Thursday, 25th Aug.	Bacchus Marsh	2 p.m. ..	12.39 p.m. ..	8.57 a.m. (26th)
GOULBURN VALLEY, No. 1.				
Monday, 22nd Aug. ..	Elmore ..	1.30 p.m.	1.11 p.m. ..	2.30 p.m., driving
Monday, 22nd Aug. ..	Rochester ..	3.30 p.m.	3.30 p.m., driving	10.19 p.m.
Tuesday, 23rd Aug. ..	Echuca ..	11 a.m. ..	10.58 p.m. (22nd)	2.55 p.m.
Wednesday, 24th Aug.	Kyabram ..	2 p.m. ..	4.20 p.m. (23rd)	4.20 p.m.
Thursday, 25th Aug.	Tatura ..	2 p.m. ..	6.50 p.m. (24th)	5.36 p.m.
Friday, 26th Aug. ..	Murchison ..	11 a.m. ..	11 a.m., driving	12 noon, driving
Friday, 26th Aug. ..	Rushworth	2 p.m. ..	1.30 p.m., driving	5.30 p.m.
ROYAL SHOW.				
Tuesday, 30th Aug. ..	Show Grounds, Flemington	8 a.m. to 10 a.m.		

TIME TABLE, STALLION PARADES—*continued.*

Week ending 10th September.

District and Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
GOULBURN VALLEY, No. 2.				
Monday, 5th Sept. ..	Cobram ..	2 p.m. ..	1.57 p.m. ..	3.10 p.m.
Tuesday, 6th Sept. ..	Numurkah ..	2 p.m. ..	4.28 p.m. (5th)	12.50 p.m. (7th)
Wednesday, 7th Sept.	Nathalia ..	2 p.m. ..	1.40 p.m ..	3.25 p.m.
Thursday, 8th Sept.	Dookie ..	2 p.m. ..	12.52 p.m. ..	4.11 p.m.
Friday, 9th Sept. ..	Shepparton ..	2 p.m. ..	5.8 p.m. (8th) ..	5.34 p.m.
NORTH-EASTERN, No. 1.				
Monday, 5th Sept. ..	Yarrawonga	2.30 p.m.	2 p.m. ..	7 a.m. (6th)
Tuesday, 6th Sept. ..	Tungamah	2 p.m. ..	7.45 a.m. ..	7.45 a.m. (7th)
Wednesday, 7th Sept.	Rutherglen	2 p.m. ..	1.48 p.m. ..	3.22 p.m.
Thursday, 8th Sept.	Wangaratta	2 p.m. ..	4.30 p.m. (7th) ..	9.1 a.m. (9th)
Friday, 9th Sept. ..	Benalla ..	2 p.m. ..	9.40 a.m. ..	5.35 p.m.
WESTERN, No. 1.				
Tuesday, 6th Sept. ..	Coleraine ..	11 a.m. ..	7.35 p.m. (5th)	12 noon, driving
Tuesday, 6th Sept. ..	Casterton ..	3 p.m. ..	2 p.m., driving	8.15 a.m. (7th)
Wednesday, 7th Sept.	Condah ..	2 p.m. ..	11.35 a.m. ..	11.35 a.m. (8th)
Thursday, 8th Sept.	Portland ..	1.15 p.m.	1.2 p.m. ..	2.30 p.m.
Friday, 9th Sept. ..	Hamilton ..	2 p.m. ..	5.27 p.m. (8th) ..	11.50 a.m. (10th)

Week ending 17th September.

District and Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
WESTERN, No. 2.				
Monday, 12th Sept. ..	Warrnambool	3 p.m. ..	1.57 p.m. ..	7.11 a.m. (13th)
Tuesday, 13th Sept.	Terang ..	2 p.m. ..	8.13 a.m. ..	4.35 p.m.
Wednesday, 14th Sept.	Camperdown	2 p.m. ..	5.5 p.m. (13th) ..	5.23 p.m.
Thursday, 15th Sept.	Colac ..	2 p.m. ..	6.32 p.m. (14th)	6.52 p.m.
Friday, 16th Sept. ..	Geelong ..	2 p.m. ..	8.50 p.m. (15th)	8.5 a.m. (17th)
Saturday, 17th Sept.	Werribee ..	10 a.m. ..	8.45 a.m. ..	1.25 p.m.
CENTRAL, No. 2.				
Monday, 12th Sept. ..	Daylesford ..	2 p.m. ..	11.5 a.m. ..	3.40 p.m.
Tuesday, 13th Sept.	Clunes ..	11 a.m. ..	9.25 p.m. (12th)	12 noon, driving
Wednesday, 14th Sept.	Smeaton ..	2.30 p.m.	1.30 p.m., driving	3.30 p.m., driving
Thursday, 15th Sept.	Ballarat ..	2 p.m. ..	6.35 p.m. (14th)	10.50 a.m. (16th
Friday, 16th Sept. ..	Ballan ..	2 p.m. ..	12.7 p.m. ..	5.25 p.m.
NORTH-EASTERN, No. 2.				
Monday, 12th Sept. ..	Heathcote ..	2 p.m. ..	11.41 a.m. ..	6.10 p.m.
Tuesday, 13th Sept.	Euroa ..	2 p.m. ..	10.24 a.m. ..	6.57 p.m.
Wednesday, 14th Sept.	Myrtleford ..	2 p.m. ..	10.45 p.m. (13th)	6.4 a.m. (15th)
Thursday, 15th Sept.	Seymour ..	2 p.m. ..	12.5 p.m. ..	9.55 a.m. (16th)
Friday, 16th Sept. ..	Kilmore ..	2 p.m. ..	11.15 a.m. ..	9 p.m., driving

TIME TABLE, STALLION PARADES—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Week ending 24th September.				
CENTRAL, No. 3.				
Monday, 19th Sept.	Kyneton	2 p.m.	9.24 a.m.	5.25 p.m.
Tuesday, 20th Sept.	Romsey	2 p.m.	7.57 p.m. (19th)	5.25 p.m.
Wednesday, 21st Sept.	Alexandra	2 p.m.	12.35 p.m.	4.40 p.m.
Thursday, 22nd Sept.	Yea	9.30 a.m.	6.33 p.m. (21st)	10.40 a.m.
Friday, 23rd Sept.	Mansfield	2 p.m.	2 p.m.	3.25 p.m.
Saturday, 24th Sept.	Melton	11 a.m.	8.35 a.m.	1.21 p.m.
GIPPSLAND, No. 1.				
Monday, 19th Sept.	Yarram	4 p.m.	3.45 p.m.	10.55 a.m.
Tuesday, 20th Sept.	Foster	3 p.m.	2.1 p..m	2.21 p.m. (21st)
Wednesday, 21st Sept.	Leongatha	4 p.m.	3.56 p.m.	8.41 a.m. (22nd)
Thursday, 22nd Sept.	Korumburra	2 p.m.	9.17 a.m.	8.20 a.m. (23rd)
Friday, 23rd Sept.	Lang Lang	2 p.m.	9.23 a.m.	6.3 p.m.
Saturday, 24th Sept.	Frankston	11 a.m.	9.34 a.m.	1.17 p.m.
GIPPSLAND, No. 2.				
Monday, 19th Sept.	Bairnsdale	3.30 p.m.	3.25 p.m.	9.30 a.m. (20th)
Tuesday, 20th Sept.	Sale	2 p.m.	12.15 p.m.	4.33 p.m.
Wednesday, 21st Sept.	Traralgon	2 p.m.	5.42 p.m. (20th)	5.57 p.m.
Thursday, 22nd Sept.	Mirboo North	2 p.m.	7.35 p.m.	4.15 p.m.
Friday, 23rd Sept.	Morwell	2 p.m.	5.50 p.m. (22nd)	6.17 p.m.
Saturday, 24th Sept.	Lilydale	2 p.m.	1.34 p.m.	6 p.m.
Week ending 1st October.				
NORTH-EASTERN, No. 3.				
Monday, 26th Sept.	Wodonga	1.30 p.m.	1.29 p.m.	3.15 p.m.
Tuesday, 27th Sept.	Tallangatta	2 p.m.	4.35 p.m. (26th)	5 a.m. (28th)
Wednesday, 28th Sept.	Corryong	3.30 p.m.	3.30 p.m.	7 a.m. (29th)
GIPPSLAND, No. 3.				
Monday, 26th Sept.	Bunyip	11 a.m.	9.56 a.m.	2.10 p.m.
Monday, 26th Sept.	Warragul	3 p.m.	2.56 p.m.	7 p.m.
Tuesday, 27th Sept.	Trafalgar	2 p.m.	8.8 p.m. (26th)	10.1 a.m. (28th)
Wednesday, 28th Sept.	Berwick	2 p.m.	12.16 p.m.	9.9 p.m.
Thursday, 29th Sept.	Cranbourne	10 a.m.	8.1 a.m.	11.22 a.m.
Thursday, 29th Sept.	Dandenong	2 p.m.	11.42 a.m.	4.48 p.m.
Friday, 30th Sept.	Whittlesea	2 p.m.	12.45 p.m.	8 p.m.
GIPPSLAND, No. 4.				
Tuesday, 4th Oct.	Orbost	3 p.m.	2 p.m.	8.2 a.m. (5th)

LIST OF CERTIFICATED STALLIONS.

(To 31st December, 1909.)

Cert. No.	Name of Horse.	Age.*	Owner.	Parade.	Date.	Officer.
			DRAUGHTS.			
1251	Aboon the Lave ..	6 years	W. T. Cox ..	Maryborough ..	11.9.08	W.J.C.
969	Acorn	Aged	T. Naughton ..	Cobram ..	5.8.08	E.A.K.
731	Adam Bede ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
166/3	Admiral Sperry ..	3 years	Alex Duff ..	Maryborough ..	11.9.09	W.J.C.
65/3	Advance ..	3 years	J. and J. J. McCarron	N.Z. Govt. Cert...	—.—.09	
720	Agent General ..	4 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
737	Agitator Yet ..	3 years	J. and W. Freeman	Melbourne ..	14.7.08	S.S.C.
490	Ailsa Craig ..	3 years	H. M. S. Cox ..	Daylesford ..	20.9.07	W.J.C.
205/3	Airedale	3 years	W. R. Pitman ..	N.Z. Govt. Cert...	—.—.09	
522	Aitkenbrae ..	Aged	Summerhill Stud Farm	Kyneton ..	26.9.07	W.R.
41	Akbar	5 years	W. F. Dorman ..	Pyramid Hill ..	3.8.07	S.S.C.
1452	Albert's Prince ..	4 years	Head and Green	Melbourne ..	27.7.09	W.R.
1638	Albyn's Pride ..	Aged	Cameron Bros. ..	Maryborough ..	11.9.09	W.J.C.
183/3	Albyn's Victor ..	3 years	James Rigney ..	Ballan	25.9.09	E.A.K.
1069	Alderman Herod ..	3 years	J. Kearney ..	Bendigo ..	19.8.08	W.J.C.
714	Andrew Mac ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
792	Aparima Lad ..	3 years	Chas. McDougall	Melbourne ..	27.7.08	W.R.
1441	Argyle	5 years	Donald Blair ..	Melbourne ..	26.7.09	W.R.
56	Ariel Prince ..	Aged	H. C. Robertson ..	Colac	7.8.07	S.S.C.
284	Arthur McBride ..	6 years	W. G. Hicks ..	Tatura	24.8.07	W.R.
1210	Athol	4 years	A. Mitchell ..	Casterton ..	26.8.08	W.J.C.
769	Athol's Pride ..	4 years	Jas. Storach ..	Stawell ..	20.7.08	S.S.C.
313	Avondale	3 years	J. Walder ..	Birchip	21.8.07	W.J.C.
599	Avondale	6 years	Jas. Harper ..	Murchison Show ..	30.10.07	W.R.
1561	Avondale II. ..	Aged	Mrs. A. Guinene ..	Tungamah ..	24.8.09	J.L.
976	Avondale Oak ..	3 years	A. Johnson ..	Wangaratta ..	5.8.08	W.J.C.
1729	Baden Powell ..	Aged	W. Gould ..	Rainbow ..	14.10.09	E.A.K.
6/3	Baird's Pride ..	3 years	Wyangarie Company	Newmarket ..	14.5.09	W.R.
781	Bancor's Chief ..	3 years	C. W. Bunbury ..	Melbourne ..	27.7.08	S.S.C.
1475	Bancor's Pride ..	5 years	Fred Hammill ..	N.Z. Govt. Cert...	—.—.09	
71/3	Bancor Yet ..	3 years	W. Dean ..	N.Z. Govt. Cert...	—.—.09	
1539	Barbour II. ..	Aged	Joseph Chambers	Swan Hill ..	18.8.09	W.R.
1433	Bar None ..	5 years	Stanley Young ..	Horsham ..	14.7.09	W.J.C.
610	Bar None ..	3 years	D. Stewart ..	Ballarat Show ..	17.10.07	S.S.C.
17/3	Baron Aldie ..	3 years	G. and W. Lord ..	Melbourne ..	5.7.09	W.R.
7/3	Baron Blair ..	3 years	Caffrey and Murphy	Newmarket ..	14.5.09	W.J.C.
735	Baron Faithful ..	4 years	Jno. Burns ..	Melbourne ..	14.7.08	S.S.C.
1128	Baron Insch ..	3 years	W. T. Manifold ..	Camperdown ..	19.8.09	J.L.
723	Baron Knight ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
162/3	Baron Mainstay ..	3 years	R. J. Wilson ..	Warrnambool ..	9.9.09	J.L.
1246	Baron Mitchell ..	5 years	J. P. Arandt ..	Bacchus Marsh ..	10.9.08	W.J.C.
1101	Baron Percival ..	3 years	M. Michael ..	St. Arnaud ..	18.8.08	E.A.K.
60/3	Baron's Champion ..	3 years	R. Carroll ..	N.Z. Govt. Cert...	—.—.09	
727	Baron's Conqueror ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
724	Baron's Gem ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
654	Baron's Son ..	3 years	G. J. Butler ..	Maldon Show ..	30.10.07	S.S.C.
117/3	Baroone Saxon ..	3 years	S. Wrathall ..	Geelong ..	19.8.09	J.L.
124	Barrow Admiral ..	Aged	P. J. Reid ..	Wangaratta ..	15.8.07	S.S.C.
418	Bay Style ..	3 years	W. Anderson ..	Geelong ..	31.8.07	S.S.C.
142	Belted Knight ..	Aged	C. J. Cecil ..	Sea Lake ..	15.8.07	N.McD.
885	Ben Douglas ..	3 years	A. W. Andrews ..	Melbourne ..	30.7.08	W.J.C.
794	Bengal Premier ..	3 years	A. Robertson ..	Melbourne ..	27.7.08	W.J.C.
1356	Ben Hero ..	3 years	Oliver and Son ..	Boort Show ..	30.9.08	E.A.K.
742	Ben Hur ..	3 years	Jas. Hamilton ..	Horsham ..	16.7.08	S.S.C.
1610	Ben Lomond ..	4 years	Stephen Harris ..	Royal Show ..	31.8.09	W.R.
1644	Ben Lomond ..	Aged	Doherty Bros. ..	Yea	15.9.09	W.J.C.
1179	Ben Lomond ..	Aged	O. and M. Bodey	Ararat	7.9.08	W.J.C.
293	Ben Lomond ..	5 years	J. McDonald ..	Kaniva	28.8.07	N.McD.
535	Ben More II. ..	3 years	Con. Hogan ..	Horsham Show ..	27.9.07	S.S.C.
1498	Ben More's Pride ..	Aged	A. Wohlers ..	Beulah	12.8.09	J.L.

* Age is reckoned as from 1st July preceding the date of examination.

List of Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
	Draughts—*continued.*					
996	Ben Nevis ..	Aged	W. Danaher ..	Rutherglen ..	6.8.08	W.J.C.
79	Bernewang ..	Aged	W. McKnight ..	Swan Hill ..	7.8.07	W.R.
1238	Bill Squires ..	3 years	E. O'Flaherty ..	Warrnambool ..	10.9.08	W.R.
1587	Black Champion ..	Aged	J. Johnson ..	Wangaratta ..	25.8.09	W.J.C.
729	Black Douglas ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
564	Black Heather ..	3 years	R. A. Barrett ..	Numurkah Show..	9.10.07	W.J.C.
611	Black Knight ..	4 years	W. H. Michael ..	Ballarat Show ..	17.10.07	S.S.C.
1/3	Black Prince ..	3 years	J. Small ..	Melbourne ..	8.6.09	W.R.
1487	Black Rock ..	4 years	J. R. Mitchell ..	Casterton ..	6.8.09	W.J.C.
1063	Blackwatch ..	5 years	J. Davis ..	Colac	17.8.08	W.J.C.
32/2	Blair's Pryde ..	2 years	W. T. Gibbs ..	Casterton ..	6.8.09	W.J.C.
1222	Blockader ..	Aged	Executors of T. Brown	Hamilton ..	25.8.08	J.L.
1120	Blue Bonnet ..	6 years	Coy Bros. ..	Terang	19.8.08	J.L.
155	Blue Chief ..	Aged	A. Purcell ..	Yarrawonga ..	16.8.07	S.S.C.
114/3	Blue Harold ..	3 years	W. Price ..	Pyramid ..	19.8.09	W.R.
21	Blythe Laddie ..	4 years	C. H. Krelle ..	Horsham ..	18.7.07	S.S.C.
743	Bonaparte ..	Aged	T. Gregory ..	Horsham ..	16.7.08	S.S.C.
997	Bonnie Carlyle ..	Aged	A. Mitchell ..	Rutherglen ..	6.8.08	W.J.C.
674	Bonnie Champion ..	3 years	P. R. Hearn ..	Mansfield Show ..	21.11.07	N.McD.
957	Bonnie Doon ..	Aged	Hay Bros. ..	Numurkah ..	4.8.08	S.S.C.
1253	Bonnie Doon ..	4 years	G. J. Butler ..	Maryborough ..	11.9.08	W.J.C.
200	Bonnie Lad ..	Aged	J. G. Schneider ..	Hamilton ..	17.8.07	W.R.
62/3	Bonnie Newton ..	3 years	J. A. McKenzie ..	N.Z. Govt. Cert...	—.—.09	
1170	Bonnie Scotchman ..	Aged	John. Storer ..	Condah ..	26.8.08	J.L.
1389	Bonnie Shepherd ..	3 years	R. S. McKenzie ..	Numurkah Show	23.10.08	E.A.K.
162	Bonnie Star ..	3 years	J. Carroll ..	Benalla ..	17.8.07	S.S.C.
199	Bonnie Style ..	4 years	D. Fox ..	Hamilton ..	17.8.07	W.R.
27/3	Bonnie Times ..	3 years	J. Thornton ..	Melbourne ..	7.7.09	W.R.
563	Bonny Bray ..	Aged	D. Coghill ..	Numurkah Show	9.10.07	W.J.C.
63/3	Borderside.. ..	3 years	George Nield ..	N.Z. Govt. Cert...	—.—.09	
1476	Boro Cashier ..	4 years	A. and J. H. Young	Melbourne ..	31.7.09	W.J.C.
1351	Botanist	5 years	J. P. Morris ..	Yarrawonga Show	23.9.08	J.L.
1603	Botany's Pride ..	Aged	David Allen ..	Smeaton ..	6.9.09	W.J.C.
998	Bothwell ..	Aged	E. Black ..	Rutherglen ..	6.8.08	W.J.C.
848	Bounding Willow ..	3 years	Quinlan and McLean	Melbourne ..	28.7.08	W.J.C.
1034	Bounding Willow ..	Aged	Harry Jeitz ..	Rainbow ..	11.8.08	E.A.K.
795	Bramhope Monarch	4 years	—. Weatherall ..	Melbourne ..	27.7.08	S.S.C.
1350	British Admiral ..	3 years	A. Cameron ..	Yarrawonga ..	23.9.08	J.L.
137/3	British Arthur ..	3 years	D. Browning ..	Yarrawonga ..	24.8.09	J.L.
999	Britisher	Aged	J. McCartie ..	Rutherglen ..	6.8.08	W.J.C.
1585	British Hero ..	Aged	Evans Bros. ..	Wangaratta ..	24.8.09	W.J.C.
1618	British Laddie ..	Aged	Smythe Bros. ..	Daylesford ..	6.9.09	W.J.C.
197	British Lion ..	Aged	Habel Bros. ..	Hamilton ..	17.8.07	W.R.
184	British Oak ..	Aged	A. Kinghorn ..	Warracknabeal ..	14.8.07	W.R.
368	British Officer ..	Aged	— McCulloch ..	St. Arnaud ..	28.8.07	W.J.C.
153	British Wrestler ..	Aged	J. Ryan ..	Yarrawonga ..	16.8.07	S.S.C.
1097	Briton	Aged	S. Haire ..	Port Fairy ..	18.8.08	J.L.
1359	Briton	5 years	W. McKay ..	Corryong ..	3.10.08	E.A.K.
746	Bruce Hamilton ..	4 years	G. H. Hill ..	Horsham ..	16.7.08	S.S.C.
931	Brutus	3 years	McCann Bros. ..	Kerang ..	24.7.08	W.R.
445	Buckshot	Aged	A. Henderson ..	Warrnambool ..	10.9.07	W.J.C.
1183	Burns II. ..	5 years	T. Falls ..	Sale	7.9.08	W.R.
179	Cameron's Chief ..	Aged	— MacNab ..	Maffra	16.8.07	W.J.C.
1719	Cantab	Aged	Jno. Egan ..	Ballan	25.9.09	E.A.K.
34	Captain Cook ..	Aged	W. Bolger ..	Traralgon ..	31.7.07	S.S.C.
474	Captain Gunn ..	3 years	— Fisher ..	Morwell ..	16.9.07	W.J.C.
333	Capt. Seddon ..	4 years	H. Boyd ..	Elmore ..	26.8.07	W.J.C.
986	Carbrook	3 years	Matthew Ewart ..	Murchison ..	6.8.08	S.S.C.
161	Carlisle	4 years	M. Michael ..	Benalla ..	17.8.07	S.S.C.
226	Carmyle	6 years	W. J. Day ..	Nhill	21.8.07	S.S.C.
18/3	Carol Redwood ..	3 years	C. H. Feldtmann	Melbourne ..	5.7.09	W.R.
30/3	Castle Craig ..	3 years	Jas. Gildea ..	Horsham ..	14.7.09	W.J.C.
642	Cedric	..	J. Wallace ..	Pyramid Show ..	23.10.07	W.R.
43	Celt	4 years	Jno. Ervin, sen. ..	Pyramid ..	3.8.07	S.S.C.
797	Celtic Lad ..	3 years	A. Crystal ..	Melbourne ..	27.7.08	S.S.C.
1184	Challenger ..	3 years	G. and W. Lord ..	Sale	7.9.08	W.R.
1204	Challicum Punch ..	4 years	L. E. Walker ..	Royal Show ..	28.8.08	E.A.K.
1256	Champ	Aged	Jno. Young ..	Mildura Show ..	14.10.08	J.L.
1162	Champion II. ..	Aged	P. Laydon ..	Kyabram ..	24.8.08	W.R.
798	Champion Charlie	3 years	Jno. Brown ..	Melbourne ..	27.7.08	W.R.

LIST OF CERTIFICATED STALLIONS—*continued.*

DRAUGHTS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
33/2	Champion Hero ..	2 years	J. W. Dean ..	Euroa	11.8.09	W.R.
519	Champion of the North	3 years	F. Thonemann ..	Kyneton ..	26.9.07	W.R.
473	Champion Scotsman	5 years	E. Gamble ..	Morwell ..	16.9.07	W.J.C.
951	Charlie II. ..	4 years	C. Warren ..	Nathalia ..	3.8.08	S.S.C.
220	Charmer	4 years	F. W. Sallman ..	Nhill	21.8.07	S.S.C.
1279	Christmas Eve ..	3 years	J. T. Smethurst	Lang Lang ..	11.9.08	E.A.K.
36/3	Clan Garthland ..	3 years	J. J. Vile ..	Agricultural Offices	17.7.09	J.L.
964	Clan McGregor ..	Aged	Jas. Clark ..	Tungamah ..	4.8.08	W.J.C.
965	Clan McGregor II. ..	3 years	T. Lewis ..	Tungamah ..	4.8.08	W.J.C.
37	Clansman II. ..	5 years	H. Curran ..	Traralgon ..	31.7.07	S.S.C.
850	Clan Stewart ..	3 years	J. Nolan ..	Melbourne ..	28.7.08	S.S.C.
1730	Clan Stuart ..	Aged	Jno. Dart ..	Rainbow Show ..	14.10.09	E.A.K.
159/3	Clem McArthur ..	3 years	J. Hiskens ..	Rutherglen ..	26.8.09	W.J.C.
411	Clifton	4 years	H. Ross ..	Mansfield ..	30.8.07	W.J.C.
801	Clontorf	6 years	J. H. Harrison ..	Melbourne ..	27.7.08	W.R.
1084	Cluny's Pride ..	3 years	H. Curran ..	Traralgon ..	17.8.08	W.R.
36	Cluny's Style ..	Aged	Lewis Clark ..	Traralgon ..	31.7.07	S.S.C.
799	Clydebrae ..	3 years	Alf. Neave ..	Melbourne ..	27.7.08	S.S.C.
800	Clyde Lad ..	3 years	Wm. Hercus ..	Melbourne ..	27.7.08	W.J.C.
265	Clydesdale King ..	5 years	Herbert Wright ..	Shepparton ..	24.8.07	S.S.C.
1519	Clydeside	Aged	Garvin and Gray	Boort	10.8.09	E.A.K.
1675	Cocksparrow ..	6 years	W. A. Wrigglesworth	Maffra	18.9.09	W.R.
1562	Colin Clyde ..	Aged	E. Moulsdale ..	Tungamah ..	24.8.09	J.L.
176/3	Colonel Mellington	3 years	R. Sheddy ..	Foster	14.9.09	E.A.K.
1467	Commander ..	4 years	M. McCormack ..	N.Z. Govt. Cert. ..	—.—.09	
397	Commander ..	4 years	T. Creighton ..	Mansfield ..	30.8.07	W.J.C.
1657	Commonweal ..	4 years	J. Harper ..	Foster	14.9.09	E.A.K.
1499	Commonwealth ..	Aged	A. McPherson ..	Beulah	12.8.09	J.L.
659	Commonwealth ..	5 years	G. R. McPhail ..	Sale Show ..	31.10.07	W.J.C.
1111	Commotion ..	6 years	Howlet Bros. ..	Bairnsdale ..	19.8.08	W.R.
328	Cooring Chief ..	3 years	P. J. Hamilton ..	Lilydale ..	23.8.07	W.J.C.
1150	Corporal	3 years	Geelong Harbor Trust	Geelong ..	20.8.08	W.J.C.
722	Count Fascinator ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
802	County Member ..	3 years	W. H. Thomson ..	Melbourne ..	27.7.08	S.S.C.
359	County Member ..	Aged	Ross Bros. ..	St. Arnaud ..	28.8.07	W.J.C.
920	Craig Albyn ..	4 years	K. Matheson, sen.	Birchip	21.7.08	W.J.C.
207	Craig Lea ..	4 years	N. McLean ..	Minyip	21.8.07	W.R.
1055	Craigie Far ..	6 years	J. B. Marshall ..	Nhill	14.8.08	S.S.C.
1056	Craigie Lea II. ..	5 years	W. H. Treloar ..	Nhill	14.8.08	J.L.
419	Craigie Le Varden ..	5 years	T. Stiles ..	Geelong ..	31.8.07	S.S.C.
1287	Craigie Mains ..	4 years	Jeffrey Bros. ..	Whittlesea ..	15.9.08	J.L.
1260	Craigie's Pride ..	6 years	G. M. Gauge ..	Ballarat ..	11.9.08	W.J.C.
580	Cremoron	3 years	P. Kelley ..	Jeparit Show ..	16.10.07	W.J.C.
152/3	Crested Knight ..	3 years	Jno. Dugdale ..	Royal Show ..	31.8.09	W.J.C.
1103	Crown Grant ..	3 years	Jno. Moss ..	St. Arnaud ..	18.8.08	E.A.K.
233	Crown Jewel ..	3 years	R. Ward ..	Nhill	21.8.07	S.S.C.
337	Crown Prince ..	6 years	D. Trewick ..	Elmore ..	26.8.07	W.J.C.
968	Crown Prince ..	3 years	W. E. Taylor and Sons	Cobram ..	5.8.08	E.A.K.
1009	Crown Prince ..	6 years	J. T. Murray ..	Alexandra ..	11.8.08	W.J.C.
719	Crown Prosecutor ..	3 years	B. Chaffey ..	Melbourne ..	14.7.08	S.S.C.
1440	Dalmeny	5 years	A. Crystal ..	Agricultural Offices	17.7.09	J.L.
438	Dandy Dick ..	Aged	M. Ewart ..	Royal Show ..	9.8.07	S.S.C.
929	Dandy of Kunat ..	4 years	J. Roberts, jun. ..	Swan Hill ..	22.7.08	W.R.
1547	Dan's Pride ..	5 years	E. S. Dunstan ..	Donald	19.8.09	E.A.K.
37/3	Darnley	3 years	J. McLeod ..	Melbourne ..	26.7.09	J.L.
436	Darnley's Best ..	3 years	J. Cummings, jun.	Royal Show ..	7.9.07	S.S.C.
841	Dawn of Hope ..	3 years	E. Francis ..	Melbourne ..	27.7.08	W.R.
855	Defender	3 years	Jas. Hamilton ..	Melbourne ..	28.7.08	S.S.C.
64/2	Delver	2 years	Thos. Bird ..	Warragul ..	23.9.09	W.R.
1464	Diamond Jubilee ..	4 years	W. Dean ..	N.Z. Govt. Cert. ..	—.—.09	
122	Diamond Prince ..	3 years	T. Hart ..	Wangaratta ..	15.8.07	S.S.C.
186	Dictate	6 years	J. Bunge ..	Warracknabeal ..	14.8.07	W.R.
712	Dictator	3 years	R. Barrons ..	Murchison ..	14.7.08	S.S.C.
439	Dingly Dell Standard Bearer	3 years	F. J. Cato ..	Agricultural Offices	10.9.07	S.S.C.
803	Don Albyn ..	3 years	Wm. Weatherley	Melbourne ..	27.7.08	J. L.
55/2	Donald	2 years	Morrish Bros. ..	Smeaton ..	6.9.09	W.J.C.
1640	Donald	4 years	Jno. Keilor ..	Maryborough ..	11.9.09	W.J.C.
147/3	Donald McPherson	3 years	Colin Gardner ..	Wangaratta ..	25.8.09	W.J.C.
590	Donald's Pride ..	3 years	.. ..	Maryborough Show	16.10.07	S.S.C.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer
	DRAUGHTS—*continued.*					
154/3	Donnybrook's Champion	3 years	Vincent Daldy ..	Royal Show ..	31.8.09	W.J.C.
15/3	Dreadnought ..	3 years	W. G. Parish ..	Newmarket ..	10.4.09	W.R.
140/3	Drumcolin ..	3 years	Quinn Bros. ..	Rochester ..	30.8.09	J.L.
77/3	Drummer ..	3 years	W. Dean ..	Melbourne ..	30.7.09	W.R.
53	Duke of Albyn ..	Aged	L. G. Calvert ..	Colac	7.8.07	S.S.C.
145	Duke of Athol ..	5 years	M. Brown ..	Sea Lake ..	15.8.07	N.McD.
38/3	Duke of Hamilton ..	3 years	F. Skene ..	Melbourne ..	26.7.09	W.J.C.
44	Duke of York ..	Aged	A. Wallace ..	Pyramid Hill ..	3.8.07	S.S.C.
1298	Dun Craig ..	5 years	J. Russell ..	Smeaton ..	17.9.08	J.L.
91/3	Dundonald ..	3 years	J. F. Newton ..	Beulah	12.8.09	J.L.
733	Dunedin	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
806	Dunmore	3 years	Alex. McCallum ..	Melbourne ..	27.7.08	J.L.
39/3	Dunoon	3 years	M. Domaschenz ..	Melbourne ..	26.7.09	W.J.C.
1639	Dun Robin ..	5 years	Henry Harbour ..	Maryborough	11.9.09	W.J.C.
805	Dun Robin ..	3 years	J. McDougall ..	Melbourne ..	27.7.08	S.S.C.
804	Dunsmore Patriarch	3 years	Patrick Connell ..	Melbourne ..	27.7.08	S.S.C.
1468	Earl Donald ..	5 years	G. Stokes ..	Melbourne ..	28.7.09	W.R.
1035	Earl Garthland ..	3 years	N. G. Crust ..	Rainbow ..	11.8.08	E.A.K.
933	Earl Grey ..	3 years	McCann Bros. ..	Kerang	24.7.08	W.R.
339	Earl Jock ..	4 years	D. McNamara ..	Elmore	26.8.07	W.J.C.
143/3	Earl of Cobram ..	3 years	R. Parkin ..	Cobram ..	25.8.09	E.A.K.
1001	Earl of Dalmuir ..	6 years	F. E. Peake ..	Rutherglen ..	6.8.08	W.J.C.
1247	Earl of Darnley ..	Aged	A. Miller ..	Bacchus Marsh ..	10.9.08	W.J.C.
1262	Earl of Dundonald ..	5 years	Jas. Booth ..	Ballarat ..	11.9.08	W.J.C.
1072	Earl of Roseneath ..	Aged	J. Carter ..	Bendigo ..	19.8.08	W.J.C.
988	Eclipse	Aged	Wm. Nelson ..	Numurkah ..	4.8.08	S.S.C.
807	Elderslie	3 years	H. Moss ..	Melbourne ..	27.7.08	W.J.C.
134/3	Ettrick	3 years	Ed. Looby ..	Benalla ..	23.8.09	J.L.
152	Everlasting ..	Aged	Jas. Clark ..	Yarrawonga ..	16.8.07	S.S.C.
168/3	Everlasting King ..	3 years	Geo. Fraser ..	Ballarat ..	11.9.09	W.J.C.
71	Experiment ..	Aged	Shields Bros. ..	Dookie	27.7.07	W.J.C.
561	Extinguisher II. ..	4 years	Dunning and Shea	Numurkah Show	9.10.07	W.J.C.
90	Falstaff	5 years	J. Cockbill ..	Melton	10.8.07	S.S.C.
178	Farmer	6 years	G. Missen ..	Maffra ..	16.8.07	W.J.C.
475	Farmer	Aged	— Buckley ..	Morwell ..	16.9.07	W.J.C.
1698	Farmer's Favourite ..	Aged	F. G. Fechner ..	Warragul ..	23.9.09	W.R.
808	Farmer's Glory ..	3 years	A. C. Petras ..	Melbourne ..	27.7.08	W.J.C.
258	Farmer's Glory ..	..	W. J. Hiles ..	Cobram ..	23.8.07	N.McD.
1230	Farmer's Pride ..	Aged	H. Curran ..	Bunyip	9.9.08	W.R.
1289	Fashion Again ..	5 years	Wm. Crozier ..	Whittlesea ..	15.9.08	J.L.
1112	Federal	Aged	J. H. Poulson ..	Bairnsdale ..	19.8.08	W.R.
1396	Federal	3 years	Geo. Nixon ..	Orbost	28.10.08	E.A.K.
789	Federal Charlie ..	4 years	Jas Killmister ..	Melbourne ..	27.7.08	S.S.C.
268	Federal King ..	3 years	White Bros. ..	Shepparton ..	24.8.07	S.S.C.
174/3	Federal Prince ..	3 years	J. Pasco ..	Morwell ..	13.9.09	W.R.
282	Federal Prince ..	3 years	L. McLeod ..	Tatura	24.8.07	S.S.C.
49/2	Federal Star ..	2 years	L. McLeod ..	Tatura	26.8.09	W.R.
54	Federal Style ..	3 years	T. T. Mulder ..	Colac	7.8.07	S.S.C.
301	Federation ..	Aged	F. Hamill ..	Maffra	16.8.07	W.J.C.
141/3	Federation King ..	3 years	D. Trewick ..	Rochester ..	30.8.09	J.L.
1352	Fitz Lion	4 years	E. J. Lewis ..	Yarrawonga Show	23.9.08	J.L.
88/3	Flash Oak ..	3 years	F. Moar ..	Kaniva	12.8.09	W.J.C.
294	Flashwood ..	Aged	Meyer Bros. ..	Kaniva	28.8.07	N.McD.
112	Flashwood ..	3 years	Dean Bros. ..	Euroa	14.8.07	S.S.C.
1427	Flower's Fancy ..	5 years	Mitchell and O'Brien	Melbourne ..	5.7.09	W.R.
364	Forest Chief ..	3 years	D. W. Stewart ..	St. Arnaud ..	28.8.07	W.J.C.
698	Forester	6 years	H. C. Lees ..	Tallangatta Show	5.3.08	W.J.C.
109	Forest Hill ..	5 years	Balmattum District Horse Breeders' Association	Euroa	14.8.07	S.S.C.
178/3	Forest King ..	3 years	A. J. Ryan ..	Bairnsdale ..	15.9.09	W.R.
362	Fortune Teller ..	5 years	— Stephens ..	St. Arnaud ..	28.8.07	W.J.C.
57/3	Frogmore	3 years	J. Giddings ..	Melbourne ..	27.7.09	J.L.
96	Gallant Lad ..	3 years	J. Hamilton ..	Murtoa	9.8.07	W.J.C.
1018	Gallant Lad ..	3 years	A. Mitchell ..	Hopetoun ..	13.8.08	W.R.
123	Gallant Lad ..	Aged	E. Land ..	Wangaratta ..	15.8.07	S.S.C.
1332	Gallant Scotchman	Aged	A. Skirving ..	Warragul ..	24.9.08	W.R.
1240	General Gordon ..	3 years	R. J. Wilson ..	Warrnambool ..	10.9.08	W.R.
398	General Grant ..	Aged	T. Creighton ..	Mansfield ..	30.8.07	W.J.C.
1012	General Hamilton ..	3 years	R. Crafter ..	Minyip	12.8.08	W.R.
518	General McClelland ..	Aged	Healey and Harwood	Kyneton ..	26.9.07	W.R.

List of Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			Draughts—*continued.*			
592	Gladbrook ..	6 years	Tippett Bros. ..	Maryborough Show	16.10.07	S.S.C.
1418	Gladiator	4 years	Caffrey and Murphy	Newmarket ..	14.5.09	W.J.C.
858	Gladiator	3 years	J. R. Stokes ..	Melbourne ..	28.7.08	W.R.
728	Gladiator	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C
35	Glancer	Aged	W. Bolger ..	Traralgon ..	31.7.07	S.S.C.
1421	Glasgow Jock ..	5 years	Thos. Jess ..	Melbourne ..	8.6.09	W.R.
172/3	Glen Arthur ..	3 years	Sime Bros. ..	Frankston ..	11.9.09	W.R.
111	Glencoe	Aged	Jno. Hewlett ..	Euroa	14.8.07	S.S.C.
1286	Glencoe	Aged	David Lindsay ..	Wangaratta Show	15.9.08	E.A.K.
1442	Glen Conna ..	4 years	M. Michael ..	Melbourne ..	26.7.09	J.L.
591	Glen Dhu ..	3 years	J. R. Stokes ..	Maryborough Show	16.10.07	S.S.C.
779	Glenfield	4 years	J. Roberts ..	Charlton ..	23.7.08	W.J.C.
19	Glengarry ..	4 years	H. O. Daniel ..	Horsham ..	18.7.07	S.S.C.
1299	Glen Lea	Aged	J. and J. Russell	Smeaton ..	17.9.08	J.L.
1214	Glen Lee	3 years	C. Milburn ..	Casterton ..	26.8.08	W.J.C.
916	Glenlee	4 years	D. Lang ..	Charlton ..	23.7.08	W.J.C.
109/3	Glenlyon	3 years	A. J. Glen ..	Birchip	18.8.09	E.A.K.
292	Glenoak	Aged	C. Wallis ..	Kaniva ..	28.8.07	N.McD.
1541	Glen Paisley ..	Aged	A. Ward ..	Swan Hill ..	18.8.09	W.R.
171/3	Glenroy	3 years	J. Long ..	Heathcote ..	13.9.09	W.J.C.
78/3	Glen William ..	3 years	G. Krelle ..	Murtoa	6.8.09	W.R.
19/3	Gold Cup	3 years	Alex. Robertson ..	Melbourne ..	5.7.09	W.R.
1658	Golden Bell ..	4 years	W. H. Michael ..	Foster	14.9.09	E.A.K.
677	Golden Gift ..	3 years	Wm. Foubister ..	Kyneton Show ..	26.11.07	W.R.
860	Gold Top	3 years	J. Londen ..	Melbourne ..	28.7.08	W.J.C.
326	Gordon Lad ..	Aged	W. J. Murray ..	Lilydale ..	23.8.07	W.J.C.
1	Governor General ..	Aged	Jas. Scott ..	Korumburra ..	29.9.06	S.S.C.
190/3	Grampian II. ..	3 years	A. Blew ..	Korumburra ..	22.9.09	W.R.
750	Grand Style ..	6 years	C. Krelle ..	Horsham ..	16.7.08	S.S.C.
1712	Grey Albans ..	Aged	Connor Bros. ..	Bendigo ..	22.9.09	E.A.K.
370	Halswell	3 years	Dyke Bros. ..	St. Arnaud ..	28.8.07	W.J.C.
810	Halyard	3 years	Thos. Bookless ..	Melbourne ..	27.7.08	W.J.C.
315	Hamilton Hero ..	3 years	H. McLure ..	Birchip	21.8.07	W.J.C.
1019	Hamiltonian ..	3 years	C. Waser ..	Hopetoun ..	13.8.08	W.R.
32/3	Hamilton Star ..	3 years	R. Steer ..	Horsham ..	14.7.09	W.J.C.
31/3	Hampton's Pride ..	3 years	Thos. Maddern ..	Horsham ..	14.7.09	W.J.C.
738	Harry Lauder ..	3 years	E. Williamson and Son	Melbourne ..	14.7.08	S.S.C.
155/3	Hatton Prince ..	3 years	Abbott Bros. ..	Royal Show ..	31.8.09	W.J.C.
399	Hawthorn's Pride ..	3 years	W. J. Taylor ..	Mansfield ..	30.8.07	W.J.C.
40/3	Hazel Boy ..	3 years	G. T. Chirnside ..	Melbourne ..	26.7.09	W.J.C.
1045	Heart of Oak ..	Aged	C. W. Thomas ..	Jeparit	13.8.08	E.A.K.
257	Heather Jock ..	3 years	S. M. Brown ..	Cobram ..	23.8.07	N.McD.
58/3	Heather Lad ..	3 years	M. Walters ..	Melbourne ..	27.7.09	J.L.
33	Herald Lad ..	3 years	L. Roach ..	Traralgon ..	31.7.07	S.S.C.
151	Hercules	4 years	P. Kneenan ..	Yarrawonga ..	16.8.07	S.S.C.
1025	Herd Lad ..	3 years	J. Williams ..	Romsey	14.8.08	W.J.C.
1647	Herd's Boy ..	4 years	N. G. Tevchenne ..	Ballarat ..	11.9.09	W.J.C.
1732	Herd's Fashion ..	6 years	M. Cunningham ..	Werribee ..	21.10.09	W.J.C.
954	Herdsman	Aged	Alex. Colvin ..	Nathalia ..	3.8.08	S.S.C.
1443	Here-I-Go ..	Aged	Caffrey & Murphy	Melbourne ..	26.7.09	W.J.C.
8/3	Hero	3 years	Caffrey & Murphy	Newmarket ..	14.5.09	W.R.
1159	Herod's Boy ..	3 years	Wm. Roberts and Sons	Daylesford ..	21.8.08	E.A.K.
346	Herod's Knight ..	3 years	E. J. Beer ..	Echuca	24.8.07	W.J.C.
925	Hero Laddie ..	4 years	T. A. Kendall ..	Kerang	24.7.08	W.R.
1362	Hiawatha	4 years	A. L. Hamilton ..	Corryong ..	3.10.08	E.A.K.
1504	Highland Clan ..	6 years	E. J. Vincent ..	Agricultural Offices	14.8.09	J.L.
861	Highland Jock ..	5 years	G. Ritchie ..	Melbourne ..	28.7.08	J.L.
102/3	Highland Laddie ..	3 years	W. Ramsay ..	Inglewood ..	16.8.09	W.R.
344	Highland Sandy ..	4 years	J. Crawford ..	Echuca ..	24.8.07	W.J.C.
73	His Majesty ..	4 years	Geo. Jackson ..	Dookie	27.7.07	W.J.C.
1646	Holm Point ..	5 years	R. Hornbuckle ..	Ballarat ..	11.9.09	W.J.C.
381	Honest Ben ..	3 years	C. Ley	Casterton ..	28.8.07	W.R.
751	Honest Lad ..	4 years	Donald McLeod ..	Horsham ..	16.7.08	S.S.C.
95/3	Ian Boy	3 years	D. Kelly ..	Warracknabeal ..	13.8.09	J.L.
124/3	Ian Lad	3 years	Johns Bros. ..	Dimboola ..	20.8.09	W.J.C.
18	Ian Lad	3 years	P. Hamilton ..	Horsham ..	18.7.07	S.S.C.
58/2	Ian Mac	2 years	McMillan Bros. ..	Lang Lang ..	16.9.09	E.A.K.
47/2	Ian MacIntosh ..	2 years	Wm. Cameron ..	Agricultural Offices	2.9.09	J.L.
520	Ian McDougall ..	5 years	B. Benton ..	Kyneton ..	26.9.07	W.R.
35/3	Ian North	3 years	Chas. H. Warne ..	Horsham ..	15.7.09	W.J.C.
1042	Ian Russell ..	5 years	W. Moll ..	Dimboola ..	12.8.08	E.A.K.

List of Certificated Stallions—*continued*.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
	Draughts—*continued*.					
713	Imperial King ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
365	Imperial Prince ..	4 years	Batten Bros. ..	St. Arnaud ..	28.8.07	W.J.C.
305	Irish Hero ..	6 years	E. Spinks ..	Wycheproof ..	20.8.07	W.J.C.
1057	Jack Macduff ..	4 years	J. Dufty and Son	Nhill	14.8.08	J.L.
23	Jack of Hearts ..	6 years	J. H. Gressels ..	Horsham ..	18.7.07	S.S.C.
9/3	Jim Blair	3 years	G. Menzies ..	Newmarket ..	14.5.09	W.J.C.
255	Jock	Aged	Wm. Williams ..	Cobram ..	23.8.07	N.McD.
44/2	Jock McGregor	2 years	Jno. Carroll ..	Benalla ..	23.8.09	J.L.
24	Jno. Ballance ..	Aged	R. H. B. Guest ..	Horsham ..	18.7.07	S.S.C.
52/2	Jolly Native ..	2 years	Wm. Wood ..	Rutherglen ..	26.8.09	W.J.C.
752	Kaid Maclean ..	3 years	Joseph Taylor ..	Horsham ..	16.7.08	S.S.C.
422	Keithdale ..	5 years	W. Mitchell ..	Geelong ..	31.8.07	S.S.C.
1534	Keith's Model ..	5 years	J. A. Denyer ..	Kerang	17.8.09	W.R.
1058	Kelmscott	6 years	Jno. Bateson ..	Nhill	14.8.08	E.A.K.
1407	Kelso	4 years	H. Alan Currie ..	Camperdown ..	26.11.08	E.A.K.
74	Kelvin Craig ..	Aged	Jno. McDougall ..	Dookie	29.7.07	W.J.C.
171	Kelvin Grove ..	4 years	A. M. Foster ..	Maffra	16.8.07	W.J.C.
169/3	Kelvin Lad ..	3 years	R. W. Ham ..	Ballarat ..	11.9.09	W.J.C.
1007	Kelvin Lad ..	3 years	J. D. Tepper and Sons	Murtoa	11.8.08	W.R.
358	Kenwyn Jock ..	4 years	Jas. Barry ..	St. Arnaud ..	28.8.07	W.J.C.
785	Khandahar ..	3 years	C. H. Wilmott ..	Melbourne ..	27.7.08	S.S.C.
812	Khandahar ..	3 years	A. C. Ross ..	Melbourne ..	27.7.08	W.R.
314	Kilmore	Aged	A. P. Jones ..	Birchip	21.8.07	W.J.C.
203/3	King	5 years	Chisholm Bros. ..	Yea Show ..	18.11.09	W.J.C.
345	King Albyn ..	5 years	J. Rousch ..	Echuca	28.8.07	W.J.C.
230	King Ben ..	Aged	W. Mill ..	Nhill	21.8.07	S.S.C.
813	King Duncan ..	3 years	E. Leydon ..	Melbourne ..	27.7.08	W.J.C.
1245	King Edward ..	Aged	Wilson Bros. ..	Wangaratta ..	4.9.08	E.A.K.
1661	King Hero ..	4 years	S. Marshall ..	Yea	15.9.09	W.J.C.
1422	King Lawrence ..	4 years	J. C. Rockliffe ..	Melbourne ..	8.6.09	W.R.
20/3	King of Newton ..	3 years	J. E. and M. Walters	Melbourne ..	5.7.09	W.R.
74/3	King of the Roses ..	3 years	A. McKenzie ..	N.Z. Govt. Cert. ..	—.—.09	
514	King of the Valley ..	3 years	D. J. Murphy ..	Elmore Show ..	25.9.07	W.R.
1460	Kingsley	4 years	J. Cable ..	N.Z. Govt. Cert. ..	—.—.09	
1495	King Stephen ..	4 years	Exors. D. Archibald	Agricultural Offices	13.8.09	W.R.
86/3	Kingsway ..	3 years	Exors. D. Archibald	Agricultural Offices	13.8.09	W.R.
29/3	King William ..	3 years	Alfred Milne ..	Horsham ..	14.7.09	W.J.C.
139/3	King William ..	3 years	Benson Bros. ..	Melton	28.8.09	J.L.
222	Kinlock	4 years	W. T. Bodey ..	Nhill	21.8.07	S.S.C.
753	Kintyre	Aged	Otto Maroske ..	Horsham ..	16.7.08	S.S.C.
101/3	Kirk's Pride ..	3 years	Fred Kirchofer ..	Echuca	16.8.09	J.L.
869	Knight Commander	3 years	R. T. Anderson ..	Melbourne ..	28.7.08	W.R.
56/2	Knight Dunmore ..	2 years	D. J. Kelleher ..	Kilmore ..	14.9.09	W.J.C.
1531	Knight Errant ..	4 years	Malcolm McKinnon	St. Arnaud ..	17.8.09	E.A.K.
21/3	Knight of Quality ..	3 years	G. H. Hill and Sons	Melbourne ..	5.7.09	W.R.
786	Knight of Waihi ..	3 years	Dookie Agricultural College	Melbourne ..	27.7.08	S.S.C.
814	Knight's Royal ..	3 years	D. Davies ..	Melbourne ..	27.7.08	W.J.C.
42/3	Laddie's Pride ..	3 years	Benj. Merriman ..	Melbourne ..	26.7.09	W.R.
1093	Laird o' Cluny ..	Aged	H. Wright ..	Shepparton ..	22.8.08	W.J.C.
839	Laird of Bothwell ..	3 years	Caffrey and Murphy	Melbourne ..	27.7.08	S.S.C.
138/3	Laird of Burnbrae ..	3 years	W. Cameron ..	Melton	28.8.09	J.L.
1186	Laird of Irwell ..	3 years	E. Bennett ..	Sale	7.9.08	W.R.
572	Laird o' Lanark ..	3 years	P. Rogers ..	Dimboola Show ..	11.10.07	S.S.C.
870	Laird of Mar ..	3 years	Caffrey and Murphy	Melbourne ..	28.7.08	S.S.C.
1369	Laird of the Mains ..	Aged	Grace and Fletcher	Ballarat ..	5.10.08	W.J.C.
80/3	Laird o' Struan ..	3 years	J. M. Stewart ..	Edenhope ..	5.8.09	E.A.K.
1280	Lancer	6 years	R. N. Herkes ..	Lang Lang ..	11.9.08	E.A.K.
448	Lauderdale ..	Aged	Jas. Jenkins ..	Warrnambool ..	10.9.07	W.J.C.
815	Laudermark ..	5 years	J. E. and M. Walters	Melbourne ..	27.7.08	S.S.C.
1302	Liberator	Aged	J. and J. Russell ..	Smeaton ..	17.9.08	J.L.
41/3	Lieutenant Mac	3 years	R. G. Anderson ..	Melbourne ..	26.7.09	W.R.
245	Lion	4 years	H. J. Alford ..	Yarram ..	21.8.07	N.McD.
1555	Lion Prince ..	Aged	Con Murphy ..	Benalla ..	23.8.09	J.L.
97	Little Wonder ..	4 years	A. C. Petrass ..	Murtoa ..	9.8.07	W.J.C.
60/2	Livingstone ..	2 years	T. B. Anderson ..	Maffra	18.9.09	W.R.
1648	Lochiel	5 years	A. Kay ..	Ballarat ..	11.9.09	W.J.C.
1605	Lochiel	Aged	Jas. Charlson ..	Smeaton ..	6.9.09	W.J.C.
1164	Lochiel	4 years	J. T. Ovens ..	Kyabram ..	24.8.08	W.R.

List of Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			Draughts—*continued.*			
110	Lochiel's Champion	5 years	Ryan and Cooper	Euroa	14.8.07	S.S.C.
816	Lochinvar ..	5 years	Jno. Small ..	Melbourne ..	27.7.08	S.S.C.
322	Locknaw Hero ..	Aged	D. Syme ..	Lilydale ..	23.8.07	W.J.C.
492	Lonsdale ..	3 years	Cooper Bros. ..	Stawell Show ..	18.9.07	W.R.
1031	Lord Benmore ..	Aged	D. Johns ..	Beulah	13.8.08	W.R.
1564	Lord Burleigh ..	Aged	H. T. Whitty ..	Yarrawonga ..	24.8.09	J.L.
1303	Lord Carrick ..	4 years	J. Sewell	Smeaton ..	17.9.08	J.L.
1735	Lord Castlereagh ..	5 years	Regan and Whitehead	Quambatook ..	16.9.09	W.J.C.
1733	Lord Clarendon ..	6 years	W. Missen ..	Werribee ..	21.10.09	W.J.C.
701	Lord Clifford ..	4 years	A. E. Schotz ..	Tallangatta Show	5.3.08	W.J.C.
198/3	Lord Clyde ..	3 years	Exors. M. Walsh	Werribee ..	21.10.09	W.J.C.
872	Lord Clyde ..	5 years	A. Williams ..	Melbourne ..	28.7.08	W.J.C.
817	Lord Clyde ..	3 years	Jno. McDonald ..	Melbourne ..	27.7.08	W.J.C.
818	Lord Cranbourne II.	Aged	O. and M. Bodey	Melbourne ..	27.7.08	S.S.C.
1037	Lord Darnley ..	5 years	D. McMillan ..	Rainbow ..	11.8.08	E.A.K.
696	Lord Dean ..	5 years	W. D. Taylor ..	Lilydale Show ..	4.3.08	W.R.
1059	Lord Derby ..	3 years	M. Rees ..	Nhill	14.8.08	E.A.K.
1542	Lord Douglas ..	5 years	J. Hickey ..	Swan Hill ..	18.8.09	W.R.
928	Lord Douglas ..	3 years	J. Hickey ..	Swan Hill ..	22.7.08	W.R.
65/2	Lord Dudley ..	2 years	A. Thomson ..	Korumburra ..	22.9.09	W.R.
1543	Lord Dudley ..	4 years	W. Theyers ..	Swan Hill ..	18.8.09	W.R.
608	Lord Dunbar ..	3 years	J. J. Downie ..	Ballarat Show	17.10.07	S.S.C.
609	Lord Dunkeld ..	3 years	Mrs. Sutherland ..	Ballarat Show	17.10.07	S.S.C.
558	Lord Dunmore ..	3 years	D. McKinnon ..	Wycheproof Show	4.10.07	W.R.
1307	Lord Edward ..	Aged	G. W. Ford ..	Melton	18.9.08	J.L.
788	Lord Erskine ..	3 years	W. Thompson ..	Melbourne ..	27.7.08	S.S.C.
133/3	Lord Ettrick ..	3 years	H. Brooker ..	Benalla ..	23.8.09	J.L.
1304	Lord Hermiston ..	4 years	R. Cowie ..	Smeaton ..	17.9.08	J.L.
48/2	Lord Hopetoun ..	2 years	W. Ritchie ..	Ballarat ..	11.9.09	W.J.C.
42	Lord Hopetoun ..	Aged	J. E. Morgan ..	Pyramid ..	3.8.07	S.S.C.
144	Lord Hopton ..	Aged	G. A. Neville ..	Sea Lake ..	15.8.07	N.McD.
2/3	Lord John ..	3 years	J. Small ..	Melbourne ..	8.6.09	W.R.
1478	Lord Linlithgow ..	4 years	Petrie and Sons ..	Melbourne ..	27.7.09	J.L.
1325	Lord Lyon ..	3 years	Rd. Fleming ..	Kyneton ..	24.9.08	W.J.C.
819	Lord Marconi ..	3 years	Martin Egan ..	Melbourne ..	27.7.08	S.S.C.
691	Lord McDonald ..	4 years	Wm. Foubister ..	Bunyip Show ..	26.2.08	W.R.
820	Lord Montrave ..	3 years	Wm. Crozier ..	Melbourne ..	27.7.08	W.J.C.
732	Lord Mount Stephen	3 years	Jno. Dixon ..	Melbourne ..	14.7.08	S.S.C.
1512	Lord Nelson ..	4 years	G. A. Dunnett ..	Beaufort ..	13.8.09	W.J.C.
1548	Lord Nelson ..	Aged	H. Goldsmith ..	Donald	19.8.09	E.A.K.
231	Lord Percy ..	3 years	M. Mills ..	Nhill	21.8.07	S.S.C.
787	Lord Roberts ..	Aged	P. Moreland ..	Melbourne ..	27.7.08	S.S.C.
348	Lord Roberts ..	5 years	Thos. Fulham ..	Echuca	24.8.07	W.J.C.
417	Lord Ronald ..	5 years	A. W. Warren ..	Geelong ..	31.8.07	S.S.C.
87/3	Lord Sheffield ..	3 years	A. Hardres ..	Jeparit	11.8.09	W.J.C.
304	Lord Stanley ..	Aged	W. Harty, sen. ..	Wycheproof ..	20.8.07	W.J.C.
585	Lord Wallace ..	3 years	E. J. Rickey ..	Maryborough Show	16.10.07	S.S.C.
46/2	Lorryman ..	2 years	W. Grattan ..	Dookie	24.8.09	E.A.K.
1046	Lowland Oak ..	Aged	G. Eldridge ..	Jeparit	13.8.08	J.L.
993	Lucky Willie ..	3 years	Carroll Bros. ..	Euroa	7.8.08	W.J.C.
533	Lucky Willie ..	6 years	Otto Maroske ..	Horsham Show ..	24.9.07	S.S.C.
267	MacArthur Again ..	Aged	A. Kennedy ..	Shepparton ..	24.8.07	S.S.C.
782	Macdonald ..	3 years	Jno. Brown ..	Melbourne ..	27.7.08	S.S.C.
587	MacDonald ..	3 years	G. Porteous ..	Maryborough Show	16.10.07	S.S.C.
56/3	McGregor's Fancy ..	3 years	W. Vaught ..	N.Z. Govt. Cert. ..	—.—.09	
1678	McKinley	Aged	F. Hammill ..	Maffra	18.9.09	W.R.
10/3	McLeish	3 years	W. Crozier ..	Newmarket ..	14.5.09	W.R.
146	Mafeking	3 years	P. Gottschutzke ..	Sea Lake ..	15.8.07	N.McD.
49	Magnet	Aged	W. A. Mitchell ..	Hopetoun ..	3.8.07	W.J.C.
160	Major General ..	4 years	D. Kenneally ..	Benalla ..	17.8.07	S.S.C.
1248	Major Grant ..	3 years	L. Dugdale ..	Bacchus Marsh ..	10.9.08	W.J.C.
1290	Major John ..	4 years	Cornellia Estate ..	Echuca	15.9.08	W.R.
182/3	Major Mac ..	3 years	Stucky Bros. ..	Traralgon ..	17.9.09	W.R.
1649	Major Mac ..	5 years	T. S. Hynes ..	Ballarat ..	11.9.09	W.J.C.
663	Major MacDonald ..	5 years	G. Luckie ..	Traralgon Show	13.11.07	W.R.
1165	Major Mills ..	5 years	J. Bail and Sons ..	Kyabram ..	24.8.08	W.R.
560	Major Robin ..	Aged	J. C. Rockliffe ..	Numurkah Show	24.10.07	W.J.C.
1087	Major Taylor ..	5 years	W. Fuller ..	Kaniva	15.8.08	E.A.K.
108	Marcellus	4 years	W. Cavanagh ..	Euroa	14.8.07	S.S.C.
879	Marion's Champion	4 years	G. W. Barnett ..	Melbourne ..	29.7.08	W.R.
1702	Marksman ..	Aged	T. H. Wilson ..	Tallangatta ..	21.9.09	W.J.C.
1429	Mark Time ..	4 years	D. Davies ..	Melbourne ..	5.7.09	W.R.
34	Mark Time ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
	DRAUGHTS—*continued.*					
1470	Marmion	4 years	C. J. Penrose ..	Melbourne ..	30.7.09	W.R.
961	Marquis of Albyns ..	Aged	James Tyers ..	Numurkah ..	4.8.08	S.S.C.
154	Marquis of Boorol ..	3 years	McPherson Bros.	Yarrawonga ..	16.8.07	S.S.C.
1249	Marshall Hard Times	4 years	D. Robertson ..	Bacchus Marsh ..	10.9.08	W.J.C.
1192	Master Carmyle ..	3 years	J. Ellis ..	Royal Show ..	28.8.08	J.L.
175/3	Master Watty ..	3 years	Brick Bros. ..	Morwell ..	13.9.09	W.R.
1477	Mataura	Aged	A. J. Walters ..	Melbourne ..	27.7.09	J.L.
232	Matchless Oak ..	Aged	A. E. and W. H. Sambell	Nhill	21.8.07	S.S.C.
22/3	May Flower ..	3 years	T. Larcombe ..	Melbourne ..	5.7.09	W.R.
59/3	Melville Lad ..	3 years	F. H. Dunn ..	N.Z. Govt. Cert. ..	—.—.09	
70/3	Merry Prince ..	3 years	G. Pearce ..	N.Z. Govt. Cert. ..	—.—.09	
5/3	Merry Tom ..	3 years	Capt. R. Clarke ..	Agricultural Offices	2.6.09	W.J.C.
821	Merry Tom ..	3 years	Harrison and Hastie	Melbourne	27.7.08	W.J.C.
822	Middlerigg Royal Ensign	3 years	J. Bourke ..	Melbourne ..	27.7.08	W.J.C.
823	Middlerigg Royal Oak	3 years	E. Moreton ..	Melbourne ..	27.7.08	W.R.
875	Middlerigg Royal Salute	3 years	— Waggon ..	Melbourne ..	27.7.08	W.R.
927	Millfield	Aged	W. Hercus ..	Pyramid ..	23.7.08	W.R.
1565	Model	6 years	Maher Bros. ..	Yarrawonga ..	24.8.09	J.L.
1166	Model	Aged	H. S. Graham ..	Kyabram ..	24.8.08	W.R.
312	Model	Aged	P. J. Grogan ..	Birchip ..	21.8.07	W.J.C.
511	Model	6 years	A. J. Bodey ..	Camperdown ..	26.9.07	W.J.C.
75	Model	3 years	W. G. Down ..	Dookie	27.7.07	W.J.C.
192/3	Modelmore ..	3 years	Colin Wallace ..	Bendigo ..	22.9.09	E.A.K.
894	Model Oak ..	6 years	Jas. Hamilton ..	Melbourne ..	28.7.08	S.S.C.
725	Money More ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
1419	Montgomery ..	3 years	Caffrey and Murphy	Newmarket ..	14.5.09	W.J.C.
683	Montrave ..	3 years	J. Wheelan ..	Korumburra Show	22.1.08	W.R.
23/3	Morning Star ..	3 years	J. E. and M. Walters	Melbourne ..	5.7.09	W.R.
1496	Morven Prince ..	4 years	Mitchell and O'Brien	Agricultural Offices	13.8.09	W.R.
400	Native Blue ..	Aged	S. Doak ..	Mansfield ..	30.8.07	W.J.C.
447	Native Prince ..	Aged	J. Clements ..	Warrnambool ..	10.9.07	W.J.C.
1021	Navy Blue ..	Aged	H. Jenkins ..	Hopetoun ..	13.8.08	W.R.
287	Near the Mark ..	5 years	W. Hicks ..	Kilmore ..	27.8.07	S.S.C.
543	Neil Gow	3 years	J. Hamilton ..	Horsham Show ..	27.9.07	S.S.C.
197/3	New Blood ..	3 years	T. Bagnell ..	Pyramid Show ..	20.10.09	E.A.K.
72/3	Newton Stewart ..	3 years	G. Devereux ..	N.Z. Govt. Cert. ..	—.—.09	
886	Newton Stewart ..	3 years	Joseph Brunton ..	Melbourne ..	30.7.08	W.J.C.
895	Nipper	Aged	Eldridge Bros. ..	Melbourne ..	28.7.08	W.R.
1335	North King ..	Aged	E. Elliott ..	Warragul ..	24.9.08	W.R.
1141	Oak Branch ..	Aged	F. J. Quick ..	Werribee ..	21.8.08	J.L.
824	Oakhurst	3 years	McLauran Bros. ..	Melbourne ..	27.7.08	W.J.C.
98/3	Oakland's Pride ..	3 years	Phillips and Hosken	Charlton ..	13.8.09	E.A.K.
308	O'Connell's Pride ..	3 years	J. P. Billeville ..	Birchip ..	21.8.07	W.J.C.
1444	Old Style	Aged	James Johns ..	Melbourne ..	26.7.09	W.R.
1144	Old Type ..	Aged	A. McKenzie ..	Werribee ..	21.8.08	J.L.
709	Onward	3 years	Jas. Phillips ..	Melbourne ..	14.7.08	S.S.C.
721	Orari	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
225	Orbost	6 years	F. G. Allen and Son	Nhill	21.8.07	S.S.C.
89/3	Orbost Oak ..	3 years	J. C. Wallace ..	Kaniva	12.8.09	W.J.C.
73/3	Orphan Boy ..	3 years	J. Burns ..	N.Z. Govt. Cert. ..	—.—.09	
1466	Overtime	4 years	Jas. Danaher ..	N.Z. Govt. Cert. ..	—.—.09	
1308	Papakaio	6 years	Robt. Watson ..	Melton	18.9.08	J.L.
11/3	Patrician	2 years	R. McKenzie ..	Newmarket ..	14.5.09	W.J.C.
89	Pearlstone ..	4 years	Fred. Walsh ..	Melton	10.8.07	S.S.C.
756	Percy	3 years	Jas. Hamilton ..	Horsham ..	16.7.08	S.S.C.
1627	Peter H.	Aged	Finlay Paton ..	Coleraine ..	8.9.09	E.A.K.
83/3	Pimpernel ..	3 years	G. Parker ..	Euroa	11.8.09	W.R.
1114	Playmate ..	5 years	P. D. Hanley ..	Bairnsdale ..	19.8.08	W.R.
1471	Ploughboy ..	4 years	Sullivan Bros. ..	N.Z. Govt. Cert. ..	—.—.09	
115/3	Powisland Pure Blood	3 years	Chas. Mills ..	Pyramid ..	19.8.09	W.R.
1296	Preferential ..	Aged	Mrs. Hugh Rae ..	Lilydale ..	17.9.08	E.A.K.
32	Premier Prince ..	4 years	M. Michael ..	Traralgon ..	31.7.07	S.S.C.
825	Present Times ..	3 years	J. L. Oliver and Son	Melbourne ..	27.7.08	W.J.C.
349	President	4 years	J. McLeod ..	Echuca	24.8.07	W.J.C.

LIST OF CERTIFICATED STALLIONS—*continued*.

DRAUGHTS—*continued*.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
1265	President	3 years	G. Eason ..	Ballarat ..	11.9.08	W.J.C.
1472	Professor Alvie ..	4 years	F. E. Coster ..	N.Z. Govt. Cert. ..	—.—.09	
1580	Pride of Albyn ..	5 years	Thos. Gunning ..	Shepparton ..	27.8.09	E.A.K.
1304	Pride of Garthlands	4 years	Robt. Watson ..	Melton	18.9.08	J.L.
151/3	Pride of Lochiel ..	3 years	J. P. Ovens ..	Tatura	26.8.09	W.R.
1086	Pride of Moe ..	5 years	R. H. Gibson ..	Traralgon ..	17.8.08	W.R.
826	Pride of Moira ..	3 years	Falkiner and Sons	Melbourne ..	27.7.08	W.R.
40/2	Pride of Morton Plains	2 years	P. Sexton, sen. ..	Birchip	18.8.09	E.A.K.
1318	Pride of Springfield	4 years	J. B. Howe ..	Inglewood ..	18.9.08	W.R.
329	Pride of the Hills ..	4 years	J. Taylor ..	Lilydale ..	23.8.07	W.J.C.
420	Pride of the Hills ..	Aged	Ronald McDonald	Geelong ..	31.8.07	S.S.C.
43/2	Pride of the Oaks ..	2 years	W. Blair ..	Watchem ..	20.8.09	E.A.K.
413	Pride of the Park ..	4 years	Trustees Barwon Park	Geelong ..	31.8.07	S.S.C.
1154	Pride of the Ponds	3 years	E. Drayton ..	Geelong ..	20.8.08	J.L.
181	Pride of the Walk ..	..	T. Pollock ..	Maffra	16.8.07	W.J.C.
1269	Pride of Yarram ..	5 years	Barlow and Richards	Yarram ..	9.9.08	J.L.
116/3	Prince	3 years	W. J. Hewitt ..	Pyramid ..	19.8.09	W.R.
136/3	Prince Aerial ..	3 years	O'Leary Bros. ..	Hamilton ..	14.8.09	W.R.
504	Prince Again ..	3 years	D. J. Fergnson ..	Seymour Show ..	11.10.07	W.J.C.
167/3	Prince Albert II. ..	3 years	F. Berger ..	Maryborough ..	11.9.09	W.J.C.
1137	Prince Albyn ..	3 years	D. McDonald ..	Donald	19.8.08	E.A.K.
291	Prince Arthur ..	Aged	F. Quire ..	Kaniva	28.8.07	N.McD.
132/3	Prince Avon ..	3 years	W. A. Croxford ..	Benalla ..	23.8.09	J.L.
1226	Prince Bonnie ..	..	H. Miller ..	Sale	7.9.08	W.R.
508	Prince Charlie ..	Aged	J. Taylor ..	Camperdown ..	26.9.07	W.J.C.
256	Prince Clyde ..	Aged	W. E. Taylor ..	Cobram ..	23.8.07	N.McD.
1694	Prince Gladstone ..	Aged	E. Exner ..	Dandenong ..	21.9.09	W.R.
757	Prince Henry ..	Aged	M. Carmichael ..	Horsham ..	16.7.08	S.S.C.
350	Prince Imperial ..	3 years	D. Murphy ..	Echuca	24.8.07	W.J.C.
1131	Prince Juno ..	4 years	W. T. Manifold ..	Camperdown ..	19.8.08	J.L.
1473	Prince Kelvin ..	4 years	L. Bagnall ..	N.Z. Govt. Cert. ..	—.—.09	
283	Prince of Albyn ..	Aged	J. Wilson ..	Tatura	24.8.07	W.R.
332	Prince of Avondale ..	Aged	— McGregor ..	Elmore	26.8.07	W.J.C.
57	Prince of Hearts ..	6 years	Jos. Phalp ..	Colac Show ..	7.8.07	S.S.C.
22	Prince of Kyle ..	Aged	Jno. Bushby ..	Horsham ..	18.7.07	S.S.C.
269	Prince of Lorne ..	5 years	R. Young ..	Shepparton ..	24.8.07	S.S.C.
307	Prince of Oaklands	4 years	M. J. Ryan ..	Wycheproof ..	20.8.07	W.J.C.
185	Prince of the Clans ..	6 years	J. Annison ..	Warracknabeal ..	14.8.07	W.R.
1572	Prince of Wales ..	4 years	Rd. Harney ..	Elmore	30.8.09	J.L.
1115	Prince of Wales ..	Aged	F. E. Coster ..	Bairnsdale ..	19.8.08	W.R.
784	Prince o' Kyle ..	3 years	A. Blaikie ..	Melbourne ..	27.7.08	S.S.C.
874	Prince Royal ..	4 years	W. E. Smith ..	Melbourne ..	28.7.08	S.S.C.
1043	Prince William ..	3 years	J. Elsom ..	Dimboola ..	12.8.08	E.A.K.
347	Prince York ..	3 years	W. G. Freeman	Echuca	24.8.07	W.J.C.
453	Rainbow	..	G. Ritchie .	Warrnambool ..	10.9.07	W.J.C.
43/3	Rainbow	3 years	Caffrey and Murphy	Melbourne ..	26.7.09	J.L.
710	Ranfurley's Hero ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
1169	Rendlesham Daisy Boy	5 years	Groongal Pastoral Coy.	Royal Show ..	2.9.08	J.L.
1680	Renfrew Model ..	Aged	S. Farrell ..	Maffra	18.9.09	W.R.
1358	Retainer	6 years	D. Blair ..	Boort Show ..	30.9.08	E.A.K.
1461	Revelanta ..	5 years	E. Coxson ..	N.Z. Govt. Cert. ..	—.—.09	
1459	Revolter	6 years	H. Feldtmann ..	Melbourne ..	27.7.09	J.L.
1568	Revolution ..	6 years	P. Down ..	Yarrawonga ..	24.8.09	J.L.
319	Ribbon Wood ..	5 years	Hugh McLaren ..	Lilydale ..	23.8.07	W.J.C.
555	Right Bower ..	Aged	D. Blair ..	Wycheproof Show	4.10.07	W.R.
534	Robert Charters ..	3 years	Ralph Guest ..	Horsham Show ..	24.9.07	S.S.C.
882	Robin	3 years	J. D. Mitchell ..	Melbourne ..	30.7.08	W.R.
685	Robin	4 years	C. Simons ..	Leongatha Show	11.2.08	S.S.C.
600	Robin Adair ..	4 years	A. Robinson ..	Murchison Show	30.10.07	W.R.
54/3	Robin Hood ..	3 years	O'Keefe Bros. ..	Melbourne ..	27.7.09	W.R.
1513	Romany Lad ..	4 years	M. Notman ..	Beaufort ..	13.8.09	W.J.C.
880	Rory's Pride ..	3 years	D. McCulloch ..	Melbourne ..	29.7.08	W.R.
401	Roseberry ..	Aged	Smith Bros. ..	Mansfield ..	30.8.07	W.J.C.
68/3	Rosie's Pride ..	3 years	Mitchell and O'Brien	N.Z. Govt. Cert. ..	—.—.09	
1242	Rowen Prince ..	6 years	J. Jenkin ..	Warrnambool ..	10.9.08	W.R.
1398	Roy McGregor ..	3 years	S. J. Lynn ..	Orbost	28.10.08	E.A.K.
828	Royal Albert ..	3 years	W. Manifold ..	Melbourne ..	27.7.08	W.R.
44/3	Royal Albert ..	3 years	Robt. Glenn ..	Melbourne ..	26.7.09	J.L.

List of Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			Draughts—*continued.*			
1077	Royal Argyle ..	4 years	E. Williamson ..	Bendigo ..	19.8.08	W.J.C.
59/2	Royal Bay ..	2 years	J. D. Rathjen ..	Traralgon ..	17.9.09	W.R.
80	Royal Ben ..	6 years	F. Le Lievre ..	Swan Hill ..	7.8.07	W.R.
990	Royal Blend ..	3 years	Dick Bros. ..	Tatura	6.8.08	S.S.C.
1523	Royal Blend ..	4 years	C. E. Abbott ..	Hamilton ..	14.8.09	W.R.
711	Royal Blend ..	3 years	Dick Bros. ..	Melbourne ..	14.7.08	S.S.C.
827	Royal Blue ..	Aged	Ed. McKoy ..	Melbourne ..	27.7.08	W.J.C.
1051	Royal Blue ..	3 years	Thos. King ..	Warrnambool ..	14.8.08	W.R.
335	Royal Blue ..	3 years	H. Rathjen ..	Elmore	26.8.07	W.J.C.
1604	Royal Carrick ..	4 years	John Joliffe ..	Smeaton ..	6.9.09	W.J.C.
446	Royal Cedric ..	6 years	Jno. Gooden ..	Warrnambool ..	10.9.07	W.J.C.
1690	Royal Charlie ..	Aged	Lang Bros. ..	Traralgon ..	17.9.09	W.R.
1052	Royal Charlie ..	3 years	W. Craig ..	Hopetoun ..	14.8.08	W.R.
675	Royal Charlie ..	Aged	Smythe Bros. ..	Kyneton Show ..	26.11.07	W.R.
559	Royal Chief ..	3 years	T. Lowes ..	Wycheproof Show	4.10.07	W.R.
1563	Royal Clyde ..	Aged	Jno. Colvin ..	Tungamah ..	24.8.09	J.L.
1584	Royal Clyde ..	Aged	Ferguson Bros. ..	Wangaratta ..	25.8.09	W.J.C.
1216	Royal Clyde ..	3 years	A. Oliver ..	Casterton ..	26.8.08	W.J.C.
783	Royal Colours ..	3 years	J. Ball	Melbourne ..	27.7.08	S.S.C.
61/3	Royal Conqueror ..	3 years	Mitchell and O'Brien	N.Z. Govt. Cert. ..	—.—.09	
1195	Royal Crown ..	4 years	W. Seaton ..	Royal Show ..	28.8.08	W.R.
1038	Royal Crown ..	3 years	A. Schulze ..	Rainbow ..	11.8.08	E.A.K.
1156	Royal Duke ..	3 years	P. E. Piper ..	Geelong ..	20.8.08	W.J.C.
3/3	Royal Fame II. ..	3 years	Dalgety and Co. ..	Melbourne ..	8.6.09	W.R.
163/3	Royal Favourite ..	3 years	M. O'Keefe ..	Warrnambool ..	9.9.09	J.L.
1243	Royal Gartley ..	3 years	J. Gooden ..	Warrnambool ..	10.9.08	W.R.
33/3	Royal Hampton ..	3 years	A. Slocum ..	Horsham ..	14.7.09	W.J.C.
1328	Royal Hero ..	4 years	Major Clarke ..	Kyneton ..	24.9.08	W.J.C.
266	Royalist III. ..	Aged	Thos. Moore ..	Shepparton ..	24.8.07	S.S.C.
361	Royal Kingston ..	5 years	C. Northby ..	St. Arnaud ..	28.8.07	W.J.C.
69/3	Royal Knight ..	3 years	Oliver Baldwin ..	N.Z. Govt. Cert. ..	—.—.09	
1181	Royal Lad ..	3 years	C. Mason ..	Ararat	7.9.08	W.J.C.
1365	Royal Master ..	6 years	E. J. Brown ..	Corryong ..	3.10.08	E.A.K.
53/3	Royal Moor ..	3 years	D. F. Hourigan ..	Melbourne ..	27.7.09	W.R.
99/3	Royal Nugget ..	3 years	H. McGurk ..	Charlton ..	13.8.09	E.A.K.
1650	Royal Oak ..	5 years	G. W. Horne ..	Ballarat ..	11.9.09	W.J.C.
53/2	Royal Park ..	2 years	T. Oliver ..	Rutherglen ..	26.8.09	W.J.C.
1520	Royal Prince ..	Aged	Chambers Bros. ..	Boort	10.8.09	E.A.K.
2	Royal Prince ..	3 years	E. Wilson ..	Korumburra ..	29.9.06	S.S.C.
736	Royal Review ..	3 years	J. and W. Freeman	Melbourne ..	14.7.08	S.S.C.
334	Royal Ribbon ..	Aged	H. Boyd ..	Elmore	26.8.07	W.J.C.
1667	Royal Robin ..	6 years	H. Black ..	Alexandra ..	16.9.09	W.J.C.
4/3	Royal Sandy ..	3 years	J. N. and E. F. O'Sullivan	Melbourne ..	8.6.09	W.R.
179/3	Royal Scot ..	3 years	Rd. Fleming ..	Quambatook ..	16.9.09	W.J.C.
1157	Royal Shepherd ..	5 years	T. Larcombe ..	Geelong ..	20.8.08	W.J.C.
1462	Royal Sovereign ..	4 years	Walter and Agar ..	N.Z. Govt. Cert. ..	—.—.09	
883	Royal Stewart ..	3 years	W. Abram ..	Melbourne ..	30.7.08	J.L.
1330	Royal Stranger ..	3 years	Wm. Crozier ..	Kyneton ..	24.9.08	W.J.C.
955	Royal Times ..	4 years	Peter McDonald ..	Nathalia ..	4.8.08	S.S.C.
1469	Royal Title ..	Aged	E. J. Rickey ..	Melbourne ..	29.7.09	J.L.
829	Royalty	3 years	Harrison and Hastie	Melbourne ..	27.7.08	W.J.C.
1438	Sailor Prince ..	4 years	J. R. Mitchell ..	Horsham ..	15.7.09	W.J.C.
657	Sampson	3 years	G. and W. Lord ..	Sale Show ..	31.10.07	W.J.C.
12/3	Samson	3 years	Caffrey and Murphy	Newmarket ..	14.5.09	W.J.C.
661	Sandow	Aged	G. McC. Lyon ..	Coleraine Show ..	6.11.07	W.J.C.
64/3	Sandy's Heir ..	3 years	R. J. Mason ..	N.Z. Govt. Cert. ..	—.—.09	
830	Sandy's Heir ..	6 years	— McDonald ..	Melbourne ..	27.7.08	W.J.C.
42/2	Scotch Tartan ..	2 years	C. D. McIntyre ..	Geelong ..	19.8.09	J.L.
423	Scotch Thistle ..	3 years	Peter McIntyre ..	Geelong ..	31.8.07	S.S.C.
182	Scotland Again ..	Aged	F. Hamill ..	Maffra	16.8.07	W.J.C.
717	Scotland's Choice ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
120/3	Scotland's Fancy ..	3 years	D. Lamb ..	Geelong ..	19.8.09	J.L.
629	Scotland's Fashion	5 years	Jno. James ..	Colac Show ..	24.10.07	S.S.C.
1032	Scottish Chief ..	4 years	W. J. Molyneaux	Beulah	13.8.08	W.R.
146/3	Scottish King ..	3 years	Geo. Luckie ..	Wangaratta ..	25.8.09	W.J.C.
982	Scottish Lad ..	5 years	A. C. Vincent ..	Wangaratta ..	5.8.08	W.J.C.
1370	Scottish Pride ..	3 years	J. J. Alexander ..	Shepparton ..	6.10.08	W.R.
1002	Scottish Style ..	4 years	J. McDougall ..	Dookie	8.8.08	E.A.K.
1118	Searchlight ..	4 years	T. Munday ..	Bairnsdale ..	19.8.08	W.R.
1431	Seddon	4 years	Walter and Agar ..	Melbourne ..	7.7.09	W.R.

List of Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			Draughts—*continued.*			
1229	Selection	3 years	A. Watson ..	Mirboo North ..	8.9.08	W.R.
144/3	Sergeant Major ..	3 years	J. Christie ..	Numurkah ..	26.8.09	E.A.K.
1022	Shepherd Lad ..	4 years	M. Giles ..	Hopetoun ..	13.8.08	W.R.
1447	Shepherd Lad II. ..	5 years	Craven Bros. ..	Melbourne ..	26.7.09	J.L.
1060	Shepherd Plaid ..	3 years	Otto Maroske ..	Nhill	14.8.08	J.L.
1424	Shepherd Prince ..	6 years	E. Griffiths ..	Melbourne ..	8.6.09	W.R.
831	Shepherd Prince ..	Aged	J. C. Rockliff ..	Melbourne ..	27.7.08	J.L.
1016	Shepherd's Nugget	3 years	Bert Osborne ..	Benalla ..	3.8.08	W.J.C.
649	Shepherd's Pride ..	3 years	William Day ..	Murchison Show	30.10.07	W.R.
693	Scotland Yet ..	3 years	Hamilton Bros. ..	Bunyip Show ..	26.2.08	W.R.
1371	Shepparton Lad ..	5 years	A. C. Mason ..	Shepparton ..	6.10.08	J.L.
66/2	Signaller	2 years	G. Lewis ..	Korumburra ..	22.9.07	W.R.
682	Silver Crest ..	3 years	P. Watson ..	Korumburra Show	22.1.08	W.R.
902	Silver Cup ..	3 years	J. McLeod ..	Melbourne ..	28.7.08	S.S.C.
726	Silver Cup ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
715	Silver King ..	3 years	Thos. Anson ..	Melbourne ..	14.7.08	S.S.C.
1338	Simon	3 years	Innes Bros. ..	Warragul ..	24.9.08	W.R.
196	Smuggler	6 years	S. Winter Cooke	Hamilton ..	17.8.07	W.R.
716	Solicitor General ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
833	Souter Johnny ..	3 years	Anderson Bros. ..	Melbourne ..	27.7.08	S.S.C.
1474	Southern Chief ..	4 years	D. Davies ..	N.Z. Govt. Cert...	—.—.09	
762	Specialty	3 years	Jno. Annison ..	Horsham ..	16.7.08	S.S.C.
907	Springfield ..	4 years	Jas. Cullen ..	Melbourne ..	28.7.08	W.R.
1054	St. Albans ..	Aged	A. E Schmidt ..	Warracknabeal ..	14.8.08	W.R.
1628	Standard	Aged	Laidlaw Bros. ..	Coleraine ..	8.9.09	E.A.K.
15/3	St. Andrew ..	3 years	A. Hart.. ..	Newmarket ..	14.5.09	W.J.C.
183	Stanley	6 years	J. B. & W. Irvine	Maffra	16.8.07	W.J.C.
125/3	Star	3 years	C. and R. Watson	Kyabram ..	24.8.09	W.R.
835	Star's Pride ..	3 years	W. T. Manifold ..	Melbourne ..	27.7.08	W.R.
778	Statesman ..	3 years	D. Lang ..	Charlton ..	23.7.08	W.J.C.
1728	St. Kilda's Pride ..	Aged	Jno. Wallace ..	Pyramid Show ..	20.10.09	E.A.K.
1720	S. Lawrence ..	Aged	R. Ellis ..	Ballan	25.9.09	E.A.K.
834	St. Lawrence ..	Aged	H. Middleton ..	Melbourne ..	27.7.08	W.R.
223	St. Lawrence ..	Aged	F. Pilgrim and Sons	Nhill	21.8.07	S.S.C.
1004	Strathroy ..	5 years	W. G. Ballantyne	Dookie	8.8.08	E.A.K.
310	Strawn Brace ..	Aged	W. H. Lavery ..	Birchip	21.8.07	W.J.C.
643	Stylish Style ..	3 years	.. ..	Pyramid Show ..	23.10.07	W.R.
54/2	Sullivan's Fancy ..	2 years	W. H. England ..	Rutherglen ..	26.8.09	W.J.C.
45/2	Sweet William ..	2 years	Geo. Smith ..	Melton	28.8.09	J.L.
321	Sir Albyn ..	4 years	R. Pinnock ..	Lilydale ..	23.8.07	W.J.C.
58	Sir Albyn ..	Aged	J. R. Johnston ..	Colac	7.8.07	S.S.C.
143	Sir Benjamin ..	Aged	J. Milsteed ..	Sea Lake ..	15.8.07	N.McD.
75/3	Sir Charles ..	3 years	J. R. Stokes ..	N.Z. Govt. Cert...	—.—.09	
1383	Sir Charles ..	3 years	Thos. Potts ..	Bendigo Show ..	14.10.08	E.A.K.
380	Sir Colin	4 years	Koch Bros. ..	Casterton ..	28.8.07	W.R.
360	Sir Colin	3 years	T. Gifford ..	St Arnaud ..	28.8.07	W.J.C.
221	Sir David ..	6 years	Dowington Bros	Nhill	21.8.07	S.S.C.
264	Sir Donald ..	4 years	Thos. H. Roe ..	Shepparton ..	24.8.07	S.S.C.
50/2	Sir General ..	2 years	Crumb Bros. ..	Tatura	26.8.09	W.R.
517	Sir Herod II. ..	3 years	A. Watson ..	Kyneton ..	26.9.07	W.R.
1577	Sir Herod's Pride ..	5 years	H. Hanson ..	Rochester ..	30.8.09	J.L.
13/3	Sir Isaac Newton ..	3 years	D. McDonald and Sons	Newmarket ..	14.5.09	W.R.
209	Sir James ..	Aged	W. O'Callaghan ..	Minyip	21.8.07	W.R.
185/3	Sir John McFarlane	3 years	Glen Bros. ..	Kyneton ..	21.9.09	E.A.K.
68/2	Sir Malcolm ..	2 years	M. Cochrane ..	Werribee ..	21.10.09	W.J.C.
229	Sir Malcolm ..	6 years	W. R. Pittman ..	Nhill	21.8.07	S.S.C.
672	Sir Murdo ..	Aged	Thos. Wolfe ..	Yarram Show ..	20.11.07	W.J.C.
198	Sir Percy	4 years	T. McCrackens ..	Hamilton ..	17.8.07	W.R.
526	Sir Randler ..	3 years	R. W. Bowen ..	Kyneton ..	26.9.07	W.R.
832	Sir Richard ..	3 years	D. Hislop ..	Melbourne ..	27.7.08	W.J.C.
1420	Sir Robert ..	4 years	Caffrey and Murphy	Newmarket ..	14.5.09	W.R.
48/3	Sir Roger	3 years	J. E. Talbot ..	Melbourne ..	27.7.09	W.J.C.
37/2	Sir Royal	2 years	W. Cowan ..	Minyip	17.8.09	W.J.C.
46/3	Sir Rupert ..	3 years	M. Walters ..	Melbourne ..	27.7.09	W.J.C.
1329	Sir Rupert ..	Aged	Maxstead Bros. ..	Kyneton ..	24.9.08	W.J.C.
1620	Sir Samuel ..	4 years	Jno. McCarthy ..	Warrnambool ..	9.9.09	J.L.
93/3	Sir Simon Percival ..	3 years	H. Naylor ..	Beulah	12.8.09	J.L.
1349	Sir Thomas ..	6 years	Jno. Egan ..	Ballan	26.9.08	W.J.C.
20	Sir William ..	3 years	G. J. Kennedy ..	Horsham ..	18.7.08	S.S.C.
1305	Sir William ..	Aged	S. Winterbottom..	Smeaton ..	17.9.08	J.L.
641	Sir William ..	4 years	Jas. Langford ..	Pyramid Show ..	23.10.07	W.R.

List of Certificated Stallions—*continued*.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			Draughts—*continued*.			
469	Sir William ..	4 years	G. Payne ..	Alexandra ..	14.9.07	W.J.C.
658	Sir William ..	6 years	P. Ryan ..	Sale Show ..	31.10.07	W.J.C.
1725	Sir William Wallace	5 years	H. Fisher ..	Myrtleford ..	29.9.09	E.A.K.
836	Taieri's Pride ..	3 years	M. Michael ..	Melbourne ..	27.7.08	W.J.C.
1576	Tam Alive ..	4 years	Jas. Zeatley ..	Rochester ..	30.8.09	J.L.
790	Tam o' Shanter ..	Aged	J. Roberts ..	Charlton ..	23.7.08	W.J.C.
121/3	Tarquin Junior ..	3 years	G. Beansch ..	Geelong ..	19.8.09	J.L.
1094	Tasman	Aged	A. McMaster ..	Shepparton ..	22.8.08	W.J.C.
1602	Thirdpart Sentinel ..	Aged	John Roberts ..	Agricultural Offices	4.9.09	J.L.
25/3	Thistle	3 years	Bayles Bros. ..	Melbourne ..	5.7.09	W.R.
1293	Tip Top	3 years	D. McNamara ..	Elmore ..	17.9.08	W.R.
837	Tip Top	5 years	Le Marshall Bros.	Melbourne ..	27.7.08	W.R.
224	Togo	5 years	Jno. Duffy and Son	Nhill	21.8.07	S.S.C.
311	Togo	6 years	J. Cresp ..	Birchip	21.8.07	W.J.C.
121	Togo	3 years	W. Curtis ..	Wangaratta ..	15.8.07	S.S.C.
1575	Tokomairiro ..	6 years	W. H. Guders ..	Rochester ..	30.8.09	J.L.
67/3	Tom Mann ..	3 years	Goldsborough, Mort, and Co.	N.Z. Govt. Cert...	—.—.09	
536	Tommy Burns ..	3 years	E. Sleep ..	Horsham Show ..	24.9.07	S.S.C.
309	Tom's Pride ..	4 years	H. Green ..	Birchip	21.8.07	W.J.C.
47/3	Tongala	3 years	J. J. Downey ..	Melbourne ..	27.7.09	W.J.C.
131/3	Topsail Charlie ..	3 years	S. Stidwell ..	Nathalia ..	24.8.09	W.J.C.
110/3	Tory Boy ..	3 years	J. Cox	Birchip	18.8.09	E.A.K.
1621	Treasurer II. ..	Aged	W. Harvey ..	Warrnambool ..	9.9.09	J.L.
1277	True Blue ..	Aged	J. J. Frawley ..	Cranbourne ..	11.9.08	J.L.
414	Tulchan Tarquin ..	..	S. Wrathall ..	Geelong ..	31.8.07	S.S.C.
50	Tulchan Warrior ..	4 years	S. Wrathall ..	Hopetoun ..	3.8.07	W.J.C.
1147	Tulchan Warwick ..	4 years	S. Wrathall ..	Geelong ..	21.8.08	J.L.
122/3	Tulchan Wisdom ..	3 years	S. Wrathall ..	Geelong ..	19.8.09	J.L.
913	Tweed Lad ..	3 years	J. E. and M. Walters	Melbourne ..	28.7.08	S.S.C.
55	Tweedside Chief ..	5 years	Thos. Daffy ..	Colac	7.8.07	S.S.C.
451	Tweedside Hero ..	Aged	H. W. Adams ..	Warrnambool ..	10.9.07	W.J.C.
1524	The Admiral ..	5 years	W. G. Argent ..	Hamilton ..	14.8.09	W.R.
1291	The Admiral ..	5 years	F. S. Falkiner and Sons	Echuca	16.9.08	W.R.
1641	The Beau ..	Aged	B. Hayes ..	Maryborough ..	11.9.09	W.J.C.
718	The Benedict ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
158/3	The Clydesdale ..	3 years	S. Williams and Son	Rutherglen ..	26.8.09	W.J.C.
664	The Colonel ..	4 years	G. and W. Lord	Traralgon Show ..	13.11.07	W.R.
1659	The Coming King ..	5 years	J. Falls ..	Foster	14.9.09	E.A.K.
730	The Conspirator ..	3 years	Mitchell and O'Brien	Melbourne ..	14.7.08	S.S.C.
1339	The Don ..	Aged	G. Cathcart ..	Warragul ..	24.9.08	W.R.
1078	The Don	Aged	D. Anderson ..	Bendigo ..	19.8.08	W.J.C.
681	The Duke ..	5 years	B. McKenzie ..	Grantville and Jeetho Show	16.1.08	W.R.
1109	The General ..	3 years	T. E. Parry ..	St. Arnaud ..	18.8.08	E.A.K.
421	The General ..	3 years	Wilf. Grass ..	Geelong ..	31.8.07	S.S.C.
1430	The Hamilton ..	5 years	Alex. Robertson ..	Melbourne ..	5.7.09	W.R.
562	The King	3 years	J. Biggar ..	Numurkah Show	9.10.07	W.J.C.
94/3	The Macdonald ..	3 years	A. Wolhars ..	Beulah	12.8.09	J.L.
259	The McGregor ..	Aged	Dunning and Shea	Cobram ..	23.8.07	N.McD.
506	The Maori Prince ..	Aged	Jas. Carson ..	Camperdown ..	26.9.07	W.J.C.
912	The Marquis ..	Aged	A. H. Stansfield ..	Melbourne ..	28.7.08	W.J.C.
1218	The Missing Link ..	3 years	E. H. Nolte ..	Casterton ..	26.8.08	W.J.C.
483	The Real Scottie ..	3 years	J. Biggar ..	Korumburra ..	29.9.06	S.S.C.
491	The Sirdar ..	..	E. A. House ..	Daylesford ..	20.9.07	W.J.C.
28/3	The Standard ..	3 years	Mess Bros. ..	N.Z. Govt. Cert...	—.—.09	
24/3	The Workman ..	3 years	Mitchell and O'Brien	Melbourne ..	5.7.09	W.R.
90/3	United	3 years	J. McDonald ..	Kaniva	12.8.09	W.J.C.
286	United Prince ..	6 years	P. Fitzpatrick ..	Kilmore ..	27.8.07	S.S.C.
703	Vanquisher ..	5 years	Jas. Mitchell ..	Agricultural Offices	22.5.08	S.S.C.
1221	Victorian Prince ..	3 years	E. Parks ..	Hamilton ..	25.8.08	W.J.C.
1687	Victory	5 years	T. Bishop ..	Bairnsdale ..	15.9.09	W.R.
673	Volunteer ..	3 years	P. J. Keane ..	Yarram Show ..	20.11.07	W.J.C.
416	Waiponomu ..	3 years	E. Hooper ..	Geelong ..	31.8.07	S.S.C.
1521	Waitaiti	5 years	Garvin and Gray	Boort	10.8.09	E.A.K.
88	Waitaki Chief ..	5 years	W. Mosedale ..	Melton	10.8.07	S.S.C.
768	Wallace Strong ..	3 years	Peter Plozza ..	Horsham ..	16.7.08	S.S.C.
1008	Warkworth Chieftain	5 years	W. Langley ..	Murtoa ..	11.8.08	W.R.
838	Wee McGregor ..	3 years	W. T. Manifold ..	Melbourne ..	27.7.08	W.R.

List of Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
	Draughts—*continued.*					
739	Welcome Jack	5 years	J. and W. Freeman	Melbourne	14.7.08	S.S.C.
700	Werribee Prince	4 years	— McKoy	Tallangatta Show	5.3.08	W.J.C.
454	Western Hero	..	Davis and Woolsthorpe	Warrnambool	10.9.07	W.J.C.
26/3	Whakanui	3 years	N. Ramsay	Melbourne	5.7.09	W.R.
1348	Whanga-nui-a-tara	5 years	G. Hopwood and Son	Ballan	26.9.08	W.J.C.
1174	Wimmera	Aged	A. Price	Condah	26.8.08	J.L.
66/3	Windermere	3 years	Jno. Gifford	N.Z. Govt. Cert.	—.—.09	
296	Wolseley	4 years	J. A. Rankin	Kaniva	28.8.07	N.McD.
1417	Woodlands	5 years	Danl. Vaughan	Agricultural Offices	14.5.09	W.J.C.
244	Worrack	6 years	McLeod Bros.	Yarram	21.8.07	N.McD.
1006	Wyore	4 years	P. J. Reid	Wangaratta	5.8.08	J.L.
1068	Yarra Chief	3 years	S. Maxfield	Colac	18.8.08	J.L.
45/3	Yorkshire Hero	3 years	J. Carter	Melbourne	26.7.09	W.J.C.
1080	Young Acorn	3 years	Chas. F. Gourley	Bendigo	19.8.08	W.J.C.
1663	Young Albyn	Aged	N. E. Hayes	Leongatha	15.9.09	E.A.K.
1493	Young Albyn	Aged	J. Hennebery	Euroa	11.8.09	W.R.
1310	Young Avondale	4 years	W. Dean	Melton	18.9.08	J.L.
1463	Young Bancor	4 years	W. Blakie	N.Z. Govt. Cert.	—.—.09	
765	Young Ben	4 years	T. F. Cornell	Horsham	16.7.08	S.S.C.
1532	Young Cantab	4 years	G. Medlyn	St. Arnaud	17.8.09	E.A.K.
1535	Young Champion	Aged	W. G. Hastie	Kerang	17.8.09	W.R.
254	Young Champion	Aged	R. Blomeley	Cobram	23.8.07	N.McD.
1258	Young Champion	4 years	H. and R. Galloway	Maryborough	11.9.08	W.J.C.
1283	Young Champion Hero	5 years	G. H. Grindal	Frankston	14.9.08	J.L.
30/2	Young Chieftain	2 years	H. Excell	Horsham	14.7.09	W.J.C.
507	Young Clansman II.	6 years	A. Kelly	Camperdown	26.9.07	W.J.C.
392	Young Clifton	Aged	T. McKimmie	Seymour	29.8.07	W.J.C.
1366	Young Coronation	4 years	E. A. Rangott	Swan Hill Show	30.9.08	J.L.
1538	Young Craigie	Aged	C. H. Warne	Birchip	18.8.09	E.A.K.
1434	Young Crown and Feather	4 years	J. G. Halbich	Horsham	14.7.09	W.J.C.
1311	Young Down with the Dust	Aged	W. Moulsdale	Melton	18.9.08	J.L.
145/3	Young Federation	3 years	H. F. Hansen	Numurkah	26.8.09	E.A.K.
1119	Young Flashlight	4 years	W. R. Chapman	Bairnsdale	19.8.08	W.R.
1695	Young Forrester	4 years	C. Hansen	Dandenong	21.9.09	W.R.
1546	Young General Gordon	Aged	W. Boulton	Swan Hill	18.8.09	W.R.
1516	Young Glen	6 years	J. Dunne	Wycheproof	12.8.09	E.A.K.
1586	Young Gordon's Pride	4 years	Wm. Carey	Wangaratta	25.8.09	W.J.C.
1133	Young Grampian	5 years	E. Cuthbert	Camperdown	19.8.08	J.L.
81/3	Young Hamilton	3 years	Henry Free	Edenhope	5.8.09	E.A.K.
578	Young Heart of Oak	Aged	F. Rodda	Jeparit Show	16.10.07	W.J.C.
1175	Young Hercules	Aged	Ed. Storer	Condah	26.8.08	J.L.
1081	Young Herdsman	3 years	J. McGuigan	Bendigo	19.8.08	W.J.C.
196/3	Young Highland Lad	3 years	N. G. Martin	Trafalgar	16.10.09	W.R.
766	Young Ian	3 years	Robt. Liddle	Horsham	16.7.08	S.S.C.
67/2	Young Kelmscott	2 years	Jno. Graham	Ballan	25.9.09	E.A.K.
1177	Young Kilboughie	5 years	R. Roscoe	Condah	26.8.08	J.L.
878	Young Knight	Aged	H. T. De Little	Melbourne	29.7.08	W.J.C.
686	Young Loch Gyle	4 years	J. Henderson	Leongatha	11.2.08	S.S.C.
582	Young Lord Byron	3 years	A. McCallum	Jeparit Show	16.10.07	W.J.C.
1139	Young Lord Dundonald	3 years	P. Sullivan	Donald	19.8.08	E.A.K.
1023	Young Lyon	Aged	Anderson Bros.	Hopetoun	13.8.08	W.R.
1726	Young MacGregor	Aged	John Wood	Myrtleford	29.9.09	E.A.K.
675	Young McGregor	3 years	E. Don	Kyneton Show	26.11.07	W.R.
208	Young Mariner	5 years	G. Stokes	Minyip	21.8.07	W.R.
142/3	Young Model	3 years	D. Kennedy	Rochester	30.8.09	J.L.
424	Young Model	3 years	M. McClelland	Geelong	31.8.07	S.S.C.
1230	Young Monarch	6 years	R. H. Darragh	Mirboo South	8.9.08	W.R.
227	Young Native Oak	4 years	— Irwin	Nhill	21.8.07	S.S.C.
1041	Young Oak	Aged	S. McHarg	Rainbow	11.8.08	E.A.K.
363	Young Officer	3 years	Jno. Gray	St. Arnaud	28.8.07	W.J.C.
194/3	Young Peer	3 years	Jas. McKimmie	Agricultural Offices	2.10.09	E.A.K.
1140	Young Pride of Clyde	3 years	W. Dixon	Donald	19.8.08	E.A.K.
655	Young Prince	Aged	Geo. Dennis	Maldon Show	30.10.07	S.S.C.
1244	Young Ranfurly	3 years	J. Whiting	Warrnambool	10.9.08	W.R.
1680	Young Renfrew	Aged	S. Farrell	Maffra	18.9.09	W.R.
1709	Young Revenue	4 years	A. Henry	Korumburra	22.9.09	W.R.

List of Certificated Stallions—continued.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
	Draughts—continued.					
1372	Young Royal ..	Aged	R. H. Liddle ..	Portland ..	7.10.08	W.J.C.
234	Young Royal Oak ..	Aged	W. Pohlner ..	Nhill	21.8.07	S.S.C.
187/3	Young Royal Stuart	3 years	T. Pollock ..	Maffra	18.9.09	W.R.
1320	Young Russell ..	Aged	E. Edwards ..	Kilmore ..	22.9.08	J.L.
12	Young Sir William	4 years	Thos. Cain ..	Mirboo	25.10.06	S.S.C.
163	Young Sovereign ..	3 years	Webster Bros. ..	Benalla ..	17.8.07	S.S.C.
38/2	Young St. Albans ..	2 years	G. R. Goods ..	Minyip	17.8.09	W.J.C.
554	Young Stanley ..	6 years	R. Fleming ..	Wycheproof Show	4.10.07	W.R.
228	Young Struan ..	Aged	.. .. ..	Nhill	21.8.07	S.S.C.
382	Young Style ..	Aged	A. Oliver ..	Casterton ..	28.8.07	W.R.
1681	Young Tasman ..	5 years	M. O'Sullivan ..	Maffra	18.9.09	W.R.
1228	Young Treasure ..	6 years	T. Boyle ..	Sale	7.9.08	W.R.
	THOROUGHBREDS.					
1219	Abaris	Aged	W. Robertson ..	Hamilton ..	25.8.08	W.J.C.
1341	Active	4 years	G. G. Auchterlonie	Morwell ..	28.9.08	W.R.
318	Alarm	Aged	Connelly Bros. ..	Birchip	21.8.07	W.J.C.
548	Alva	Aged	D. Coutts ..	Hamilton Show ..	19.9.07	N.McD.
1481	Arlington	6 years	Goldsborough, Mort, and Co.	Agricultural Offices	7.8.09	W.R.
1664	Apex	6 years	R. W. Pollock ..	Mansfield ..	15.9.09	W.J.C.
842	Askelon	4 years	J. Widdis ..	Melbourne ..	28.7.08	S.S.C.
260	Attendant ..	6 years	T. Hanrahan ..	Cobram ..	23.8.07	N.McD.
1415	Barr	Aged	A. G. Bowman ..	Tallangatta Show	11.3.09	J.L.
395	Baunmoor ..	3 years	H. Saunders ..	Seymour ..	29.8.07	W.J.C.
843	Beechwood ..	4 years	Jas. Russell ..	Melbourne ..	28.7.08	S.S.C.
687	Ben Jonson ..	6 years	Percy Rowan ..	Leongatha Show	11.2.08	S.S.C.
449	Beware	Aged	J. Jenkins ..	Warrnambool ..	10.9.07	W.J.C.
271	Black Stone ..	Aged	R. Storey ..	Shepparton ..	24.8.07	S.S.C.
1284	Brakpan	Aged	Briese Bros. ..	Wangaratta Show	15.9.08	E.A.K.
1630	Britannia's Pilgrim	Aged	C. T. Lucas ..	Camperdown ..	8.9.09	W.R.
586	Carlyle	3 years	E. A. House ..	Maryborough Show	16.10.07	S.S.C.
272	Chesterman ..	Aged	T. O'Keefe ..	Shepparton ..	24.8.07	S.S.C.
83/3	Count Zeppelin ..	3 years	W. Nolte ..	Casterton ..	6.8.09	W.J.C.
289	Crest of the Wave ..	5 years	T. Harkness ..	Kilmore ..	27.8.07	S.S.C.
1285	Cuneiform	6 years	Briese Bros. ..	Wangaratta Show	15.9.08	E.A.K.
1590	De Wet	Aged	G. Land. ..	Wangaratta ..	25.8.09	W.J.C.
645	Eumarrah ..	Aged	C. Nunn ..	Pyramid Show ..	23.10.07	W.R.
131	Euphorion ..	Aged	P. Travers ..	Wangaratta ..	15.8.07	S.S.C.
463	Falkirk	Aged	D. Jackman ..	Warrnambool ..	10.9.07	W.J.C.
1606	Footbolt	Aged	H. G. Burr ..	Royal Show ..	31.8.09	W.J.C.
626	Freelance ..	4 years	R. Gilder ..	Maffra Show ..	24.10.07	W.J.C.
1397	Fry Pan	3 years	Geo. Nixon ..	Orbost	28.10.08	E.A.K.
270	Gambler II. ..	Aged	Anderson and Sons	Shepparton ..	24.8.07	S.S.C.
127	Gnarpurt	Aged	H. T. Hoysted ..	Wangaratta ..	15.8.07	S.S.C.
1113	Godwin	Aged	D. Slattery ..	Bairnsdale ..	19.8.08	W.R.
1494	Gooram	4 years	T. J. Killeen ..	Euroa	11.8.09	W.R.
934	Gosport	Aged	S. R. Bloomfield	Kerang	24.7.08	W.R.
1241	Graftondelle ..	Aged	J. Jenkins ..	Warrnambool ..	10.9.08	W.R.
551	Grand Emerald ..	6 years	J. McKenna ..	Wycheproof Show	4.10.07	W.R.
406	Guide	Aged	C. McLean ..	Mansfield ..	30.8.07	W.J.C.
249	Hainault ..	Aged	G. Collis, junr. ..	Yarram ..	21.8.07	N.McD.
627	Heather Lad ..	Aged	C. R. Davis ..	Maffra Show ..	24.10.07	W.J.C.
1381	High Time ..	3 years	D. O'Halloran ..	Bendigo Show ..	14.10.08	E.A.K.
83	Hobson	Aged	C. Edwards ..	Swan Hill ..	7.8.07	W.R.
1598	Hova Spin ..	6 years	J. Williams ..	Rutherglen ..	26.8.09	W.J.C.
1152	Invergordon ..	Aged	J. Mitchell ..	Geelong ..	28.8.08	W.J.C.
1731	Junot	Aged	N. McDonald ..	Rainbow Show ..	14.10.09	E.A.K.
1456	Kingski	4 years	H. G. Stansmore	Melbourne ..	27.7.09	J.L.
1187	Lake King ..	3 years	W. P. Brennan ..	Sale	7.9.08	W.R.
1405	Le Var	Aged	S. P. Mackay ..	Berwick ..	19.11.08	W.R.
177/3	Little Gun ..	3 years	J. C. H. Graves ..	Mansfield ..	15.9.09	W.J.C.
1020	Little Sailor ..	Aged	H. Jenkins ..	Hopetoun ..	13.8.08	W.R.
754	Loch Farran ..	Aged	W. Reece ..	Horsham ..	16.7.08	S.S.C.
972	Lonely Miller ..	3 years	J. Meusch ..	Cobram ..	5.8.08	E.A.K.
1394	Lord Grafton ..	4 years	T. T. Mulder ..	Colac Show ..	29.10.08	W.R.
1677	Lord Roslyn ..	Aged	W. H. Lyon ..	Maffra	18.9.09	W.R.
1074	MacClaris	4 years	T. Bailey ..	Bendigo ..	19.8.08	W.J.C.
1326	Magister	3 years	J. McCrae ..	Kyneton ..	24.9.08	W.J.C.
237	Merriang	Aged	D. S. Anderson ..	Nhill	21.8.07	S.S.C.
1486	Monte Malto ..	4 years	C. W. Kock ..	Casterton ..	6.8.09	W.J.C.
1559	Moriyama ..	6 years	Wm. Hoysted ..	Benalla ..	23.8.09	J.L.

List of Certificated Stallions—*continued.*

Thoroughbreds—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
1454	Notus	Aged	Geo. Robinson	Melbourne	27.7.09	W.R.
336	Pascarel	Aged	A. Fairbanks	Elmore	26.8.07	W.J.C.
699	Pilgrim's Rest	Aged	A. E. Scholz	Tallangatta Show	5.3.08	W.J.C.
1408	Portsea	Aged	E. Manifold	Camperdown	26.11.08	E.A.K.
114	Presto	Aged	G. Washington	Euroa	14.8.07	S.S.C.
569	Preston	Aged	C. Pratt	Seymour Show	11.10.07	W.J.C.
1458	Ranfred	5 years	John Laydon	Melbourne	27.7.09	J.L.
974	Rataplan	Aged	Geo. Smith	Cobram	5.8.08	E.A.K.
760	Richman	4 years	J. Cadden	Murchison	6.8.08	S.S.C.
1322	Right Royal	5 years	J. McKinnon	Korumburra	23.9.08	E.A.K.
1227	Rufus	3 years	R. Gilder	Sale	7.9.08	W.R.
938	Schimmell	Aged	E. Wren	Kerang	24.7.08	W.R.
1220	Scot Free	Aged	S. Winter Cooke	Hamilton	25.8.08	W.J.C.
1724	Sea Lion	Aged	S. Thomas	Myrtleford	29.9.09	E.A.K.
1449	Skye	5 years	Mrs. A. Hindson	Melbourne	27.7.09	W.J.C.
1160	Snap Shot	5 years	E. A. House	Daylesford	21.8.08	E.A.K.
1589	Solano	Aged	Evans Bros.	Wangaratta	25.8.09	W.J.C.
908	Steel King	4 years	John Widdis	Melbourne	28.7.08	W.R.
464	Straightfire	Aged	A. E. Saunders	Alexandra	14.9.07	W.J.C.
537	Straightshot	Aged	John McDonald	Horsham Show	24.9.07	S.S.C.
1492	Strathallen	6 years	M. A. Wignell	Euroa	11.8.09	W.R.
1342	Symphony	Aged	G. G. Auchterlonie	Morwell	28.9.08	W.R.
1435	Thunderer	Aged	W. Potter	Horsham	14.7.09	W.J.C.
175	Tidegate	Aged	Thomas Austin	Maffra	16.8.07	W.J.C.
29	Trentbridge	Aged	J. Deveiin	Horsham	18.7.07	S.S.C.
1416	The Captain	Aged	J. C. Hodson	Tallangatta	11.3.09	J.L.
194	The Harvester	Aged	J. H. Darlington	Hamilton	17.8.07	W.R.
911	The Labourer	6 years	J. T. Edgar	Melbourne	28.7.08	J.L.
236	Vengeance	Aged	R. Ward	Nhill	21.8.07	S.S.C.
1250	Voyou	Aged	R. Gaitskell	Bacchus Marsh	10.9.08	W.J.C.
498	Winchester	Aged	Exrs. Chas. Airey	Rupanyup Show	20.9.07	W.R.
612	Wotan	4 years	T. Dickenson	Ballarat Show	17.10.07	S.S.C.

Light Horses.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
943	Abbey Bells	Aged	G. and A. Tye	Mentone	1.8.08	S.S.C.
708	Alarm	4 years	Mitchell and O'Brien	Melbourne	14.7.08	S.S.C.
477	Alarm Gun	6 years	John Boulger	Morwell	16.9.07	W.J.C.
425	Alex R.	5 years	J. E. and W. Walters	Melbourne	5.7.09	W.R.
1673	Alleviate	6 years	S. Ritchie	Bunyip	20.9.09	W.R.
280	Almo C.	3 years	J. A. K. Clark	Shepparton	24.8.07	S.S.C.
598	Almont	Aged	A. and J. B. Sharp	Agricultural Offices	31.10.07	W.R.
589	Almont Ambassador	5 years	J. Cameron	Maryborough Show	16.10.07	S.S.C.
187	Almont B.	6 years	F. W. Schickerling	Warracknabeal	14.8.07	W.R.
165/3	Almont J.	3 years	Geo. J. Vagg	Camperdown	8.9.09	W.R.
1315	Almont Rose	3 years	E. Martin	Inglewood	18.9.08	W.R.
984	Almont Sharp	4 years	W. Hutchinson	Murchison	6.8.08	S.S.C.
1517	Almost	6 years	David Lang	Charlton	13.8.09	E.A.K.
1282	Alonzo	Aged	R. V. Collier	Lang Lang	11.9.08	E.A.K.
1570	Alto	6 years	Robertson Bros.	Melton	28.8.09	J.L.
1127	Alto Dick	3 years	W. N. Hindhaugh	Camperdown	19.8.08	J.L.
16/3	Applegarth	3 years	Mitchell and O'Brien	Melbourne	5.7.09	W.R.
119	Ashplant II.	Aged	A. Kennedy	Euroa	14.8.07	S.S.C.
5	Aster	Aged	R. F. Kurrle	Korumburra	29.9.06	S.S.C.
1518	Athlete	5 years	David Lang	Charlton	13.8.09	E.A.K.
930	Audacious	Aged	J. R. Maxwell	Kerang	24.7.08	W.R.
99	Austerlitz	Aged	W. Ueberganz	Murtoa	9.8.07	W.J.C.
377	Avon Peer	Aged	— Boyle	St. Arnaud	28.8.07	W.J.C.
793	Banker	6 years	Speer Bros.	Melbourne	27.7.08	W.R.
1355	Baron	Aged	Garvin and Gray	Boort Show	30.9.08	E.A.K.
545	Barrister	Aged	Bell Bros.	Murtoa Show	27.9.07	S.S.C.
1511	Barwon	6 years	H. W. Jaensch	Beaufort	13.8.09	W.J.C.
1540	Battle	Aged	H. A. Woods	Swan Hill	18.8.09	W.R.
1386	Bay Bells	3 years	W. Lamb	Geelong Show	21.10.08	W.J.C.
427	Bay Hawk	Aged	E. Hooper	Geelong	31.8.07	S.S.C.
1497	Bay Mount	Aged	G. Fruland	Beulah	12.8.09	J.L.
276	Bell Boy	6 years	John Gribbins	Shepparton	24.8.07	S.S.C.
1593	Bellfounder	4 years	J. T. Ovens	Tatura	26.8.09	W.R.
1503	Bellringer	Aged	Harry Doig	Agricultural Offices	14.8.09	J.L.
844	Belvoir	Aged	J. Carmichael	Melbourne	28.7.08	S.S.C.

List of Certificated Stallions—continued.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
	Light Horses—continued					
977	Bengal	Aged	M. and T. Duncan	Wangaratta ..	5.8.08	W.J.C.
1536	Ben Nevis ..	4 years	J. G. Bathe ..	Nhill	18.8.09	W.J.C.
1102	Bentwood ..	Aged	B. Hayes ..	St. Arnaud ..	18.8.08	E.A.K.
458	Best of Quality ..	Aged	G. Smith ..	Warrnambool ..	10.9.07	W.J.C.
1062	Billy	3 years	A. E. Haywood ..	Colac	17.8.08	W.J.C.
1594	Birchfield	Aged	John Williams ..	Rutherglen ..	26.8.09	W.J.C.
845	Bismarck	Aged	Alfred Neave ..	Melbourne ..	28.7.08	W.R.
461	Black Boy ..	Aged	J. G. Cox ..	Warrnambool ..	10.9.07	W.J.C.
1528	Black Eagle ..	Aged	G. Howells ..	Inglewood ..	16.8.09	W.R.
631	Black Hawk ..	3 years	G. S. Farrar ..	Colac Show ..	24.10.07	S.S.C.
577	Blackness ..	Aged	R. Penny ..	Jeparit Show ..	16.10.07	W.J.C.
482	Black Prince ..	4 years	T. Mackie ..	Morwell ..	16.9.07	W.J.C.
1573	Blacksmith ..	4 years	G. Childs ..	Elmore	30.8.09	J.L.
970	Black Turpin ..	Aged	W. McKellar ..	Cobram ..	5.8.08	E.A.K.
684	Black Wilks ..	Aged	W. J. Wilson ..	Korumburra Show	22.1.08	W.R.
846	Black Wind ..	Aged	S. Young ..	Melbourne ..	28.7.08	W.J.C.
847	Blue Peter II. ..	5 years	Alfd. Neave ..	Melbourne ..	28.7.08	W.R.
1178	Boatman	Aged	Mrs. Wilson ..	Ararat	7.9.08	W.J.C.
147	Bold Harold ..	Aged	W. Purcher ..	Sea Lake ..	15.8.07	N.McD.
1096	Bolinda	Aged	Jos. Tilley ..	Port Fairy ..	18.8.08	J.L.
86	Bonnie Lea ..	Aged	S. Taylor ..	Swan Hill ..	7.8.07	W.R.
1321	Bonza	Aged	G. Whiteman ..	Kilmore ..	22.9.08	J.L.
745	Boomerang ..	4 years	A. Hutcheson ..	Horsham ..	16.7.08	S.S.C.
744	Bo Peep	6 years	J. C. R. Jende ..	Horsham ..	16.7.08	S.S.C.
1316	Boswell	Aged	P. Lyons ..	Inglewood ..	18.9.08	W.R.
1611	Brigadier	Aged	Capt. Phillip Charley	Royal Show ..	31.8.09	W.R.
579	Brightlight ..	? Aged	R. Penny ..	Jeparit Show ..	16.10.07	W.J.C.
169	Brooklyn Junr. ..	3 years	E. W. Roscoe ..	Benalla ..	17.8.07	S.S.C.
279	Brooklyn Peer ..	3 years	W. Mahoney ..	Shepparton ..	24.8.07	S.S.C.
405	Brown Harold ..	6 years	T. Cain ..	Mansfield ..	30.8.07	W.J.C.
41/2	Brown Owyhee ..	2 years	O. A. Millard ..	Geelong ..	19.8.09	J.L.
796	Bundoora ..	3 years	Donald McKey ..	Melbourne ..	27.7.08	W.R.
950	Bungarby ..	4 years	E. Brensing ..	Nathalia ..	3.8.08	S.S.C.
556	Cabena	3 years	M. Kinnana ..	Wycheproof Show	4.10.07	W.R.
164	Calliope	Aged	S. Gardiner ..	Benalla ..	17.8.07	S.S.C.
849	Captain Tracy ..	Aged	A. McLennan ..	Melbourne ..	28.7.08	W.R.
440	Cheviot	6 years	M. Zimmer ..	Agricultural Offices	11.9.07	W.J.C.
1030	Chief Justice ..	4 years	A. J. Dunkley ..	Shepparton ..	22.8.08	W.J.C.
1380	Childe Osterley ..	4 years	John Mitchell ..	Bendigo ..	14.10.08	E.A.K.
1028	Chiming Bells ..	3 years	A. J. Whitehill ..	Agricultural Offices	15.8.08	W.J.C.
1091	Ciaredo	Aged	J. Swindle ..	Shepparton ..	22.8.08	W.J.C.
1071	Claretonian ..	5 years	H. C. Plainbeck ..	Bendigo ..	19.8.08	W.J.C.
1188	Cleve Don ..	4 years	T. Larcombe ..	Royal Show ..	28.8.08	J.L.
472	Colleague	4 years	H. Coller ..	Alexandra ..	14.9.07	W.J.C.
1343	Consequence ..	Aged	Hill Bros. ..	Horsham Show ..	25.9.08	S.S.C.
653	Contractor ..	4 years	J. Ovens ..	Murchison Show ..	30.10.07	W.R.
105	Coolgardie ..	Aged	Alex. Gunn ..	Donald	14.8.07	W.J.C.
136	Cornsborough ..	3 years	J. McGuinness ..	Wangaratta ..	15.8.07	S.S.C.
616	Cosmopolitan Jnr. ..	6 years	A. Wade ..	Ballarat Show ..	17.10.07	S.S.C.
1700	Countersign ..	Aged	J. McGill ..	Tallangatta ..	21.9.09	W.J.C.
1076	Courtly	6 years	C. Marchesi ..	Bendigo ..	19.8.08	W.J.C.
603	Crown Derby ..	3 years	Woolcock Bros. ..	Ballarat Show ..	17.10.07	S.S.C.
1135	Dan Alto	3 years	R. G. Hannah ..	Donald	19.8.08	E.A.K.
104	Dan Cleve ..	5 years	McCubbery Bros.	Donald	14.8.07	W.J.C.
944	Dan Patch ..	6 years	G. and A. Tye ..	Mentone ..	1.8.08	S.S.C.
323	Dan Tracey ..	5 years	J. G. Christie ..	Lilydale ..	23.8.07	W.J.C.
1665	Darven	4 years	J. P. Smith ..	Mansfield ..	15.9.09	W.J.C.
1716	Dashaway	5 years	J. T. Forbes ..	Romsey	20.9.09	E.A.K.
34/2	Decorator ..	2 years	F. Jennings ..	Inglewood ..	16.8.09	W.R.
529	Defoe	Aged	J. Brooks ..	Kyneton ..	26.9.07	W.R.
1261	Deisha	Aged	J. J. Challis ..	Ballarat ..	11.9.08	W.J.C.
455	Demonstrator ..	4 years	Jas. Gooden ..	Warrnambool ..	10.9.07	W.J.C.
1213	Desert King ..	Aged	A. Shanks ..	Casterton ..	26.8.08	W.J.C.
81	Dexter	Aged	T. Wilkins ..	Swan Hill ..	8.7.07	W.R.
1450	Dicky Whips ..	Aged	J. Phyland ..	Melbourne ..	27.7.09	W.J.C.
153/3	Dictator	3 years	Bennett and Woolcock	Royal Show ..	31.8.09	W.R.
932	Digitalis	Aged	E. Wren ..	Kerang ..	24.7.08	W.R.
648	Digitalis II. ..	5 years	S. Winterbottom	Pyramid Show ..	23.10.07	W.R.
101	Diogenes	Aged	W. E. Trollope ..	Donald	14.8.07	W.J.C.
925	Director	3 years	D. Foley ..	Boort	21.7.08	W.R.
704	Director	6 years	W. Williams ..	Melbourne ..	14.7.08	S.S.C.
1075	Director Pell Mell ..	3 years	G. R. Greaves ..	Bendigo ..	19.8.08	W.J.C.
1711	Directway	Aged	R. Matchett ..	Bendigo ..	22.9.09	E.A.K.

List of Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
	Light Horses—*continued.*					
354	Dirk Hammerhand	5 years	J. M. Campbell ..	Echuca ..	24.8.07	W.J.C.
355	Dirk Hammerhead	4 years	— Bowtell ..	Echuca ..	24.8.07	W.J.C.
971	Dixie	3 years	J. Donkin ..	Cobram ..	5.8.08	E.A.K.
679	Dixie Alto ..	Aged	W. B. Viers ..	Kyneton Show ..	26.11.07	W.R.
1122	Dixie G.	5 years	W. Erving ..	Terang	19.8.08	J.L.
841	Dixie Tracy ..	3 years	A. Cockroft ..	Melbourne ..	27.7.08	W.R.
1129	Donald	3 years	Thos. Williams ..	Camperdown ..	19.8.08	J.L.
410	Donald Mac ..	Aged	A. Stewart ..	Mansfield ..	30.8.07	W.J.C.
952	Don Bell	Aged	O. Baldwin ..	Nathalia ..	3.8.08	S.S.C.
891	Don Carlo.. ..	Aged	E. P. Hood ..	Heathcote ..	3.8.08	W.R.
1092	Don Cleve ..	Aged	John Swindle ..	Shepparton ..	22.8.08	W.J.C.
1453	Don Juan ..	Aged	J. Cliffs ..	Melbourne ..	27.7.09	W.R.
1705	Don Harold ..	Aged	Wm. Brown ..	Wodonga ..	20.9.09	W.J.C.
383	Dragon	Aged	D. Munro ..	Casterton ..	28.8.07	W.R.
38	Druce	3 years	D. Canny ..	Traralgon ..	31.7.07	S.S.C.
247	Dynamo	5 years	A. Stoner ..	Yarram ..	21.8.07	N.McD.
129	Earl Hampden ..	3 years	J. E. Kneebone ..	Wangaratta ..	15.8.07	S.S.C.
1205	Earl Huon ..	4 years	O. Dutton ..	Royal Show ..	28.8.08	J.L.
118	Eclipse	Aged	A. Jobson ..	Euroa	14.8.07	S.S.C.
678	Eclipse	5 years	Jas. Tranter ..	Kyneton Show ..	26.11.07	W.R.
1368	Edward	4 years	Simon Fraser ..	Swan Hill Show ..	30.9.08	J.L.
523	Emerald	5 years	J. Danaher ..	Kyneton ..	26.9.07	W.R.
118/3	Emulation ..	3 years	A. McFarlane ..	Geelong ..	19.8.09	J.L.
1201	Emulator ..	Aged	J. B. Zander ..	Royal Show ..	28.8.08	E.A.K.
1189	Emulator Junior ..	4 years	R. G. Keys ..	Royal Show ..	28.8.08	E.A.K.
120	Emulous	5 years	M. Cann ..	Euroa	14.8.07	S.S.C.
856	Era	4 years	W. Rogers ..	Melbourne ..	28.7.08	W.R.
148/3	Ercildoune Dick ..	3 years	Colin Gardner ..	Wangaratta ..	25.8.09	W.J.C.
1064	Errand Boy ..	3 years	R. Elliott ..	Colac	18.8.08	W.J.C.
1254	Erroneous ..	Aged	A. G. Stewart ..	Maryborough ..	11.9.08	W.J.C.
542	Experience ..	Aged	J. Rosenberg ..	Hamilton Show ..	19.9.07	N.McD.
1439	Experience II. ..	4 years	R. Mackley ..	Horsham ..	15.7.09	W.J.C.
748	Experiment ..	3 years	R. Mackay ..	Horsham ..	16.7.08	S.S.C.
1426	Expert	5 years	Mitchell and O'Brien	Melbourne ..	5.7.09	W.R.
1376	Explorer	Aged	A. M. Grautt ..	Mildura Show ..	14.10.08	J.L.
749	Exponent ..	3 years	A. McLennan ..	Horsham ..	16.7.08	S.S.C.
97/3	Fairfield	3 years	G. Petschel ..	Stawell	11.8.09	J.L.
107/3	Fashion Direct ..	3 years	T. F. Hogan ..	Kerang	17.8.09	W.R.
201	F.D.B.	3 years	M. Vaughan ..	Hamilton ..	17.8.07	W.R.
613	Fearless	3 years	T. Dickenson ..	Ballarat Show ..	17.10.07	S.S.C.
551	Fintonia	Aged	J. White ..	Minyip Show ..	1.10.07	N.McD.
576	Fire Away ..	Aged	W. Habick ..	Jeparit Show ..	16.10.07	W.J.C.
1666	Fireworks ..	Aged	W. J. Nicholas ..	Mansfield ..	15.9.09	W.J.C.
1036	Fireworks ..	Aged	P. Gildea ..	Rainbow ..	11.8.08	E.A.K.
945	First Ribbon ..	4 years	G. and A. Tye ..	Mentone ..	1.8.08	S.S.C.
1451	Fisherman ..	Aged	D. McLeod ..	Melbourne ..	27.7.09	W.J.C.
376	Fitz-James ..	5 years	Dyke Bros. ..	St. Arnaud ..	28.8.07	W.J.C.
1272	Flying Star ..	5 years	J. W. H. Wilson ..	Dandenong ..	10.9.08	E.A.K
72	Fontenoy ..	Aged	J. Hoolahan ..	Dookie	27.7.07	W.J.C.
1533	Four Wings ..	6 years	C. H. Poole ..	Kerang	17.8.09	W.R.
352	Frank Harold ..	6 years	D. McLeod ..	Echuca	24.8.07	W.J.C.
170	Frank Osterley ..	4 years	G. Ward ..	Benalla ..	21.8.07	S.S.C.
1722	Freedom	Aged	A. E. Harding ..	Myrtleford ..	29.9.09	E.A.R.
1788	Freemont	Aged	A. J. McClements	Traralgon ..	17.9.09	W.R.
921	Galtee Boy ..	5 years	W. Hedigan ..	Birchip ..	21.7.08	W.J.C.
1676	Galtimore ..	5 years	W. Marshall ..	Maffra	18.9.09	W.R.
525	Galty Boy ..	4 years	A. R. Lawrence ..	Kyneton ..	26.9.07	W. R.
1552	Gambler Dick ..	4 years	C. B. Petschel ..	Dimboola ..	20.8.09	W.J.C
978	Gaylite	4 years	E. H. Gannell ..	Wangaratta ..	5.8.08	W.J.C.
1428	General Babbington	Aged	D. McLeod ..	Melbourne ..	5.7.09	W.R..
857	General R. ..	4 years	A. Robertson ..	Melbourne ..	28.7.08	W.J.C.
614	General Standish ..	Aged	J. Davies ..	Ballarat Show ..	17.10.07	S.S.C.
958	General Tracey II. ..	4 years	S. Thompson ..	Numurkah ..	4.8.08	S.S.C.
966	General Tracey ..	Aged	Alex. Parsell ..	Tungamah ..	4.8.08	W.J.C.
35/2	Gerald Cleve ..	2 years	H. and A. McCubbery	Minyip	17.8.09	W.J.C.
1597	Ginger	5 years	D. McLean ..	Rutherglen ..	26.8.09	W.J.C.
160/3	Glendon	3 years	Dr. R. I. Loosli ..	Royal Show ..	31.8.09	W.R.
1437	Glen Leith ..	4 years	W. McComb ..	Horsham ..	15.7.09	W.J.C.
1414	Glen Martin ..	6 years	H. Petersen ..	Tallangatta ..	11.3.09	J.L.
859	Golden Eagle ..	5 years	J. Small ..	Melbourne ..	28.7.08	S.S.C.
979	Golden King ..	4 years	M. Neary ..	Wangaratta ..	5.8.08	J.L.
1569	Goldie	5 years	W. J. Minns ..	Melton	28.8.09	J.L.
273	Goldie	3 years	H. J. Scott ..	Shepparton ..	24.8.07	S.S.C.

List of Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
	Light Horses—*continued.*					
1622	Gold Spec ..	Aged	P. B. O'Keefe ..	Bacchus Marsh ..	9.9.09	W.J.C.
571	Gold Top ..	Aged	M. Darcy ..	Seymour ..	11.10.07	W.J.C.
705	Goodwood ..	Aged	F. H. Walsh ..	Melbourne ..	14.7.08	S.S.C.
103	Governor	3 years	— McCubbery ..	Donald ..	14.8.07	W.J.C.
159	Governor Tracey ..	Aged	E. G. Gorman ..	Yarrawonga ..	16.8.07	S.S.C.
539	Graingeburn ..	3 years	A. Ballenger ..	Horsham Show ..	24.9.07	S.S.C.
606	Grainger Junior II...	Aged	.. .. ..	Ballarat Show	17.10.07	S.S.C.
396	Grandeur ..	Aged	D. Ryan ..	Seymour ..	29.8.07	W.J.C.
953	Grand March II. ..	Aged	B. Ferrari, junr. ..	Nathalia ..	3.8.08	S.S.C.
28	Granger II. ..	5 years	W. F. Allen ..	Horsham ..	18.7.07	S.S.C.
1525	Grasshopper ..	6 years	Wm. Cain ..	Echuca	16.8.09	J.T.
60	Grey Hawk ..	Aged	W. W. Pierce ..	Colac	7.8.07	S.S.C.
213	Grey Royal ..	Aged	A. Boyd ..	Minyip	21.8.07	W.R.
662	G.T.F.	6 years	Glenister Bros. ..	Coleraine Show ..	6.11.07	W.J.C.
1255	Guitar	Aged	J. H. Bruhn ..	Maryborough ..	11.9.08	W.J.C.
356	Haco	Aged	Curragh Bros. ..	Echuca	24.8.07	W.J.C.
946	Hal Zolock ..	3 years	G. and A. Tye ..	Mentone ..	1.8.08	S.S.C.
670	Hambletonian Belt Boy	Aged	Gregg and Crowe	Northcote ..	16.11.07	S.S.C.
302	Hambletonian Boy	6 years	Peter Thompson	Wycheproof ..	20.8.07	W.J.C.
980	Hampden ..	Aged	J. H. McInnes ..	Wangaratta ..	5.8.08	J.L.
119/3	Happy Bells ..	3 years	F. Cox	Geelong ..	19.8.09	J.L.
189/3	Harkaway ..	3 years	M. Harper ..	Warragul ..	23.9.09	W.R.
809	Harmony ..	Aged	A. W. Fletcher ..	Melbourne ..	27.7.08	W.R.
876	Harold	4 years	Alex. Colvin ..	Melbourne ..	29.7.08	W.J.C.
877	Harold Douglas ..	5 years	Alex. Colvin ..	Melbourne ..	29.7.08	W.J.C.
100	Harold II. ..	5 years	R. C. Hannah ..	Donald	14.8.07	W.J.C.
211	Hassan	Aged	E. A. Watson ..	Minyip	21.8.07	W.R.
1692	Heather Jock ..	5 years	J. Mason ..	Dandenong ..	21.9.09	W.R.
1344	Height of Fashion ..	Aged	T. and V. Brown	Horsham Show ..	25.9.08	S.S.C.
1049	Hero	4 years	J. McKenzie ..	Warracknabeal ..	14.8.08	W.R.
1357	Hero	Aged	John Boyle ..	Boort Show ..	30.9.08	E.A.K.
1124	Hill Mont ..	3 years	W. Erving ..	Terang	19.8.08	J.L.
111/3	Honest	3 years	W. J. Gillard ..	Swan Hill ..	18.8.09	W.R.
275	Honest Bert ..	Aged	T. Harrison ..	Shepparton ..	24.8.07	S.S.C.
811	Honest Cleve ..	3 years	O. Baldwin ..	Melbourne ..	27.7.08	W.R.
1026	Honest Jack ..	..	J. Gallagher ..	Romsey ..	14.8.08	W.J.C.
115	Honest Lad ..	4 years	F. P. Boyle ..	Euroa	14.8.07	S.S.C.
862	Honest Lad ..	4 years	E. H. B. Young ..	Melbourne ..	28.7.08	W.R.
1010	Honest Lea ..	Aged	D. Ryan ..	Alexandra ..	11.8.08	W.J.C.
1588	Honesty	Aged	M. Dillon ..	Wangaratta ..	25.8.09	W.J.C.
1591	Honesty II. ..	Aged	Jas. Flanagan ..	Wangaratta ..	25.8.09	W.J.C.
1693	Honorable ..	6 years	Thos. Mitchell ..	Dandenong ..	21.9.09	W.R.
188	Huon Seaton ..	6 years	Phillips and Devereaux	Warracknabeal ..	15.8.07	W.R.
1190	Ian Cleve	Aged	Miss Phipps ..	Royal Show ..	28.8.08	E.A.K.
456	Imperial	Aged	H. W. Adams ..	Warrnambool ..	10.9.07	W.J.C.
863	Imperial Willie ..	3 years	J. Small ..	Melbourne ..	28.7.08	S.S.C.
1273	Inform	4 years	G. Crook ..	Dandenong ..	10.9.08	E.A.K.
132	Integrity	Aged	J. B. Docker ..	Wangaratta ..	15.8.07	S.S.C.
426	Integrity	Aged	J. J. Eadey ..	Geelong ..	31.8.07	S.S.C.
1105	Integrity	Aged	W. Gleeson, junr.	St. Arnaud ..	18.8.08	E.A.K.
936	Irish King ..	Aged	J. H. Roberts ..	Kerang ..	24.7.08	W.R.
165	Iroquois	Aged	G. Pearson ..	Benalla ..	17.8.07	S.S.C.
135	Ito	Aged	J. Graham ..	Wangaratta ..	15.8.07	S.S.C.
1505	Jack O'Lewy ..	Aged	L. Johns ..	Jeparit	11.8.09	W.J.C.
865	Jack W.	Aged	R. Tutty ..	Melbourne ..	28.7.08	W.R.
866	Jay Belden ..	5 years	A. Robertson ..	Melbourne ..	28.7.08	W.J.C.
864	Jerill	5 years	D. Hislop ..	Melbourne ..	28.7.08	W.R.
77	Joker	Aged	.. .. ..	Dookie	27.7.07	W.J.C.
46	Jonathan	Aged	W. Hiscock ..	Pyramid ..	3.8.07	S.S.C.
39/2	Joy Bells	2 years	M. Peacock ..	Kerang ..	17.8.09	W.R.
157	J. R. Wilkes ..	Aged	Toms Bros. ..	Yarrawonga ..	16.8.07	S.S.C.
1207	Judge Huon ..	Aged	O. Dutton ..	Royal Show ..	28.8.08	W.R.
1579	Judge Huon II. ..	4 years	M. H. Collins ..	Shepparton ..	27.8.09	E.A.K.
538	Juniper	Aged	Langley Bros. ..	Horsham Show ..	24.9.07	S.S.C.
246	Jupiter Junior ..	Aged	Rossiter Bros. ..	Yarram ..	21.8.07	N.McD.
1180	Justice	6 years	Harricks Bros. ..	Ararat ..	7.9.08	W.J.C.
918	Kaaban	4 years	M. Kirane ..	Charlton ..	23.7.08	W.J.C.
1672	Keeper Hill ..	Aged	D. Ryan ..	Seymour ..	17.9.09	W.J.C.
342	Kentucky ..	6 years	H. C. Johnson ..	Elmore ..	26.8.07	W.J.C.
867	Khakee	Aged	T. Nolan ..	Melbourne ..	28.7.08	W.R.
773	Killarney	Aged	W. Reece ..	Goroke	21.7.08	S.S.C.
618	Killarney II. ..	Aged	Grace and Fletcher	Ballarat Show ..	17.10.07	S.S.C.
127/3	Kintrave	3 years	A. Colvin ..	Nathalia ..	24.8.09	W.J.C.

List of Certificated Stallions—*continued.*

Light Horses—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
331	Kintyre	6 years	— McGregor ..	Elmore ..	26.8.07	W.J.C.
92/3	King Almont ..	3 years	J. Scott Lyon ..	Beulah	12.8.09	J.L.
647	King Bronte ..	Aged	C. Hands ..	Pyramid Hill Show	23.10.07	W.R.
513	King Draper ..	..	Victor Edgar ..	Camperdown ..	26.9.07	W.J.C.
868	Kingfisher ..	Aged	J. S. Orr ..	Melbourne ..	28.7.08	S.S.C.
481	King Harold ..	Aged	Francis Bros. ..	Morwell ..	16.9.07	W.J.C.
102	King Harold ..	5 years	T. McCubbery ..	Donald ..	14.8.07	W.J.C.
937	King Midas ..	6 years	D. Maxwell ..	Kerang	24.7.08	W.R.
103/3	King of Bronte Jun.	3 years	H. J. Jackson ..	Inglewood ..	16.8.09	W.R.
602	La Marnie ..	4 years	Gilbert Bros. ..	Ballarat Show ..	17.10.07	S.S.C.
617	Larrakin	Aged	Mrs. Sutherland ..	Ballarat Show ..	17.10.07	S.S.C.
615	Lernecker ..	Aged	C. Lippiatt ..	Ballarat Show ..	17.10.07	S.S.C.
1684	Leichardt ..	Aged	Worsley Bros. ..	Bairnsdale ..	15.9.09	W.R.
1626	Le Rosier ..	6 years	Glenister Bros. ..	Condah ..	7.9.09	E.A.K.
1465	Lieutenant J. ..	Aged	Mitchell and O'Brien	N.Z. Govt. Cert. ..	—.—.09	
871	Lieutenant Osterley	5 years	A. J. Clark ..	Melbourne ..	28.7.08	S.S.C.
1073	Little Hambletonian	4 years	H. C. Plainbeck ..	Bendigo ..	19.8.08	W.J.C.
1635	Little Osterley ..	6 years	Baxter and O'Keefe	Terang	6.9.09	W.R.
1582	Little Wonder ..	Aged	John Phyland ..	Agricultural Offices	11.9.09	E.A.K.
1224	Londonderry ..	3 years	John Finney ..	Sale	7.9.08	W.R.
468	Lord Derby ..	Aged	A. Douglas ..	Alexandra ..	14.9.07	W.J.C.
884	Lord Harold ..	3 years	A. Colvin ..	Melbourne ..	30.7.07	W.R.
755	Lord Hope ..	Aged	D. Bunworth ..	Horsham ..	16.7.08	S.S.C.
706	Lord of the Isles ..	4 years	A. D. Gaukroger ..	Melbourne ..	14.7.08	S.S.C.
1723	Lord Palmerston ..	6 years	W. Munro ..	Myrtleford ..	29.9.09	E.A.K.
1295	Lord Roberts ..	Aged	H. J. Payne ..	Lilydale ..	17.9.08	E.A.K.
873	Lord Vanderook ..	Aged	W. Abrams ..	Melbourne ..	28.7.08	W.J.C.
62	Loudoun Squire ..	5 years	J. Dunlop ..	Colac	7.8.07	S.S.C.
465	Macquarie ..	Aged	T. Aldous ..	Alexandra ..	14.9.07	W.J.C.
960	Major Tracy ..	4 years	T. H. Ford ..	Numurkah ..	4.8.08	S.S.C.
1689	Man of Honor ..	4 years	W. K. Basset ..	Traralgon ..	17.9.09	W.R.
892	Maori	4 years	A. McDonald ..	Melbourne ..	28.7.08	W.R.
630	Maori Chief ..	3 years	L. Strickland ..	Colac Show ..	24.10.07	S.S.C.
973	March	Aged	J. E. Turner ..	Cobram ..	5.8.08	E.A.K.
137	Marland Derby ..	Aged	Stewart and Sloan	Wangaratta ..	15.8.07	S.S.C.
947	Marvin Wilkes ..	Aged	G. and A. Tye ..	Mentone ..	1.8.08	S.S.C.
1613	Mauritius	Aged	J. B. Zander ..	Royal Show ..	31.8.09	W.R.
528	Mazeppa	Aged	A. W. Harvey ..	Kyneton ..	26.9.07	W.R.
1480	Merry Boy ..	Aged	M. J. Bourke ..	Murtoa	6.8.09	W.R.
1388	Merry Spark ..	Aged	Crozier Bros. ..	Lilydale ..	17.9.08	E.A.K.
428	Merry Speed ..	Aged	W. E. Rosling ..	Geelong ..	31.8.07	S.S.C.
688	Message	6 years	W. H. Michael ..	Leongatha ..	11.2.08	S.S.C.
303	Metal B.	6 years	E. Glasheen ..	Wycheproof ..	20.8.07	W.J.C.
300	Millstone	Aged	J. O'Donoghue ..	Elmore	26.8.07	W.J.C.
581	Miss Prize.. ..	6 years	J. F. W. Garvith..	Jeparit Show ..	16.10.07	W.J.C.
1382	Mistake	5 years	Robt. Southby ..	Bendigo Show ..	14.10.08	E.A.K.
1566	Molonga	4 years	Toms Bros. ..	Yarrawonga ..	24.8.09	J.L.
278	More Huon ..	3 years	T. Moore ..	Shepparton ..	24.8.07	S.S.C.
1502	Mount Palm ..	Aged	T. W. Schickerling	Warracknabeal ..	13.8.09	J.L.
195/3	Neptune	3 years	R. R. Coakes ..	Agricultural Offices	16.10.09	W.J.C.
1263	Nero	Aged	J. Jopling ..	Ballarat ..	11.9.08	W.J.C.
923	Never Sweat II. ..	5 years	J. Gilmour ..	Sea Lake ..	22.7.08	W.J.C.
488	Nick o' the Woods ..	Aged	M. P. Marwick ..	Daylesford ..	20.9.07	W.J.C.
295	Norback	5 years	F. Quire ..	Kaniva ..	27.8.07	N.McD.
1679	Norfolk Swell ..	6 years	W. H. Lyon ..	Maffra	18.9.09	W.R.
1637	Norval	6 years	Glenister Bros. ..	Ararat	10.9.09	E.A.K.
1674	Oakus	Aged	D. Tallent ..	Bunyip	20.9.09	W.R.
948	Obligado	4 years	G. and A. Tye ..	Mentone ..	1.8.08	S.S.C.
1314	Odd Trick ..	Aged	Dolman Bros. ..	Coleraine ..	19.9.08	W.J.C.
1634	Office	Aged	W. J. Trask ..	Colac	9.9.09	W.R.
149/3	Ohio	3 years	Dr. McCardel ..	Wangaratta ..	25.8.09	W.J.C.
919	Olympian ..	6 years	D. Lang ..	Charlton ..	23.7.08	W.J.C.
189	Olympic	3 years	Thompson Bros. ..	Warracknabeal ..	14.8.07	W.R.
366	Olympic Yet ..	3 years	— Bryce ..	St. Arnaud ..	30.8.07	W.J.C.
1455	O.M.L.	Aged	Josiah Opie ..	Melbourne ..	27.7.09	W.R.
76/3	Orderly	3 years	W. E. Gibson ..	Melbourne ..	29.7.09	J.L.
1143	Orme	6 years	John Ball ..	Werribee ..	21.8.08	J.L.
1193	Orthodox	Aged	J. Brown ..	Royal Show ..	28.8.08	J.L.
634	Oscar	4 years	Wm. Anderson ..	Colac Show ..	24.10.07	S.S.C.
1713	Oscombe	4 years	Arthur Lowe ..	Bendigo ..	22.9.09	E.A.K.
1363	Osman	6 years	T. Robertson ..	Corryong ..	3.10.08	E.A.K.
1085	Osprey	3 years	H. G. Staff ..	Traralgon ..	17.8.08	W.R.
607	Osprey II. ..	5 years	Gilbert Bros. ..	Ballarat Show ..	17.10.07	S.S.C.
1623	Osprey Junior ..	Aged	J. Axford ..	Terang	6.9.09	W.R.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			LIGHT HORSES—*continued.*			
1142	Osprey Premier ..	6 years	A. D. Rowan ..	Werribee ..	21.8.08	J.L.
646	Ostenesty ..	6 years	F. J. Dorman ..	Pyramid Show ..	23.10.07	W.R.
1292	Oster Boccacio ..	Aged	A. Bond ..	Elmore	17.9.08	W.R.
588	Osterfield	6 years	— Willatts ..	Maryborough Show	16.10.07	S.S.C.
652	Osterley II. ..	..	W. Hutchinson ..	Murchison Show ..	30.10.07	W.R.
923	Osterley Again ..	3 years	Wm. Hinneberg ..	Birchip ..	21.7.08	W.J.C.
460	Osterley Again ..	4 years	G. Smith ..	Warrnambool ..	10.9.07	W.J.C.
26	Osterley Hero ..	5 years	E. Koenig ..	Horsham ..	18.7.07	S.S.C.
896	Osterley Junior ..	5 years	Claude Walker ..	Melbourne ..	28.7.08	W.J.C.
544	Osterley Junior ..	Aged	Gready Bros. ..	Murtoa Show ..	24.9.07	S.S.C.
235	Osterley Wilkes ..	Aged	J. B. Marshall ..	Nhill	21.8.07	S.S.C.
632	Osterlight ..	3 years	G. S. Connor ..	Colac Show ..	24.10.07	S.S.C.
633	Ostermeyer ..	5 years	E. Batson ..	Colac Show ..	24.10.07	S.S.C.
202/3	Ostermeyer Direct ..	3 years	N. Sterritt ..	Ballarat Show ..	18.11.09	E.A.K.
1336	Osterwind ..	Aged	F. McNab ..	Warragul ..	24.9.08	W.R.
434	Ostray	6 years	J. Fitzgerald ..	Geelong ..	31.8.07	S.S.C.
989	Ostrich II. ..	5 years	J. P. Ovens ..	Tatura	6.8.08	S.S.C.
290	Oswestry	5 years	J. Hefferman ..	Kilmore ..	27.8.07	S.S.C.
93	Othello	5 years	A. Shebler ..	Melton	10.8.07	S.S.C.
1225	Owhy	3 years	C. B. Trood ..	Sale	7.9.08	W.R.
1194	Owyhee	Aged	D. Taylor ..	Royal Show ..	28.8.08	W.R.
1153	Owyhee Junior ..	4 years	E. Batson ..	Geelong ..	20.9.08	J.L.
897	Oyama	6 years	A. H. Capron ..	Melbourne ..	28.7.08	S.S.C.
1317	O.Y.D.	4 years	P. Lyons ..	Inglewood ..	18.9.08	W.R.
1202	O.Y.K.	3 years	E. H. Palfrey ..	Royal Show ..	28.8.08	E.A.K.
31/2	Pacific	2 years	Dr. Martell ..	Agricultural Offices	31.7.09	W.J.C.
1065	Paymaster ..	Aged	W. McCombe ..	Colac	17.8.08	W.J.C.
605	Pedestal	5 years	T. Davies ..	Ballarat Show ..	17.10.07	S.S.C.
1445	Penarth	6 years	J. Stein, jun. ..	Melbourne ..	26.7.09	W.J.C.
130	Pianola	Aged	F. Larkin ..	Wangaratta ..	15.8.07	S.S.C.
149	Planet Boy ..	Aged	C. Butcher ..	Sea Lake ..	15.8.07	N.McD.
297	Premier	5 years	Jos. Binns ..	Kaniva ..	28.8.07	N.McD.
117	Priam	Aged	L. Cusack ..	Euroa	14.8.07	S.S.C.
926	Prince Bronte ..	Aged	G. Bottomley ..	Boort	21.7.08	W.R.
1155	Prince Charman ..	3 years	Geo. Golightly ..	Geelong ..	20.8.08	W.J.C.
206/3	Prince Douglas ..	3 years	Mrs. Clara White	Agricultural Offices	4.12.09	W.R.
161/3	Prince Harold ..	3 years	Albert Pardon ..	Daylesford ..	6.9.09	W.J.C.
340	Prince Osterley ..	5 years	D. Murphy ..	Elmore	26.8.07	W.J.C.
546	Prince Osterley ..	4 years	C. W. Watts, jun.	Agricultural Offices	1.10.07	W.R.
1614	Prince Rothschild ..	5 years	Thos. McCallum ..	Royal Show ..	31.8.09	W.R.
351	Prince Whips ..	5 years	J. McLeod ..	Echuca	24.8.07	W.J.C.
532	Principal	Aged	Glenister Bros. ..	Horsham Show ..	24.9.07	S.S.C.
758	Prior II.	Aged	Stanley Young ..	Horsham ..	16.7.08	S.S.C.
1714	Procombe ..	Aged	J. D. O'Shea ..	Bendigo ..	22.9.09	E.A.K.
668	Protest	3 years	E. H. Bell ..	Traralgon Show ..	13.11.07	W.R.
150/3	Punch	3 years	Beard and Farley	Wangaratta ..	25.8.09	W.J.C.
1668	Quintore	Aged	J. Mitchell ..	Alexandra ..	16.9.09	W.J.C.
1274	Radiator	5 years	J. W. Welsby ..	Dandenong ..	10.9.08	E.A.K.
898	Radium	3 years	A. Robertson ..	Melbourne ..	28.7.08	W.J.C.
1522	Rafyk	Aged	S. Winter Cooke	Hamilton ..	14.8.09	W.R.
1581	Ranji	Aged	Chas. Daly ..	Shepparton ..	27.8.09	E.A.K.
899	Ratawood ..	5 years	A. Robertson ..	Melbourne ..	28.7.08	W.J.C.
1446	Red Cloud ..	5 years	C. Ridley ..	Melbourne ..	26.7.09	W.R.
316	Red Light ..	Aged	Neylands Bros. ..	Birchip	21.8.07	W.J.C.
1116	Red Wind Jun. ..	Aged	J. Williams ..	Bairnsdale ..	19.8.08	W.R.
1423	Referee	6 years	C. Stocks ..	Melbourne ..	8.6.09	W.R.
1574	Result	Aged	J. Marks ..	Elmore	30.8.09	J.L.
1125	Rex Osterley ..	6 years	T. C. Blain ..	Terang	19.8.08	J.L.
79/3	Richard Cleve ..	3 years	Henry Doig ..	Agricultural Offices	7.8.09	W.R.
1633	Rifle	Aged	H. Fisher ..	Colac	9.9.09	W.R.
180/3	Ringer	3 years	W. H. Johnston ..	Lang Lang ..	16.9.09	E.A.K.
770	Ringleader ..	6 years	Thos. Pearce ..	Stawell	20.7.08	S.S.C.
1545	Rival	5 years	R. Develine ..	Swan Hill ..	18.8.09	W.R.
524	Robin's Pride ..	3 years	A. Armstrong ..	Kyneton ..	26.9.07	W.R.
126/3	Rockefeller ..	3 years	D. McLeod ..	Kyabram ..	24.8.09	W.R.
250	Rose Musk ..	4 years	J. Bland ..	Yarram ..	21.8.07	N.McD.
1553	Rosewood ..	Aged	A. C. Mason ..	Kyabram ..	24.8.09	W.R.
402	Rufus	Aged	Smith Bros. ..	Mansfield ..	30.8.07	W.J.C.
1551	Royal Bells ..	4 years	W. Sharkey ..	Geelong ..	19.8.09	J.L.
780	Royal George II. ..	Aged	Chas. Grant ..	Melbourne ..	27.7.08	S.S.C.
1377	Royal Highlander ..	4 years	Thos. Harrop ..	Mildura Show ..	14.10.08	J.L.
942	Royal Roue ..	Aged	J. Clark ..	Heathcote ..	3.8.08	W.R.
343	Royal Whips ..	4 years	A. J. Walter ..	Elmore	26.8.07	W.J.C.
125	Safeguard ..	Aged	Evans Bros. ..	Wangaratta ..	15.8.07	S.S.C.
644	Sailor King ..	Aged	H. Gibbins ..	Pyramid Show ..	23.10.07	W.R.

List of Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
	Light Horses—*continued.*					
133	Satellite	Aged	J. Putty ..	Wangaratta ..	15.8.07	S.S.C.
1554	Saxon	6 years	E. Hale ..	Nathalia ..	24.8.09	W.J.C.
85	Seaforth Highlander	6 years	T. McCrae ..	Swan Hill ..	7.8.07	W.R.
202	Seldom Seen ..	6 years	S. Winter Cooke ..	Hamilton ..	17.8.07	W.R.
330	Selkirk	3 years	A. Scott ..	Elmore ..	26.8.07	W.J.C.
248	Shanet-a-boo ..	6 years	J. J. Sherry ..	Yarram ..	21.8.07	N.McD.
901	Shooting Star ..	5 years	W. Savage ..	Melbourne ..	28.7.08	W.R.
903	Silver King ..	Aged	John Mason ..	Melbourne ..	28.7.08	W.J.C.
210	Solicitor	3 years	J. T. Oram ..	Minyip	21.8.07	W.R.
939	Sparrowhawk ..	5 years	J. Langford ..	Kerang	24.7.08	W.R.
994	Spectator	Aged	W. Shelswell ..	Euroa	7.8.08	W.J.C.
763	Spight	3 years	G. Haensler ..	Horsham ..	16.7.08	S.S.C.
128	Stamp	Aged	Kettle & Moroney	Wangaratta ..	15.8.07	S.S.C.
1257	Standish	3 years	L. P Davis ..	Maryborough ..	11.9.08	W.J.C.
170/3	Standish Direct ..	3 years	W. Walter ..	Ballarat ..	11.9.09	W.J.C.
1146	Starlight	4 years	H. Anderson ..	Berwick ..	21.8.08	W.R.
212	Steel Arab ..	6 years	M. McLean ..	Minyip	21.8.07	W.R.
91	St. Patrick ..	—	A. Shebler, jun. ..	Melton	10.8.07	S.S.C.
84	Strathlodden ..	Aged	T. Wickens ..	Swan Hill ..	7.8.07	W.R.
502	St. Swivan ..	6 years	M. Gargan ..	Mirboo North ..	24.9.07	N.McD.
1275	Sultan	4 years	M. McKenna ..	Dandenong ..	10.9.08	E.A.K.
239	Sunfish	4 years	W. Kennedy ..	Nhill	21.8.07	S.S.C.
67	Sunlight	Aged	A. E. Carter ..	Colac	7.8.07	S.S.C.
963	Sunlight	3 years	R. Biggar ..	Numurkah ..	4.8.08	S.S.C.
1039	Swagman	3 years	R. J. Knott ..	Rainbow ..	11.8.08	E.A.K.
1506	Swivelette.. ..	5 years	R. Penny ..	Jeparit	11.8.09	W.J.C.
1378	Swiveller Shamrock..	4 years	W. Crosbie ..	Mildura Show ..	4.10.08	J.L.
702	Sir Harold ..	Aged	H. Bainbridge ..	Agricultural Offices	6.3.08	W.J.C.
905	Sir Roger	—	W. T. Foster ..	Melbourne ..	28.7.08	W.R.
367	Sir Simon ..	—	D. Campbell ..	St. Arnaud ..	28.8.07	W.J.C.
61	Sir Wyhee ..	3 years	W. Connor ..	Colac	7.8.07	S.S.C.
575	Talk o' the Hills ..	Aged	S. R. Klinge ..	Dimboola Show ..	11.10.07	S.S.C.
887	Tallis Pride ..	3 years	D. D. Tuttle ..	Agricultural Offices	1.8.08	J.L.
494	Tallis W.	4 years	J. T. Smith ..	Stawell	18.9.07	W.R.
1379	Taradale	Aged	L. W. Lilley ..	Mildura Show ..	14.10.08	J.L.
940	Tenant	Aged	G. Sharp ..	Kerang	24.7.08	W.R.
595	Terrific	Aged	Jas. Blenheim ..	Maryborough Show	16.10.07	S.S.C.
503	Testator	4 years	Arthur Knight ..	Agricultural Offices	8.10.07	S.S.C.
1686	Texedo	Aged	F. Hammil ..	Bairnsdale ..	15.9.09	W.R.
1530	Theatre	Aged	D. McKenzie ..	Minyip	17.8.09	W.J.C.
552	Thunder Jewell ..	3 years	R. Hetherington	Minyip Show ..	1.10.07	N.McD.
1266	Togos	Aged	W. Hitcheson ..	Ballarat ..	11.9.08	W.J.C.
1703	Tom	6 years	A. J. Thomson ..	Tallangatta ..	21.9.09	W.J.C.
565	Tommy Huon ..	4 years	J. G. Hodgson ..	Numurkah Show..	9.10.07	W.J.C.
1095	Toxo	Aged	T. J. Doherty ..	Shepparton ..	22.8.08	W.J.C.
1319	Tracey Alto ..	3 years	I. Kelly ..	Inglewood ..	18.9.08	W.R.
1053	Trickster	6 years	W. Craig ..	Warracknabeal ..	14.8.08	W.R.
261	Triumph	4 years	T. Nelson ..	Cobram ..	23.8.07	N.McD.
59	True Sign ..	Aged	G. H. Hill ..	Colac	7.8.07	S.S.C.
388	Truro	4 years	R. McInroy ..	Casterton ..	28.8.07	W.R.
1198	Tynedock Legislator	4 years	R. G. Wilson, jun.	Royal Show ..	28.8.08	W.R.
353	The Brook ..	4 years	D. McLeod ..	Echuca	24.8.07	W.J.C.
1233	The Cadet ..	5 years	A. C. Bair ..	Leongatha ..	9.9.08	E.A.K.
404	The Deemster ..	Aged	G. E. Kipping ..	Mansfield ..	30.8.07	W.J.C.
1526	The Dirk	Aged	W. Martin ..	Echuca	16.8.09	J.L.
1607	The Draper ..	Aged	P. W. C. Palmer	Royal Show ..	31.8.09	W.J.C.
462	The Governor ..	5 years	John Gooden ..	Warrnambool ..	10.9.07	W.J.C.
1100	The Grader ..	3 years	James Dyson ..	Port Fairy ..	18.8.08	J.L.
1354	The Judge ..	6 years	E. Francis ..	Yarrawonga Show	23.9.08	J.L.
1409	The Kaffir ..	5 years	G. B. Mackie ..	Camperdown Show	26.11.08	E.A.K.
1027	The Masher ..	Aged	T. H. Skene ..	Romsey.. ..	14.8.08	W.J.C.
495	The Merchant ..	4 years	Oliver Bodey ..	Stawell	18.9.07	W.R.
741	The Pet of the Public	3 years	Gus Krause ..	Horsham ..	16.7.08	S.S.C.
1347	The Swell ..	Aged	Geo. McDonnell ..	Ballan	26.9.08	W.J.C.
1030	The Toff	6 years	W. Peacock ..	Agricultural Offices	15.8.08	W.R.
553	The Trick ..	Aged	Jas. Fisher ..	Warracknabeal Show	3.10.07	N.McD.
1017	Unknown	Aged	T. H. McEwan ..	Benalla ..	3.8.08	W.J.C.
407	U.R.I.	Aged	W. Dovahy ..	Mansfield ..	30.8.07	W.J.C.
1662	Velvet	Aged	E. W. Murphy ..	Leongatha ..	15.9.09	E.A.K.
1267	Vendetta	5 years	R. F. Howard ..	Ballarat ..	11.9.08	W.J.C.
190	Vengeance II. ..	4 years	G. Hausler ..	Warracknabeal ..	14.8.07	W.R.
92	Venture	4 years	J. Cockbill ..	Melton	10.8.07	S.S.C.
1578	Victor	Aged	A. Cunnington ..	Rochester ..	30.8.09	J.L.
1715	Victor McKinney ..	Aged	R. Matchett ..	Bendigo ..	22.9.09	E.A.K.

LIST OF CERTIFICATED STALLIONS—*continued*.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
	LIGHT HORSES—*continued*.					
214	Victor's Pride ..	3 years	P. Doyle ..	Minyip	21.8.07	W.R.
156	Volant	4 years	Jas. Clark ..	Yarrawonga ..	16.8.07	S.S.C.
425	Von Osterley ..	6 years	F. R. Heard ..	Geelong ..	31.8.07	S.S.C.
489	Walnut	Aged	G. Burgess ..	Daylesford ..	20.9.07	W.J.C.
776	Wangoola ..	Aged	J. Potter ..	Goroke	21.7.08	S.S.C.
1721	Warrior	Aged	W. S. Riddle ..	Ballan	23.9.09	E.A.K.
1276	Warrior King ..	5 years	J. New	Dandenong ..	10.9.08	E.A.K.
1199	Waterloo	Aged	J. Ellis	Royal Show ..	28.8.08	E.A.K.
57/2	Weeho	2 years	W. D. McFarlane	Lilydale ..	11.9.09	E.A.K.
1660	Wee Scott	Aged	W. Jones ..	Foster	14.9.09	E.A.K.
134	Welfare	Aged	F. Holmes ..	Wangaratta ..	15.8.07	S.S.C.
1200	Wenlock	3 years	A. L. Barclay ..	Royal Show ..	28.8.08	W.R.
485	Westerley	Aged	F. R. G. Robertson	Korumburra ..	18.9.07	W.J.C.
96/3	W.F.A.	3 years	W. Brown ..	Warracknabeal ..	13.8.09	J.L.
195	Whalebone ..	Aged	W. R. Cross ..	Hamilton ..	17.8.07	W.R.
274	Why Not	3 years	O. Dutton ..	Shepparton ..	7.9.07	S.S.C.
1571	Wheatland ..	4 years	M. Carberry ..	Melton	28.8.09	J.L.
550	Wildbird	—	H. Bineham ..	Hamilton Show ..	19.9.07	N.McD.
1624	Willie Tracey ..	5 years	T. B. Ward ..	Terang	6.7.09	W.R.
158	Willie Wilkes ..	3 years	M. Rowan ..	Yarrawonga ..	16.8.07	S.S.C.
530	Woodstock ..	Aged	A. Dickens ..	Kyneton ..	26.9.07	W.R.
1670	Woollamai ..	Aged	P. P. Martin ..	Alexandra ..	16.9.09	W.J.C.
374	Yamba	6 years	— Smith, junior ..	St. Arnaud ..	28.8.07	W.J.C.
1083	Yelretso	Aged	W. H. Wallis ..	Bendigo ..	19.8.08	W.J.C.
1346	Yendon	6 years	W. Payne ..	Ballan	26.9.08	W.J.C.
384	Yettendon ..	Aged	A. Bond ..	Casterton ..	28.8.07	W.R.
45	Young Ashplant ..	Aged	J. E. Morgan ..	Pyramid ..	3.8.07	S.S.C.
656	Young Bow Boy ..	3 years	T. Upstill ..	Maldon Show ..	30.10.07	S.S.C.
1699	Young Cannoneer ..	Aged	R. H. Elliot ..	Warragul ..	23.9.09	W.R.
1374	Young Clarendon ..	6 years	J. M. Wilson ..	Portland ..	7.10.08	W.J.C.
1529	Young Cosmopolitan	Aged	G. Gregson ..	Inglewood ..	16.8.09	W.R.
324	Young Cureton ..	3 years	Salvation Army ..	Lilydale ..	23.8.07	W.J.C.
1040	Young Dragon ..	6 years	A. R. Lush ..	Rainbow ..	11.8.08	E.A.K.
1138	Young Grand Prix ..	5 years	J. McKenna ..	Donald	19.8.08	E.A.K.
298	Young Hamlet ..	Aged	John Head ..	Kaniva	28.8.07	N.McD.
1643	Young Harold ..	Aged	M. Kelly ..	Heathcote ..	13.9.09	W.J.C.
1399	Young Highlander ..	Aged	W. Hicks ..	Orbost	28.8.08	E.A.K.
371	Young Irrtum ..	—	— Fithall ..	St. Arnaud ..	28.8.07	W.J.C.
1167	Young Jester ..	—	J. Bourke ..	Kyabram ..	24.8.08	W.R.
82	Young King Louis ..	6 years	W. Ross ..	Swan Hill ..	7.8.07	W.R.
1395	Young Kintore ..	Aged	G. Morris ..	Colac Show ..	29.10.08	W.R.
1168	Young Middlemarch	Aged	J. Bourke ..	Kyabram ..	24.8.08	W.R.
372	Young Osterley ..	Aged	N. McDonald ..	St. Arnaud ..	28.8.07	W.J.C.
924	Young Osterley II. ..	4 years	Jas. McDonald ..	Sea Lake ..	22.7.08	W.J.C.
412	Young Pieman ..	5 years	M. McLean ..	Mansfield ..	30.8.07	W.J.C.
325	Young Richmond ..	Aged	E. Fontaine ..	Lilydale ..	23.8.07	W.J.C.
1033	Young Swiveller ..	Aged	H. Naylor ..	Beulah	13.8.08	W.R.
150	Young Tynon ..	Aged	W. Rugge ..	Sea Lake ..	15.8.07	N.McD.
243	Young Vengeance ..	3 years	E. Huff ..	Nhill	21.8.07	S.S.C.
95	Zouroff	Aged	J. Minns ..	Melton	10.8.07	S.S.C.
	PONIES.					
1237	Admiration ..	5 years	S. O'Callaghan ..	Warrnambool ..	10.9.08	W.R.
622	Admiration ..	5 years	T. T. Taylor ..	Ballarat Show ..	17.10.07	S.S.C.
512	Aladdin	Aged	R. Kelly ..	Camperdown ..	26.9.07	W.J.C.
584	Alma Jimmy ..	3 years	G. Willatts ..	Maryborough Show	16.10.07	S.S.C.
1259	Arabi	3 years	G. J. Phillips ..	Ballarat ..	10.9.08	W.J.C.
1556	Arab King ..	Aged	G. H. Norton ..	Benalla ..	28.8.09	J.L.
975	Argyle	Aged	W. Conner ..	Wangaratta ..	5.8.08	W.J.C.
1252	Badaween ..	5 years	E. S. Herring ..	Maryborough ..	11.9.08	W.J.C.
635	Bally	Aged	J. F. King ..	Colac Show ..	24.10.07	S.S.C.
1401	Bally Boy	3 years	W. G. Illingworth	Ballarat Show ..	12.11.08	W.R.
433	Bally Rogan ..	3 years	J. E. Jelleff ..	Geelong ..	31.8.07	S.S.C.
431	Bally Roy ..	4 years	A. J. Spalding & Sons	Geelong ..	31.8.07	S.S.C.
1048	Baltimore ..	5 years	Jas. A. Johnson ..	Warracknabeal ..	14.8.08	W.R.
516	Bay Briton ..	Aged	P. Wharton ..	Elmore Show ..	25.9.07	W.R.
07/3	Beeac Bells ..	3 years	Jas. Egan ..	Colac Show ..	27.10.09	E.A.K.
306	Bell Boy	6 years	J. D. Pryse ..	Wycheproof ..	20.8.07	W.J.C.
696	Bend Or	4 years	Geo. Borland ..	Warragul ..	23.9.09	W.R.
400	Bengal	Aged	J. Ford ..	Ballarat Show ..	12.11.08	W.R.
791	Berkeley Magician ..	Aged	R. G. Wilson, jun.	Melbourne ..	27.7.08	W.R.
391	Bill	Aged	J. Grinham ..	Casterton ..	28.8.07	W.R.

List of Certificated Stallions—continued.

Ponies—continued.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
1527	Billy	5 years	G. H. and F. Leech	Inglewood	16.8.09	W.R.
772	Black Bolt	3 years	H. Redford	Goroke	21.7.08	S.S.C.
476	Black Boy	3 years	F. Bridges	Morwell	16.9.07	W.J.C.
87	Black Prince	Aged	Staley & Connell	Swan Hill	7.8.07	W.R.
51/3	Black Shanter	3 years	H. Hunt	Melbourne	27.7.09	W.R.
573	Bobbie Burns	Aged	R. H. Wright	Dimboola Show	11.10.07	S.S.C.
1161	Bobs	Aged	T. A. Mackenzie	Kyabram	24.8.08	W.R.
1682	Bonnie	Aged	T. Norton	Bairnsdale	15.9.09	W.R.
1235	Bonnie Boy	Aged	W. H. Spooner	Bunyip	9.9.08	W.R.
1683	Bonnie Doon Junior	Aged	A. and W. Howlett	Bairnsdale	15.9.09	W.R.
985	Bounding Willow	5 years	Hugh McCue	Murchison	6.8.08	S.S.C.
452	Bower	Aged	M. Quigley	Warrnambool	10.9.07	W.J.C.
1110	Boxer	Aged	E. Glenn	Bairnsdale	19.8.08	W.R.
241	Brassey's Pride	5 years	A. E. Millar	Nhill	21.8.07	S.S.C.
1479	Brigaway	5 years	A. L. Harris	Murtoa	6.8.09	W.R.
1239	Brigham	Aged	J. Jenkins	Warrnambool	10.9.08	W.R.
541	Brigham	3 years	S. Blakeley	Horsham Show	27.9.07	S.S.C.
1223	Brigham II.	Aged	J. G. Schneider	Hamilton	25.8.08	J.L.
1134	Brigham King	3 years	A. P. Jones	Donald	19.8.08	E.A.K.
68	Brigham Young II.	Aged	A. E. McCure	Colac	7.8.07	S.S.C.
450	Brigham Young II.	Aged	J. Hall	Warrnambool	10.9.07	W.J.C.
201/3	Briton's Pride	3 years	G. S. Kenworthy	Ballarat Show	18.11.09	E.A.K.
1015	Bronzewing	Aged	V. Little	Benalla	3.8.08	W.J.C.
497	Bryce	—	C. McKay	Stawell Show	18.9.07	W.R.
1070	Bull Jinks	Aged	F. Osborne	Bendigo	19.8.08	W.J.C.
70	By Night	4 years	Hunt Bros.	Dookie	27.7.07	W.J.C.
317	Canary	Aged	G. Gould	Birchip	21.8.07	W.J.C.
441	Caractacus II.	Aged	Farrell Bros.	Warrnambool	10.9.07	W.J.C.
1148	Caradoc	3 years	C. D. Hobbs	Geelong	20.8.08	J.L.
596	Cardiff	4 years	J. L. Edwards	Iona	21.10.07	W.J.C.
1149	Celtic Chief	4 years	C. Grant	Geelong	20.8.08	W.J.C.
141	Chief Justice	5 years	T. Moroney	Wangaratta	15.8.07	S.S.C.
129/3	Clarion	3 years	W. Thompson	Nathalia	24.8.09	W.J.C.
1484	Clarionet	Aged	J. R. Mitchell	Casterton	6.8.09	W.J.C.
1631	Clem	6 years	Michael Skeyhill	Camperdown	8.9.09	W.R.
747	Clem	3 years	P. Doyle	Horsham	16.7.08	S.S.C.
1121	Clem	3 years	J. Crimmin	Terang	19.8.08	J.L.
1595	Clem Again	6 years	H. McConnell	Rutherglen	26.8.09	W.J.C.
14	Clifton	Aged	L. Lynch	Mirboo	25.10.06	S.S.C.
1000	Cocaine	Aged	W. R. Cullen	Rutherglen	6.8.08	W.J.C.
1044	Cock o' the Walk	Aged	R. McKenzie	Dimboola	12.8.08	E.A.K.
568	Cocoanut	Aged	D. J. Fergusson	Seymour Show	11.10.07	W.J.C.
636	Combine	Aged	..	Colac Show	24.10.07	S.S.C.
640	Comet	4 years	A. Billings	Colac Show	24.10.07	S.S.C.
429	Comet	3 years	Alfred Beales	Geelong	31.8.07	S.S.C.
1619	Comet	Aged	T. H. Goodwin	Warrnambool	9.9.09	J.L.
692	Comet	—	W. Ritchie	Bunyip Show	26.2.08	W.R.
8	Comet	Aged	Talbot Atkins	Korumburra	29.9.06	S.S.C.
48	Commander	Aged	W. Townsend	Pyramid	3.8.07	S.S.C.
1011	Commodore	Aged	Quinlan & McLean	Minyip	12.8.08	W.R.
432	Commodore	Aged	Jno. Ince	Geelong	31.8.07	S.S.C.
1232	Commodore	6 years	Arthur Rickards	Foster	8.9.08	E.A.K.
1390	Commonwealth	6 years	E. W. Tremellan	Numurkah Show	23.10.08	E.A.K.
1393	Commotion	6 years	Alex. McKenzie	Colac Show	29.10.08	W.R.
1557	Coralite	4 years	A. S. Sargent	Benalla	23.8.09	J.L.
1294	Courtier	3 years	R. B. Kelly	Lilydale	17.9.08	E.A.K.
1537	Cricket	4 years	W. Kennedy	Nhill	18.8.09	W.J.C.
1211	Crofton	4 years	Jas. Hortle	Casterton	26.8.08	W.J.C.
509	Crown King	5 years	J. Dwyer	Camperdown	26.9.07	W.J.C.
204	Cymro	Aged	J. R. Jackson	Hamilton	17.8.07	W.R.
173	Cyndette	6 years	J. A. Manson	Maffra	16.8.07	W.J.C.
459	Dan Daphne	3 years	J. Stafford	Warrnambool	10.9.07	W.J.C
1313	Dandy	Aged	Dolman Bros.	Coleraine	19.9.08	W.J.C
466	Dandy	3 years	R. Rennie	Alexandra	14.9.07	W.J.C
666	Dandy	6 years	G. Tory	Traralgon Show	13.11.07	W.R.
390	Dandy	Aged	A. Bilston	Casterton	28.8.07	W.R.
1483	Dandy Again	4 years	Mat. Barber	Wycheproof	12.8.09	E.A.K.
1501	Dandy Again	4 years	A. Cameron	Warracknabeal	13.8.09	J.L.
638	Dandy Bell	5 years	Jno. James	Colac Show	24.10.07	S.S.C.
106/3	Dandy Bones	3 years	J. Crosbie	St. Arnaud	17.8.09	E.A.K.
1185	Dandy Boy	Aged	G. & W. Lord	Sale	7.9.08	W.R.
112/3	Dandy Brick	3 years	J. W. Baker	Donald	19.8.09	E.A.K.
851	Dandy Brush	4 years	J. Findlay	Melbourne	28.7.08	W.R.
113/3	Dandy Chief	3 years	G. Crombie	Donald	19.8.09	E.A.K.

List of Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			Ponies—*continued.*			
470	Dandy Dick	6 years	J. Findlay	Alexandra	14.9.07	W.J.C.
1151	Dandy Don	Aged	G. R. Bowman	Geelong	20.8.08	J.L.
1270	Dandy Hero	Aged	E. Fontaine	Dandenong	10.9.08	E.A.K.
251	Dandy Geordie	4 years	T. G. McKenzie	Yarram	21.8.07	N.McD.
107	Dandy Imperial	4 years	J. P. Morgan	Donald	14.8.07	W.J.C.
1669	Dandy Jack	4 years	J. Payne	Alexandra	16.9.09	W.J.C.
1448	Dandy Jim	4 years	J. Findlay	Melbourne	27.7.09	W.J.C.
570	Dandy Jock	5 years	A. Ward	Seymour Show	11.10.07	W.J.C.
1098	Dandy Jock	Aged	D. Dawe	Port Fairy	18.8.08	J.L.
667	Dandy Junior	5 years	Widdis & King	Traralgon Show	13.11.07	W.R.
987	Dandy King	3 years	E. Mackie	Murchison	6.8.08	S.S.C.
1271	Dandy Lad	3 years	A. E. Selman and Bros.	Dandenong	10.9.08	E.A.K.
650	Dandy Lad	3 years	John Donegan	Murchison Show	30.10 07	W.R.
852	Dandy Lyons	Aged	J. O'Neil	Melbourne	28.7.08	W.R.
63/2	Dandy O'More	2 years	L. Tatterson	Dandenong	21.9.09	W.R.
1288	Dandy Prince	6 years	P. W. Carr	Whittlesea	15.9.08	J.L.
854	Dandy Scott	4 years	J. Findlay	Melbourne	28.7.08	W.R.
1704	Dandy's Pride	6 years	P. V. Frauenfelder	Wodonga	20.9.09	W.J.C.
39	Dandy's Pride	3 years	W. Widdis	Traralgon	31.7.07	S.S.C.
415	Dandy's Pride	Aged	C. Jones	Geelong	31.8.07	S.S.C.
853	Dandy's Progress	3 years	Fred Jones	Melbourne	28.7.08	S.S.C.
50/3	Deroy	3 years	J. A. Syme	Melbourne	27.7.09	W.R.
1402	Desert Born	Aged	A. J. Frisken	Ballarat Show	12.11.08	W.R.
624	Desert Lad	3 years	D. Shelly	Ballarat Show	17.10.07	S.S.C.
1212	Despised	Aged	Stock Bros.	Casterton	26.8.08	W.J.C.
180	Diagram	4 years	W. Rainey	Maffra	16.8.07	W.J.C.
1099	Dingo	Aged	R. A. Gibson	Port Fairy	18.8.08	J.L.
1697	Don II.	Aged	Mann Bros.	Warragul	23.9.09	W.R.
128/3	Dontore	4 years	A. Colvin	Nathalia	24.8.09	W.J.C.
253	Duffy	5 years	J. McKenzie, jun.	Yarram	21.8.07	N.McD.
1734	Electra	Aged	Thos. Smith	Agricultural Offices	20.11.09	E.A.K.
51	Emulator Junior	5 years	Scott, Lyon	Hopetoun	3.8.07	W.J.C.
1701	Ensign	Aged	Jno. Hargreaves, junr.	Tallangatta	21.9.09	W.J.C.
62/2	Ensign's Pride	2 years	J. J. Egan	Wodonga	20.9.09	W.J.C.
1123	Era	5 years	E. Boland	Terang	19.8.08	J.L.
1163	Ethelator	Aged	J. W. West	Kyabram	24.8.08	W.R.
949	Ettrickdale	5 years	W. Cock	Melbourne	5.8.08	W.R.
1596	Explosion	6 years	J. McAuliffe	Rutherglen	26.8.09	W.J.C.
262	Fast Time	4 years	K. Stewart	Cobram	23.8.07	N.McD.
116	Federation	5 years	R. Davidson	Euroa	14.8.07	S.S.C.
1432	Fireaway's Wonder	4 years	Fred. C. Smith	Horsham	14.7.09	W.J.C.
1406	First Clem	3 years	D. Rowe	Camperdown Show	26.11.08	E.A.K.
64	First Landor	5 years	Geo. Connor	Colac	7.8.07	S.S.C.
375	Flashwood	5 years	Jno. Griffin	St. Arnaud	28.8.07	W.J.C.
480	Forest Boy	6 years	L. Fawkner	Morwell	16.9.07	W.J.C.
1691	Frisk	Aged	W. Stewart	Dandenong	21.9.09	W.R.
542	Galloway	..	..	Horsham Show	24.9.07	S.S.C.
1375	Galway	5 years	B. Conole	Portland	7.10.08	W.J.C.
547	Garfield	Aged	R. A. Gibson	Hamilton Show	19.9.07	N.McD.
1024	Garnet	4 years	J. T. Ingram	Romsey	14.8.08	W.J.C.
1707	Gaylad	Aged	S. Uren	Korumburra	22.9.09	W.R.
164/3	Gay Laddie	3 years	Edward Cuthbert	Camperdown	8.9.09	W.R.
1130	General	Aged	P. H. Satchwell	Camperdown	19.8.08	J.L.
281	Gladstone	Aged	— Collins	Tatura	24.8.07	W.R.
1708	Glengarry	5 years	Thos. Perridge	Cranbourne	23.9.09	W.J.C.
457	Glengarry	..	T. W. McCullough	Warrnambool	10.9.07	W.J.C.
1645	Gold Dust	5 years	J. Williamson	Ballarat	11.9.09	W.J.C.
188/3	Golden King	3 years	J. Simmons	Warragul	23.9.09	W.R.
1635	Governor	6 years	Chas. Bayne	Colac	9.9.09	W.R.
959	Gratis	..	R. Crawford	Numurkah	4.8.08	S.S.C.
917	Graywood	Aged	P. Glasheen	Charlton	23.7.08	W.J.C.
628	Grey Steel	6 years	S. McNabb	Maffra Show	24.10.07	W.J.C.
63	Griffo	Aged	T. Daffy	Colac	7.8.07	S.S.C.
1104	Gulliver	3 years	Rd. Crowle	St. Arnaud	18.8.08	E.A.K.
205	Hamilton Emulator Junior	5 years	W. H. Horn	Hamilton	17.8.07	W.R.
620	Harlequin	4 years	J. Daniel	Ballarat Show	17.10.07	S.S.C.
444	Heather Jock	Aged	R. Bollis	Warrnambool	10.9.07	W.J.C.
123/3	Heather Jock	3 years	Oscar Thomas	Dimboola	20.8.09	W.J.C.
238	Heather Lea	Aged	Elson & O'Keefe	Nhill	21.8.07	S.S.C.
52/3	Hercules	3 years	S. T. Alford	Melbourne	27.7.09	W.R.
1206	Here It Is	4 years	W. E. Rosling	Royal Show	28.8.08	J.L.

List of Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
	Ponies—*continued.*					
191	Here's Luck ..	4 years	F. C. Thomas ..	Warracknabeal ..	15.8.07	W.R.
1333	Highlandman ..	Aged	W. Peacock ..	Warragul ..	24.9.08	W.R.
1488	Ian Dhu	5 years	P. C. Richards ..	Ararat	9.8.09	W.R.
1391	Jack Spratt ..	Aged	Paterson Bros. ..	Numurkah Show	23.10.08	E.A.K.
94	Jimmy Governor ..	Aged	Wm. Nosedale ..	Melton	10.8.07	S.S.C.
1360	J.M.	5 years	Joseph Anderson..	Corryong ..	3.10.08	E.A.K.
13	John Gilpin ..	6 years	J. Patterson ..	Mirboo	25.10.06	S.S.C.
680	Johnny O'More ..	6 years	John McDonald ..	Grantville and Jeetho Show	16.1.08	W.R.
193	John Osterley Junior	4 years	Thompson Bros. ..	Warracknabeal ..	14.8.07	W.R.
49/3	Joy Bells	3 years	Mrs. E. Montgomery	Melbourne ..	27.7.09	W.R.
1718	Jubilant	6 years	C. Lancaster ..	Castlemaine ..	23.9.09	E.A.K.
1361	Jubilee	Aged	T. B. Waters, jun.	Corryong ..	3.10.08	E.A.K.
435	Kaizer II. ..	Aged	A. S. O'Keefe ..	Royal Show ..	7.9.07	S.S.C.
1334	Kelpie	Aged	G. Freekleton ..	Warragul ..	24.9.08	W.R.
1136	King	6 years	W. H. Morgan ..	Donald	19.8.08	E.A.K.
619	King Bally ..	Aged	Downey & Lumsden	Ballarat Show ..	17.10.07	S.S.C.
623	King Bally's Pride ..	3 years	F. J. Ellsworth ..	Ballarat Show ..	17.10.07	S.S.C.
52	King Billy ..	Aged	H. Jenkins ..	Hopetoun ..	3.8.07	W.J.C.
1636	King James ..	Aged	Beazley Estate ..	Colac	9.9.09	W.R.
501	King James ..	5 years	Wm. Johnson ..	Mirboo North ..	24.9.07	N.McD.
1300	King Jimmie ..	Aged	P. Pearce ..	Smeaton ..	17.9.08	J.L.
6	King Jimmy ..	4 years	E. Wilson ..	Korumburra ..	29.9.06	S.S.C.
593	King Jimmy ..	Aged	R. Tankard ..	Maryborough Show	16.10.07	S.S.C.
1387	King Jimmy II. ..	5 years	T. Larcombe ..	Geelong Show ..	21.10.08	W.J.C.
1629	King Pasha ..	Aged	Michael Hickey ..	Camperdown ..	8.9.09	W.R.
1171	Landmark ..	5 years	W. J. Cannon ..	Condah	26.8.08	J.L.
373	Larry Boy ..	..	F. Clover ..	St. Arnaud ..	28.8.07	W.J.C.
176	Lawyer	Aged	J. A. Cooper ..	Maffra	18.8.07	W.J.C.
1301	Lee Rose	Aged	J. J. Sullivan ..	Smeaton ..	17.9.08	J.L.
386	Leetch	Aged	A. Ferguson ..	Casterton ..	28.8.07	W.R.
299	Leopard	Aged	H. Baldock ..	Kaniva	28.8.07	N.McD.
1612	Leo's Pride ..	4 years	A. H. Scott ..	Royal Show ..	31.8.09	W.R.
888	Little Bert ..	3 years	A. W. Ragg ..	Agricultural Offices	1.8.08	W.R.
1323	Little Jack ..	3 years	R. J. Argyle ..	Kyneton ..	24.9.08	W.J.C.
1685	Little Jack Horner	4 years	W. B. Irvine ..	Bairnsdale ..	15.9.09	W.R.
167	Little Jim.. ..	Aged	P. J. McAuliffe ..	Benalla	17.8.07	S.S.C.
637	Little Jim.. ..	6 years	H. E. Beard ..	Colac Show ..	24.10.07	S.S.C.
1411	Little Johnnie ..	3 years	Jno. Hancock ..	Colac	28.11.08	E.A.K.
1324	Little Mick ..	3 years	N. Aitken ..	Kyneton ..	24.9.08	W.J.C.
242	Little Pride ..	Aged	W. H. Treloar ..	Nhill	21.8.07	S.S.C.
521	Little Tich ..	5 years	W. Hogan ..	Kyneton ..	26.9.07	W.R.
1558	Little Warrior ..	4 years	J. White ..	Benalla ..	23.8.09	J.L.
219	Little Wonder ..	Aged	J. White ..	Minyip	21.8.07	W.R.
707	Little Wonder ..	3 years	A. Wells ..	Melbourne ..	14.7.08	S.S.C.
403	Little Wonder ..	Aged	F. McDonald ..	Mansfield ..	30.8.07	W.J.C.
36/2	Little Wonder II. ..	2 years	M. Ryan ..	Minyip	17.8.09	W.J.C.
890	Llandor	Aged	W. Nebel ..	Agricultural Offices	1.8.08	W.R.
740	Llandovery ..	5 years	J. Phillips ..	Agricultural Offices	18.7.08	W.R.
1413	Llewyn True Blue ..	Aged	G. L. Wilson ..	Melbourne ..	21.12.08	W.J.C.
156/3	Lou Lou's Dandy ..	3 years	C. Jones and Sons	Royal Show ..	31.8.09	W.J.C.
496	Lord Brassey ..	Aged	A. E. Millar ..	Stawell Show ..	18.9.07	W.R.
499	Lord Brassey II. ..	Aged	A. Miller ..	Rupanyup ..	20.9.07	W.R.
40	Lord Dandy ..	5 years	Jas. Alexander ..	Traralgon ..	31.7.07	S.S.C.
484	Lord Roberts ..	Aged	J. Biggar ..	Korumburra ..	18.9.07	W.J.C.
1632	Made to Order ..	6 years	H. Wright ..	Portland ..	9.9.09	E.A.K.
1013	Mahomet	..	A. Brown ..	Minyip	12.8.08	W.R.
191/3	Maori	3 years	C. Tulloch ..	Korumburra ..	22.9.09	W.R.
442	Marbro	Aged	J. Davidson ..	Warrnambool ..	10.9.07	W.J.C.
173/3	Mardanite II. ..	3 years	A. Webb ..	Mirboo	14.9.09	W.R.
1106	Masher Boy ..	Aged	Bilton Bros. ..	St. Arnaud ..	18.8.08	E.A.K.
1544	Mask Dandy ..	Aged	George Neild ..	Swan Hill ..	18.8.09	W.R.
186/3	Melboy	3 years	A. Bikerdike ..	Bunyip	20.9.09	W.R.
1215	Mick	Aged	W. Sealey, jun. ..	Casterton ..	26.8.08	W.J.C.
76	Mickey Free ..	Aged	J. McInerney ..	Dookie	27.7.07	W.J.C.
140	Midnight	Aged	J. O'Brien ..	Wangaratta ..	15.8.07	S.S.C.
184/3	Midwinter ..	3 years	Jas. McGill ..	Tallangatta ..	21.9.09	W.J.C.
486	Minstrel	4 years	R. N. Scott ..	Korumburra ..	18.9.07	W.J.C.
17	Monowai	Aged	S. Perrin ..	Mirboo	25.10.06	S.S.C.
1485	Monte Bells ..	4 years	C. Nolte ..	Casterton ..	6.8.09	W.J.C.
55/3	Mountain Bells ..	3 years	J. C. Porter ..	Melbourne ..	27.7.09	W.R.
1312	My Own	6 years	Jno. Minns ..	Melton	18.9.08	J.L.
1107	Najar Reed ..	4 years	J. Bray ..	St. Arnaud ..	18.8.08	E.A.K.

List of Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			Ponies—*continued.*			
320	Nelson	Aged	White Bros. ..	Lilydale ..	23.8.07	W.J.C.
341	Newbold	Aged	Thos. Brown ..	Elmore	26.8.07	W.J.C.
991	Nick-a-Jack ..	6 years	J. Silva ..	Tallangatta ..	7.8.08	W.R.
148	Nigger	Aged	P. Quirk ..	Sea Lake ..	15.8.07	N.McD.
108/3	Nipper	3 years	W. Kennedy, junr.	Nhill	18.8.09	W.J.C.
1264	Orion	Aged	W. Shaw ..	Ballarat ..	11.9.08	W.J.C.
981	Parsee	Aged	Witherow Bros. ..	Wangaratta ..	5.8.08	W.J.C.
106	Pasha	..	— Bones ..	Donald	14.8.07	W.J.C.
139/3	Patrick T. ..	3 years	A. Colvin ..	Nathalia ..	24.8.09	W.J.C.
1489	Pearlfisher ..	Aged	D. J. Crossley ..	Ararat	9.8.09	W.R.
393	Peep of Day ..	Aged	W. G. Hicks ..	Seymour ..	29.8.07	W.J.C.
51/2	Perfection ..	2 years	G. G. Orchard ..	Royal Show ..	31.8.09	W.J.C.
1457	Petit Maitre ..	Aged	J. R. Johnston ..	Melbourne ..	27.7.09	J.L.
1403	Pippin	Aged	Harrison Bros. ..	Ballarat Show ..	12.11.08	W.R.
217	Planet	5 years	Neil McGilp ..	Minyip	21.8.07	W.R.
252	Planet	Aged	W. Raven ..	Yarram ..	21.8.07	N.McD.
385	Pluto	Aged	J. M. Scott ..	Casterton ..	28.8.07	W.R.
215	Polo	Aged	Quinlan & McLean	Minyip	21.8.07	W.R.
1436	Polo Clem	4 years	Quinlan and McLean	Horsham ..	14.7.09	W.J.C.
379	President	6 years	A. & D. Parry ..	St. Arnaud ..	28.8.07	W.J.C.
1327	Preston	5 years	McClare and Son	Kyneton ..	24.9.08	W.J.C.
1373	Prospect	Aged	Jake Pill ..	Portland ..	7.10.08	W.J.C.
478	Prince Bally ..	6 years	J. J. O'Meara ..	Morwell ..	16.9.07	W.J.C.
204/3	Prince Dandy ..	3 years	F. Irish ..	Agricultural Offices	20.11.09	E.A.K.
1029	Prince Leo II. ..	3 years	R. F. Watson ..	Agricultural Offices	15.8.08	W.R.
669	Prince Leo Junior ..	3 years	J. E. Phillips ..	Heidelberg ..	13.11.07	S.S.C.
1567	Prince Rufus ..	Aged	A. E. Ambler ..	Yarrawonga ..	24.8.09	J.L.
621	Quercus	6 years	A. E. Callow ..	Ballarat Show ..	17.10.07	S.S.C.
694	Quicksilver ..	Aged	P. Dore ..	Bunyip Show ..	26.2.08	W.R.
82/3	Radium	3 years	S. Lancaster ..	Goroke	4.8.09	E.A.K.
1490	Rafferty	Aged	F. Herbertson ..	Ararat	9.8.09	W.R.
941	Ranji	Aged	J. Sangster ..	Heatchote ..	3.8.08	W.R.
671	Reuben	Aged	R. P. Nicol ..	Yarram Show ..	20.11.07	W.J.C.
1281	Rhyll	Aged	McMillan Bros. ..	Lang Lang ..	11.9.08	E.A.K.
65	Rhymney	5 years	C. T. Lucas ..	Colac	7.8.07	S.S.C.
1652	Rhysharold ..	Aged	A. Hunt ..	Kilmore ..	14.9.09	W.J.C.
1710	Riza Pasha ..	Aged	P. F. Meagher ..	Kyneton ..	21.9.09	E.A.K.
601	Robert	3 years	Vandamme and Foster	Coburg	23.10.07	N.McD.
1559	Robin	Aged	Jno. Dalmain ..	Geelong ..	19.8.09	J.L.
172	Rob Roy	..	J. R. & H. J. Manson	Maffra	16.8.07	W.J.C.
192	Rob Roy	6 years	W. J. Clarke ..	Warracknabeal ..	14.8.07	W.R.
1392	Rob Roy	6 years	Hugh Burke ..	Numurkah Show	23.10.08	E.A.K.
1656	Rocket	4 years	R. Pinnock ..	Lilydale ..	11.9.09	E.A.K.
1615	Roman Warrior ..	Aged	Capt. Phillip Charley	Royal Show ..	31.8.09	W.R
1364	Rory's Pride ..	Aged	A. W. Acocks ..	Corryong ..	3.10.08	E.A.K.
139	Rosslyn	..	J. B. Bryan ..	Wangaratta ..	15.8.07	S.S.C.
199/3	Rover	3 years	W. Troup ..	Werribee ..	21.10.09	W.J.C.
531	Roy	3 years	Summerhill Stud Farm	Kyneton ..	26.9.07	W.R.
113	Roy	3 years	A. Robinson ..	Euroa	14.8.07	S.S.C.
900	Roy	Aged	W. Pitcairn ..	Melbourne ..	28.7.08	W.J.C.
1208	Roy	Aged	T. E. Smith ..	Royal Show ..	28.8.08	E.A.K.
1108	Rush Harold ..	4 years	W. T. Boulton ..	St. Arnaud ..	18.8.08	E.A.K.
774	Rusty	Aged	Thos. Grace ..	Goroke	21.7.08	S.S.C.
109/3	Royal Dandy ..	3 years	Patrick Furey ..	Boort	10.8.09	E.A.K.
1196	Royal Fauntleroy ..	4 years	P. D. Ferrier ..	Royal Show ..	28.8.08	J.L.
1117	Sahara	Aged	C. L. Green ..	Bairnsdale ..	19.8.08	W.R.
983	Samson	Aged	J. Simpson ..	Wangaratta ..	5.8.08	W.J.C.
467	Sam Weller ..	Aged	Jno. Hicks ..	Alexandra ..	14.9.07	W.J.C.
105/3	Sarsfield	3 years	Thos. Long ..	Minyip	17.8.09	W.J.C.
1217	Seccoloni	Aged	G. McClyon ..	Casterton ..	26.8.08	W.J.C.
369	Shamrock	Aged	A. Ross ..	St. Arnaud ..	28.8.07	W.J.C.
25	Shamrock	6 years	Gildea Bros. ..	Horsham ..	18.7.07	S.S.C.
1197	Shamrock	4 years	Jas. May ..	Royal Show ..	28.8.08	W.R.
962	Shanter II. ..	Aged	Joe Stephens ..	Numurkah ..	4.8.08	S.S.C.
771	Shanter Again ..	6 years	Chas. McKay ..	Stawell	20.7.08	S.S.C.
759	Shanter's Ghost ..	5 years	E. McIntyre ..	Horsham ..	16.7.08	S.S.C.
203	Shroff King ..	Aged	W. S. Anderson ..	Horsham ..	17.8.07	W.R.
1126	Shylock II. ..	Aged	Fred. Coy ..	Terang	19.8.08	J.L.
639	Silverbells ..	Aged	W. H. Boston ..	Colac Show ..	24.10.07	S.S.C.
1014	Silver Boy ..	Aged	R. Glover, jun. ..	Minyip	12.8.08	W.R.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			PONIES—*continued.*			
1500	Silver King ..	5 years	H. Naylor ..	Beulah	12.8.09	J.L.
1592	Silver King ..	5 years	H. Gulliver ..	Wangaratta ..	25.8.09	W.J.C.
61/2	Silver King ..	2 years	B. A. Hall	Maffra ..	18.9.09	W.R.
775	Silver King ..	Aged	A. B. Burns ..	Goroke	21.7.08	S.S.C.
1209	Silver Prince ..	4 years	J. Prout ..	Royal Show ..	28.8.08	W.R.
181/3	Sirdan	3 years	A. Ward ..	Seymour ..	17.9.09	W.J.C.
409	Siva Junr. ..	5 years	G. F. Elliott ..	Mansfield ..	30.8.07	W.J.C.
357	Skipper	4 years	T. Gray .	Echuca	24.8.07	W.J.C.
761	Skylark	Aged	Copping Bros. ..	Horsham ..	16.7.08	S.S.C.
690	Sloper	3 years	T. Patullo ..	Bunyip Show ..	26.2.08	W.R.
443	Smithill's Fireboy ..	3 years	W. B. Harper ..	Warrnambool ..	10.9.07	W.J.C.
906	Snapshot	Aged	F. H. Walsh ..	Melbourne ..	28.7.08	W.R.
1507	Snowball	4 years	C. Alson ..	Jeparit	11.8.09	W.J.C.
168	Soda	Aged	— Rogash ..	Benalla ..	17.8.07	S.S.C.
1482	Souter	6 years	Jas. Fogarty ..	Agricultural Offices	7.8.09	W.R.
597	Souter Johnnie Junr.	Aged	Kelly and Zimmerman	Donald	14.8.07	W.J.C.
992	Sovereign	4 years	J. McDonald ..	Tallangatta ..	7.8.08	W.R.
566	Speculation ..	Aged	S. Archibald ..	Numurkah Show	9.10.07	W.J.C.
689	Sprightly	Aged	C. J. Bradbury ..	Leongatha Show	11.2.07	S.S.C.
84/3	Squib	3 years	D. Robertson ..	Ararat	9.8.09	W.R.
1655	Starlight	5 years	G. Faucke ..	Morwell ..	13.9.09	W.R.
394	Steel Arrow ..	Aged	H. Sawyer ..	Seymour ..	29.8.07	W.J.C.
1514	St. Enuc	Aged	P. A. West .	Beaufort ..	13.8.09	W.J.C.
430	Subadah	Aged	R. W. Noble ..	Geelong ..	31.8.07	S.S.C.
285	Sultan	Aged	H. Gordon ..	Tatura ..	24.8.07	W.R.
31	Sultan	Aged	W. Baker ..	Horsham ..	18.7.07	S.S.C.
1297	Sunbeam	Aged	Mrs. B. Folliott Sandford	Lilydale ..	17.9.08	E.A.K.
1005	Sunbeam	3 years	W. Church ..	Dookie	8.8.08	E.A.K.
515	Sunrise	6 years	Blight Bros. ..	Elmore Show ..	25.9.07	W.R.
1491	Swift	6 years	J. Gleeson ..	Ararat	9.8.09	W.R.
1583	Sir Charles ..	6 years	L. and E. Harrison	Rochester ..	30.8.09	J.L.
1337	Sir Fauntleroy ..	3 years	F. A. Gilbertson ..	Warragul ..	24 9.08	W.R.
904	Sir Hector ..	Aged	T. Pemill ..	Melbourne ..	28.7.08	W.J.C.
7	Sir Richard III. ..	5 years	Clarke Bros. ..	Korumburra ..	29.6.06	S.S.C.
1003	Sir Rupert ..	6 years	J. McInerney ..	Dookie	8.8.08	E.A.K.
665	Taffy	5 years	A. Williams ..	Traralgon Show ..	13.11.07	W.R.
909	Taffy	Aged	C. Piffero ..	Melbourne ..	28.7.08	W.J.C.
510	Tam	Aged	— Quinn ..	Camperdown Show	26.9.07	W.J.C.
166	Tam O'Shanter ..	6 years	H. Burness ..	Benalla ..	17.8.07	S.S.C.
1549	Tam O'Shanter ..	Aged	R. C. Hannah ..	Donald	19.8.09	E.A.K.
583	Tam O'Shanter ..	Aged	A. Haebish ..	Jeparit Show ..	16.10.07	W.J.C.
1066	Tam O'Shanter ..	3 years	T. W. Constable ..	Colac	18.8.08	W.J.C.
338	Teviot	Aged	J. Spark ..	Elmore	26.8.07	W.J.C.
479	Timmy	Aged	G. Bond ..	Morwell ..	16.9.07	W.J.C.
1653	Tom Moore ..	Aged	R. Stubber ..	Mirboo	14.9.09	W.R.
471	Tommy	4 years	Jno. Turner ..	Alexandra ..	14.9.07	W.J.C.
1384	Tommy Bent ..	5 years	R. London ..	Bendigo Show ..	14.10.08	E.A.K.
1047	Tommy Bent ..	4 years	Harry Jenz ..	Jeparit	13.8.08	J.L.
1601	Tommy Burns ..	5 years	W. Burke ..	Rutherglen ..	26.8.09	W.J.C.
47	Tommy Dod ..	Aged	S. S. Davey ..	Pyramid ..	3.8.07	S.S.C.
1642	Tom Tit	Aged	R. Jukes ..	Maryborough ..	11.9.09	W.J.C.
995	Toney II. ..	4 years	M. Hagan ..	Euroa	7.8.08	W.J.C.
263	Tony	4 years	W. Kennedy ..	Cobram ..	23.8.07	N.McD.
1172	Trump	Aged	A. W. Thompson	Condah ..	26.8.08	J.L.
914	Twilight	4 years	Alf. Neave ..	Melbourne ..	28.7.08	W.R.
527	Tyrone	Aged	A. W. Harvey ..	Kyneton ..	26.9.07	W.R.
487	The Bohemian ..	5 years	C. J. Colgan ..	Korumburra ..	18.9.07	W.J.C.
157/3	The Colonel ..	3 years	Geo. Woodmason	Royal Show ..	31.8.09	W.J.C.
177	The Count ..	5 years	T. B. Anderson ..	Maffra	16.8.07	W.J.C.
135/3	The Don	3 years	E. Ryan ..	Benalla ..	23.8.09	J.L.
15	The Dude ..	..	— Hall ..	Mirboo	25.10.06	S.S.C.
1410	The Gaffer ..	5 years	Jno. R. Mallinson	Camperdown Show	26.11.08	E.A.K.
1509	The Joker	Aged	H. H. Whitfield ..	Kaniva	12.8.09	W.J.C.
1600	The Joker	6 years	W. Wheeler, jun.	Rutherglen ..	26.8.09	W.J.C.
1510	The Kaffir ..	6 years	T. N. Skinner ..	Kaniva	12.8.09	W.J.C.
910	The King	4 years	J. Widdis ..	Melbourne ..	28.7.08	W.J.C.
1340	The Lad	4 years	F. H. Beasley ..	Warragul ..	24 9.08	W.R.
389	The Masher ..	3 years	Tompkins Bros. ..	Casterton ..	28.8.07	W.R.
1234	The Masher ..	Aged	Harper Wasson ..	Leongatha ..	9.9.08	E.A.K.
138	The Premier ..	..	F. W. Briggs ..	Wangaratta ..	15.8.07	S.S.C.
387	The Souter ..	Aged	A. Porteous ..	Casterton ..	28.8.07	W.R.
1599	The Swell ..	4 years	J. A. O'Donnel ..	Rutherglen ..	26.8.09	W.J.C.
697	The Warrior ..	4 years	— McKoy ..	Tallangatta Show	5.3.08	W.J.C.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date.	Officer.
			PONIES—*continued.*			
695	The Welsh Prince ..	Aged	Mrs. B. Folliott Sandford	Lilydale Show ..	4.3.08	W.R.
1345	Uncle Sol	Aged	Jno. McDonald ..	Horsham Show ..	25.9.08	S.S.C.
206	Utah	Aged	Malcolm Bros. ..	Hamilton ..	17.8.07	W.R.
1173	Vanity	Aged	D. Coutts ..	Condah	26.8.08	J.L.
1182	Victor	6 years	C. Young ..	Ararat	7.9.08	W.J.C.
1560	Victory	Aged	J. A. McLelland ..	Benalla ..	23.8.09	J.L.
915	Victory	4 years	Jno. Bell ..	Melbourne ..	28.7.08	W.J.C.
218	Von Atom II. ..	5 years	G. Padget ..	Minyip	21.8.07	W.R.
1508	Wakeful Dick ..	Aged	Turvey and Son ..	Jeparit	11.8.09	W.J.C.
1608	Wallasey Ping Pong	5 years	Hope Osborne and Bros.	Royal Show ..	31.8.09	W.J.C.
1268	Wanrua Lad ..	5 years	K. Taylor ..	Ballarat ..	11.9.08	W.J.C.
98	Wee Gibbie ..	4 years	J. Devlin and Son	Murtoa	9.8.07	W.J.C.
967	Wee Mick ..	5 years	Thos. Haley ..	Tungamah ..	4.8.08	W.J.C.
34/3	Welsh Flyer ..	3 years	Jno. F. Beasley ..	Horsham ..	15.7.09	W.J.C.
1203	Welsh Flyer IV. ..	Aged	S.O. and E.N. Wood	Royal Show ..	28.8.08	J.L.
193/3	Welshman ..	3 years	Wm. Hogan ..	Kyneton ..	21.9.09	E.A.K.
1067	Whalebone ..	Aged	R. Farquharson ..	Colac	18.8.08	J.L.
437	What's Wanted ..	Aged	S. O. Wood ..	Royal Show ..	7.9.07	S.S.C.
1616	Who Comes Here ..	4 years	G. Forsyth ..	Royal Show ..	31.8.09	W.R.
1079	Wizard	4 years	Jno. Kendall ..	Bendigo ..	19.8.08	W.J.C.
512	Young Aladdin ..	Aged	R. Kelly ..	Camperdown ..	26.9.07	W.J.C.
493	Young Australia ..	5 years	J. A. Dalgleish ..	Stawell	18.9.07	W.R.
764	Young Bally Gaully	Aged	Mrs. J. C. Bullen	Horsham ..	16.7.08	S.S.C.
69	Young Brigham ..	4 years	A. S. Lucas ..	Colac	7.8.07	
1306	Young Brigham ..	Aged	T. Parkin ..	Smeaton ..	17.9.08	J.L.
216	Young Brigham ..	Aged	D. McGilp ..	Minyip	21.8.07	W.R.
1385	Young Britain ..	4 years	O. Vegele ..	Bendigo Show ..	14.10 08	E.A.K.
651	Young Briton ..	Aged	J. O'Keefe ..	Murchison Show ..	30.10.07	W.R.
78	Young Briton ..	5 years	W. G. Ballantyne	Dookie	27.7.07	W.J.C.
604	Young Briton ..	..	Heinz Bros. ..	Ballarat Show ..	17.10.07	S.S.C.
1132	Young Clem ..	5 years	J. J. Wiggins ..	Camperdown ..	19.8.08	J.L.
1617	Young Comet II. ..	4 years	R. Whitechurch ..	Royal Show ..	31.8.09	W.R.
1145	Young Dandy ..	Aged	W. Horswood ..	Berwick ..	21.8.08	W.R.
27	Young Dandy II. ..	5 years	A. E. Officer ..	Horsham ..	18.7.07	S.S.C.
777	Young Docken ..	5 years	M. O'Neil ..	Goroke	21.7.08	S.S.C.
240	Young Doctor ..	Aged	W. Kennedy ..	Nhill	21.8.07	S.S.C.
1717	Young Emulator ..	4 years	Skehan Bros. ..	Romsey	20.9.09	E.A.K.
1278	Young Fauntleroy ..	4 years	Wm. McCraw ..	Lang Lang ..	11.9.08	E.A.K.
540	Young Garfield ..	Aged	.. ..	Horsham Show ..	24.9.07	S.S.C.
327	Young General ..	Aged	W. Marshall ..	Lilydale ..	23.8.07	W.J.C.
1158	Young Gladstone ..	..	M. McCartin ..	Geelong ..	20.8.08	W.J.C.
956	Young Governor Tracy	4 years	J. H. Tuckett ..	Nathalia ..	3.8.08	S.S.C.
277	Young Haukam ..	3 years	Jas. Baker ..	Shepparton ..	24.8.07	S.S.C.
11	Young Hero ..	3 years	Alex. Scott ..	Korumburra ..	29.9.06	S.S.C.
1671	Young Hero ..	Aged	J. B. Wilson ..	Berwick ..	17.9.09	E.A.K.
1609	Young Hero ..	5 years	T. H. L. Rodda ..	Royal Show ..	31.8.09	W.J.C.
408	Young Hero ..	Aged	A. J. Phillips ..	Mansfield ..	30.8.07	W.J.C.
378	Young Hero ..	Aged	T. Moss ..	St. Arnaud ..	28.8.07	W.J.C.
1176	Young Kiki ..	6 years	S. Winter Cooke ..	Condah ..	26.8.08	J.L.
594	Young King Charles	4 years	E. Culvenor ..	Maryborough ..	16.10.07	S.S.C.
1061	Young Leopard ..	5 years	G. Yetman ..	Rainbow ..	11.8.08	E.A.K.
1353	Young Lingeropper	Aged	W. Stewart ..	Yarrawonga Show	23.9.08	J.L.
889	Young Llandor ..	Aged	W. Nebel ..	Agricultural Offices	1.8.08	W.R.
1231	Young Natty ..	3 years	P. Cain ..	Mirboo North ..	8.9.08	W.R.
567	Young Nelson ..	6 years	Jno. Paterson ..	Numurkah Show	9.10.07	W.J.C.
1404	Young Prince Aladdin	6 years	R. E. Ralph ..	Ballarat Show ..	12.11.08	W.R.
574	Young Robin ..	Aged	J. Taylor, jun. ..	Dimboola Show ..	11.10.07	S.S.C.
767	Young Rory O'More	3 years	Jas. Hamilton ..	Horsham ..	16.7.08	S.S.C.
1331	Young Rysharold ..	5 years	J. Brown ..	Kyneton ..	24.9.08	W.J.C.
660	Young Sailor ..	Aged	J. F. Kirby ..	Coleraine Show ..	6.11.07	W.J.C.
1082	Young Sampson ..	6 years	W. Barker ..	Bendigo ..	19.8.08	W.J.C.
1412	Young Shanter ..	4 years	P. Ambler ..	Agricultural Offices	3.12.08	W.R.
500	Young Silver King	5 years	A. T. Darling ..	Rupanyup Show	20.9.07	W.R.
1088	Young Texas ..	3 years	R. A. Bateson ..	Kaniva	15.8.08	E.A.K.
1089	Young Tommy Dod	6 years	F. Saltmarsh ..	Kaniva	15.8.08	E.A.K.
1515	Young Trafalgar	5 years	G. A. Dunnett ..	Beaufort ..	13.8.09	W.J.C.

Agricultural Education in Victoria.

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Vol. VIII. WHEAT IMPROVEMENT. UNSOUNDNESS IN HORSES. Part 5.

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J. T. SHARP, Editor.

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WHEAT IMPROVEMENT COMMITTEE.

I.—EXPERIMENTAL WORK AT LONGERENONG AGRICULTURAL COLLEGE, 1909-10.

Mr. J. T. Pridham, Wheat Experimentalist, who is in charge of the wheat plots at the Longerenong Agricultural College, has furnished the Wheat Improvement Committee with the following notes on the work of the past year, 1909-10:—

Field Sowings.

The fallow was clean and free from weeds until the last week of April, when the unusually heavy autumn rains set in. The sowing operations were a good deal delayed and it was found impossible to cover the weeds which, early in May, germinated very thickly all over the area. The consequence was that the yields were rather poor although the College Purple Straw variety, which was sown under more favourable conditions than the others, at one time promised to yield 20 to 24 bushels per acre. It suffered severely, however, from heavy winds just before harvest and this was the case with other crops of Purple Straw in the Wimmera last season.

The following are the yields obtained:—

Variety.	Area. Acres.	Sown.	Yield per acre. bus.	lbs.
Bunyip	9 ...	11th May ...	12	48
Comeback	8.85 ...	25th May ...	10	40
College Purple Straw ...	10 ...	26th May ...	14	45
Yandilla King	10 ...	7th June ...	12	4
Federation	4 ...	11th June ...	15	5

The varieties considered most suitable for the district are Federation, Yandilla King and Bunyip.

Federation stands up remarkably well, holds its grain very satisfactorily and matures early. Its chief recommendation to the grower is its heavy yielding capacity. Attention has been drawn lately by some millers to the fact that Federation produces flour of a yellowish colour to which the bakers object. There used to be a prejudice against anything but a perfectly white loaf in New South Wales but on a recent visit to that State it was found that a yellowish tint is not now objected to; as a matter of fact, such bread, as a rule, is more nutritious than bread of a starchy whiteness. It is to be hoped, in the interests of both consumer and farmer, that the colour question in flour will not be too strongly insisted upon by the public. In England, America, India and Australia the wheats which produce the richest and best bread are apt to show a yellow tint. Federation is a wheat which is of good milling quality, as well as being a heavy grain producer, and if its grain be mixed with that of varieties yielding weaker flour the colour objected to can be overcome. In some country mills, where Federation is almost entirely grown in the district, there will be a difficulty in securing a desirable blend until the public are satisfied with bread of a less blanched appearance and richer in muscle-forming constituents.

WEEDING.

Yandilla King is late in maturing and, as our experiments for the past two years show, produces a number of sterile spikelets that is, forms a larger ear than it is able to fill with grain. In spite of this wasted energy it is a prolific variety and has straw of medium height and stout quality. It holds its grain satisfactorily and produces flour of medium strength, rather white in colour and with a good percentage of gluten. It is a good wheat for early sowings, while Federation should be sown later and Bunyip last. Unlike Federation, it is a very fair hay wheat and the grain, when mixed with Federation, should find favour with millers. It does not become knocked about in rough weather like many of the Purple Straw varieties for which it might well be substituted.

Bunyip is the quickest to mature of any variety we have yet grown in field trials and it produces a plump grain in almost any season. It should always be sown late and is a valuable variety to have when sowing is delayed by unfavourable weather; it is also a very fair hay wheat. Although the straw is not strong, it stands up well enough to be harvested. The experiment was tried of sowing this variety early last season but the straw grew too tall and showed a tendency to break down; when sown towards the end of the season, however, the straw is shorter and there is no variety that will grow more quickly and produce a good crop. It does not shake its grain with us and the sample is of very good milling quality.

These three wheats should succeed in all wheat-growing districts except those subject to rusty seasons; where this disease is prevalent Marshall's No. 3 and Yandilla King will probably give best results.

Other varieties deserving of mention are—

College Purple Straw, a good yielder, but liable to damage by heavy winds from a brittleness of the straw near the top, causing the ears to snap off.

Comeback is a variety of the highest milling excellence, but we cannot recommend it to farmers on account of the relatively poor return it gives in comparison with Federation, and, until quality in the grain of wheat is recognised, it will not pay the grower to sow it.

CROSSBREDS AND THEIR MOTHERS.

(The hoe stands against a row of crosses (first generation). The crosses are the more vigorous.)

Dart's Imperial is a good variety for hay and might be grown to some extent for grain, but the flour it yields is weak and on an average it is certainly not so prolific as Federation.

Single Row Experiments.

Single rows, as opposed to field sowings with the seed-drill, were planted to the extent of nearly 3 acres. They are 1 chain long and the grains are dropped by hand singly 6 inches apart in the rows. The following areas were sown in this way:—

Variety.	Area. Acres.	Yield per Acre. Bushels.
Comeback	.5	... $12\frac{1}{2}$
Bunyip	.5	... 16
Amarilla Oat	.069	... $22\frac{3}{4}$
Crossbred Oat "136"	.142	... $19\frac{3}{4}$
Pedigree World's Champion Barley ...	.33	... $19\frac{3}{4}$

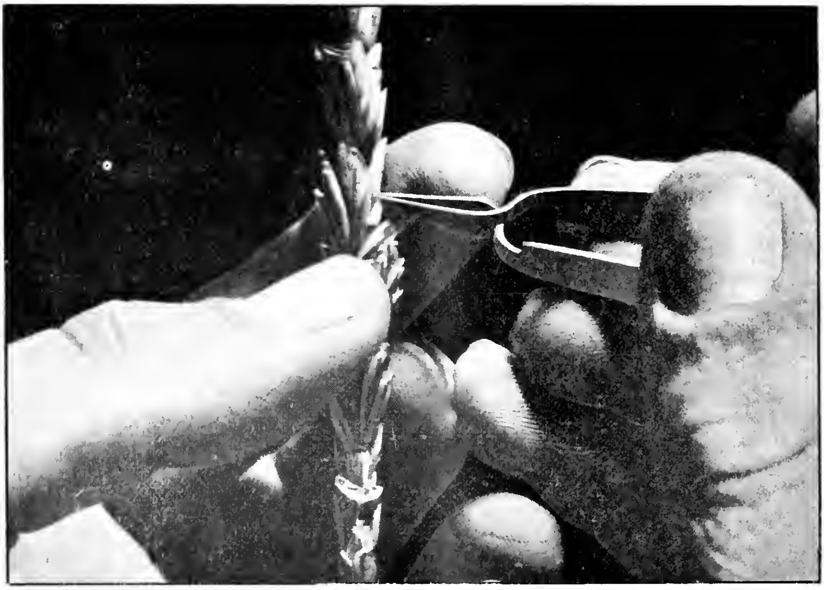
Oats and Barley.—The Amarilla Oat closely resembles Algerian but is reputed to be a heavier grain-yielder.

Oat No. 136 is a cross between Carter's Royal Cluster and Algerian and appears to yield quite as heavy a crop of hay as Algerian, and almost as much grain as that variety. It should replace the white oats where these are grown, as it produces a plumper sample of grain than the New Zealand and Tasmanian oats when grown in this State.

Some 120 rows were sown with a number of varieties obtained from Mr. Peacock of the Bathurst Experiment Farm, N.S.W.; also with crossbreds which grew here last season. Algerian oats succeeded best on an average. This variety was planted in every fifth row for comparison with the others.

The barley yielded a good sample of grain, but this is not a certain crop in the district and, except on soil of very uniform character, does not ripen evenly.

Variety trial.—In the second week of June, 139 rows were sown as a "variety trial" with Federation in every fifth row, the remainder being



CROSSING WHEAT.

(An anther containing pollen is suspended from the end of the forceps.)

planted with a different variety in each. It is necessary to have check rows of a standard variety at regular intervals so that accurate comparisons may be made. A number of plants selected from field crops in the Wimmera were sown in this section; a few of them exceeded Federation in yield and will be further used in crossing. In consequence of the crab-holey or uneven nature of the soil, it is found that more reliable results are secured by comparing the yields of a given number of the best plants in a plot, than by weighing the produce of entire plots.

A few very prolific strains of Purple Straw were isolated, but these, almost without exception, shake badly; this propensity can be corrected by crossing with Indian or Fife-Indian varieties.

Indian Wheats.—Of these wheats 55 rows were sown from samples obtained from the late W. Farrer's collection in the possession of Mr. Sutton, Wheat Experimentalist at Cowra, New South Wales. Although they were planted as late as the 5th of August, they yielded a fair crop and came into flower in time for crossing with late-maturing varieties. Their strong points are earliness, ability to hold their grain well, shortness of straw (which, however, is not strong and is too flexible) and, as a rule, the production of grain of high milling quality.

A number of rows were occupied by unfixed crossbreds which are undergoing a process of selection.

Imported Wheats.

Some Persian varieties were grown and found to be almost all of a bearded character with heads unprolific in type. Some English and American sorts tried were very late in maturing but may prove useful when crossed.

The Past Season's Crossing Work.

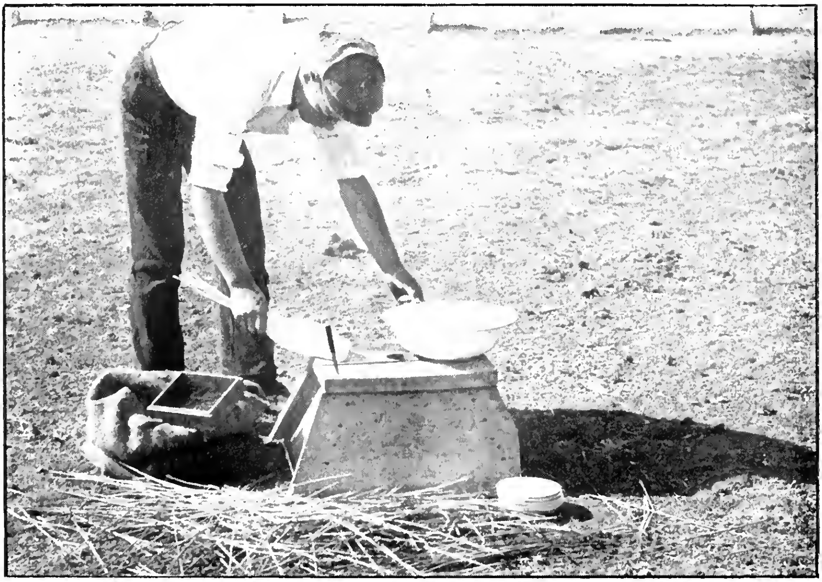
Over 100 crosses were made by myself and my assistant, Mr. Tulloh, who is becoming proficient in the operation. Except where very small, late ears were employed; there were no failures and the percentage throughout was satisfactory, the weather being favourable. The object in view was to secure wheats on the lines of Federation: prolific yielders with compact heads and short straw, assuming from last season's results that a short-straw variety is able to put more of its energy into grain-formation than a wheat with tall straw. The varieties produced must be of satisfactory milling quality and have no defect in the field which would disqualify them in the eyes of the farmer.

CROSSED HEAD OF WHEAT.

Pedigree or Stud-breeding.

Until superseded by a new variety we endeavour to keep the best of the old varieties up to a high standard of yield and quality by propagating from an approved strain, much in the same way as poultry breeders do with fowls, which can be traced back to a single prolific individual. The practice of gathering a number of fine heads in a field of wheat, irrespective of the character of the plants from which they are taken, can only result in an unsatisfactory mixture.

Although we have no new variety as yet which stands out conspicuously from the rest, we have some promising material in hand. The work of plant-breeding and improvement is necessarily slow, but its results, if persevered with on sound lines, are none the less sure.



THRESHING SELECTED PLANTS.

The Principal of the College, Mr. G. A. Sinclair, has shown his sympathy with the work the Department is carrying out here, and we are much indebted to him for facilities afforded.

HARVESTING SMALL SAMPLES.

Trial of Varieties of Wheat in plots 1 chain long, single grains dropped 5 to 6 inches apart.

No. Plot.	Variety.	Date Sown, 1909.	Began to Ear. 1909.	Maximum (5). Tillering Qualities	Maximum (5). Amount of Foliage.	Height of Crop (inches).	No. in average Ear. Fertile Spikelets.	No. in average Ear. Sterile Spikelets.	No. Grains per Average Spikelet.	No. Heads per Average Plant.	No. Plants Threshed	Date Ripe, 1909.	Date Harvested, 1909–10.	Average Yield per Plant Selected Ungraded. Actual (drams).	Average Yield per Plant Selected Ungraded. Percentage.	Average Yield per Selected Plant Graded (drams).	Yield best Selected Plant Graded (drams).
1	Federation* ..	11 June	25 Oct.	3½	3	37	19	2	3	14	6	20 Dec.	22 Dec.	5·22	100·00	4·85	5·60
2	Comeback	,,	21 ,,	2½	2	41	15	4	2–3	11	6	13 ,,	22 ,,	2·43	46·37	2·08	2·60
3	Pratt's Comeback ..	,,	21 ,,	3	2	42	17	3–4	2–3	15–16	6	13 ,,	22 ,,	3·71	70·59	2·90	3·60
4	Bobs	,,	26 ,,	3	3	42	19	3–4	2–3	11–12	6	13 ,,	22 ,,	3·57	67·48	3·13	3·95
5	Federation* ..	,,	21 ,,	3½	3	39	20	2–3	2–3	12–13	6	13 ,,	22 ,,	5·31	100·00	4·73	5·95
6	Red Fife	,,	8 Nov.	5	4½	40	15	4	2	13–14	6	26 ,,	6 Jan.	2·83	53·29	1·70	2·25
7	White Fife ..	,,	3 ,,	4½	4½	40	18	4	2	12	6	20 ,,	6 ,,	2·91	54·80	2·39	3·03
8	Genoa	,,	28 Oct.	4	2	42	17	5	2	14	6	14 ,,	6 ,,	3·50	65·91	3·29	4·05
9	Jonathan	,,	26 ,,	3	2	44	19	3	2–3	14–15	6	14 ,,	29 Dec.	3·59	67·60	2·63	3·33
10	Federation* ..	,,	22 ,,	3½	3	39	19	3	2–3	14	6	13 ,,	22 ,,	5·31	100·00	4·73	4·90
11	Cleveland	,,	31 ,,	4	3½	40	17–18	4	2–3	14	6	21 ,,	29 ,,	4·67	85·56	4·12	4·50
12	Tarragon	,,	30 ,,	4	3½	42	16	3–4	2	17	6	20 ,,	29 ,,	4·00	71·35	3·73	4·68
13	Marshall's No. 3 ..	,,	28 ,,	3½	4	39	16–17	4–5	2–3	14–15	6	18 ,,	29 ,,	5·01	87·07	4·56	6·00
14	Stanley	,,	30 ,,	4	3½	42	18	4–5	2	13–14	6	20 ,,	29 ,,	2·73	46·25	1·91	1·90
15	Federation* ..	,,	21 ,,	3½	3	39	19–20	2–3	3	15	6	13 ,,	22 ,,	6·05	100·00	5·45	6·13
16	John Brown ..	,,	28 ,,	3½	3½	46	17	5	2–3	16	6	14 ,,	22 ,,	4·03	67·50	3·58	4·00
17	Jumbuck	,,	27 ,,	3	4	43	19	4	2–3	15	6	18 ,,	29 ,,	4·07	69·10	3·92	5·56
18	Yandilla King ..	,,	27 ,,	4	3½	39	17	4–5	2	14	6	18 ,,	29 ,,	4·99	85·88	4·73	5·40
19	Plover	,,	27 ,,	3½	4	46	18	4	2	12–13	6	19 ,,	29 ,,	3·42	59·68	3·05	3·50
20	Federation* ..	,,	22 ,,	3½	3	40	20	2–3	3	14	6	13 ,,	22 ,,	5·65	100·00	4·89	6·85
21	Wallace	,,	26 ,,	4	3½	41	18	3–4	3	13	6	18 ,,	30 ,,	4·47	81·27	4·25	5·60
22	Dart's Imperial ..	,,	28 ,,	3½	4	42	18–19	3–4	2	15–16	6	19 ,,	30 ,,	5·02	93·83	4·73	5·50
23	Australian Talavera	,,	28 ,,	3	3½	42	17	4	2–3	13	6	17 ,,	30 ,,	4·56	87·69	4·09	4·60
24	Warden	,,	29 ,,	4	3	49	18	3–4	2–3	12	6	14 ,,	30 ,,	4·40	87·12	4·11	4·50
25	Federation* ..	,,	21 ,,	3½	3	40	20	2	3	13	6	13 ,,	22 ,,	4·90	100·00	4·32	5·66
26	College Purple Straw	,,	26 ,,	3½	3	45	18	2	2–3	12	6	17 ,,	30 ,,	4·69	91·85	4·45	5·40
27	Thew	,,	17 ,,	2½	1½	43	16	4	3	14	6	6 ,,	22 ,,	3·72	70·03	3·16	3·80
28	Jade	,,	26 ,,	3	4	46	18–19	3	2–3	15	6	13 ,,	22 ,,	5·81	105·29	5·66	6·45
29	Firbank	,,	17 ,,	1½	2	46	17	3–4	2–3	11–12	6	9 ,,	22 ,,	4·43	77·39	4·20	5·05
30	Federation* ..	,,	22 ,,	3½	3	41	19	2	3	16	6	13 ,,	22 ,,	5·93	100·00	5·23	7·05
31	Florence	,,	18 ,,	3½	2	44	14–15	3	2–3	14–15	6	6 ,,	22 ,,	3·26	55·06	2·87	4·00
32	Bunyip	,,	12 ,,	2	2	42	17	3	2–3	13–14	6	6 ,,	22 ,,	4·38	74·11	4·20	4·70
33	Cumberland ..	,,	20 ,,	1	2	42	16–17	3–4	3	8	6	13 ,,	22 ,,	2·76	46·78	2·37	3·33
34	Medeah (Macaroni) ..	,,	31 ,,	2½	4½	61	22	2	2–3	7–8	6	19 ,,	30 ,,	5·01	85·23	4·85	5·95
35	Federation* ..	,,	22 ,,	3½	3	41	19–20	2	3	16–17	6	13 ,,	22 ,,	5·88	100·00	5·25	7·00
36	Kubanka (Macaroni)	,,	6 Nov.	4	5	54	..	..	..	..	..	26 ,,	row was	missed	in harvesting.		

* Selected seed.

Trial of Varieties of Wheat—*continued.*

No. Plot.	Variety.	Date Sown. 1909.	Began to Ear. 1909.	Maximum (5). Tillering Qualities	Maximum (5). Amount of Foliage.	Height of Crop (inches).	No. in average Ear. Fertile Spike-lets.	No. in average Ear. Sterile Spike-lets.	No. Grains per Average Spike-let.	No. Heads per Average Plant.	No. Plants Threshed	Date Ripe, 1909.	Date Harvested, 1909–10.	Average Yield per Selected Plant Ungraded. Actual (drams).	Average Yield per Selected Plant Ungraded. Per-cent-age.	Average Yield per Selected Plant Graded (drams).	Yield best Selected Plant Graded (drams).
37	Turkey ..	.. 11 June	6 Nov.	5	4½	39	15	5	2	16	6	26 Dec.	30 Dec.	3·47	52·73	2·51	4·33
38	Karkov ..	.. ,,	8 ,,	5	4½	40	16–17	4	2	13	6	26 ,,	30 ,,	3·06	44·15	2·17	2·98
39	Koffoid ..	.. ,,	6 ,,	4½	4	45	16	4	2	21–22	6	27 ,,	30 ,,	5·29	72·66	4·77	5·95
40	Federation*	.. ,,	22 Oct.	3½	3	42	21	2	3	19	6	13 ,,	22 ,,	7·63	100·00	6·75	8·00
41	Gold Coin ..	.. ,,	5 Nov.	4	3	41	17	5	2	11	6	26 ,,	30 ,,	3·41	46·63	3·11	3·68
42	New Zealand	.. ,,	2 ,,	3½	4	46	18	5	2	15	6	26 ,,	30 ,,	4·84	69·20	4·69	5·54
43	Purple Straw†	.. ,,	28 Oct.	3	3½	45	19	4–5	2–3	13	6	20 ,,	30 ,,	4·16	62·31	3·84	4·80
44	,,	.. ,,	27 ,,	3½	3½	46	18–19	4	2–3	12	6	19 ,,	30 ,,	3·86	60·71	3·43	4·05
45	Federation*	.. ,,	22 ,,	3½	3	44	20	2–3	2–3	16	6	13 ,,	30 ,,	6·04	100·00	5·54	6·14
46	Purple Straw†	.. 12 June	28 ,,	4	3½	44	17	4	2	11–12	6	17 ,,	30 ,,	4·46	73·88	4·21	5·30
47	,,	.. ,,	27 ,,	3½	3½	47	18	4	2–3	14	6	19 ,,	30 ,,	4·20	69·62	3·98	5·05
48	,,	.. ,,	28 ,,	3	4	46	18–19	4	2–3	13	6	19 ,,	30 ,,	4·67	77·47	4·51	6·15
49	,,	.. ,,	1 Nov.	3½	3	46	19	4	2	14	6	21 ,,	30 ,,	4·25	70·55	4·16	5·00
50	Federation*	.. ,,	22 Oct.	3½	3	43	20–21	2–3	2–3	16	6	13 ,,	30 ,,	6·02	100·00	5·45	6·20
51	Purple Straw†	.. ,,	25 ,,	3½	3½	46	18	3	2–3	14	6	20 ,,	30 ,,	4·70	78·54	4·33	5·80
52	,,	.. ,,	27 ,,	3	3½	47	19–20	4	2	13	6	20 ,,	24 ,,	4·14	69·60	3·93	4·40
53	,,	.. ,,	22 ,,	3	3	48	..	..	..	..	..	17 ,,	not harvested; shelled badly.				
54	,,	.. ,,	27 ,,	3½	3½	47	18	3	2–3	14	6	18 ,,	30 ,,	4·63	78·79	4·36	4·60
55	Federation*	.. ,,	22 ,,	3½	3	44	21	2–3	2–3	17	6	14 ,,	30 ,,	5·84	100·00	5·22	6·15
56	Purple Straw†	.. ,,	26 ,,	3½	3½	50	19	3	3	13–14	6	13 ,,	22 ,,	4·43	75·52	3·64	4·05
57	,,	.. ,,	26 ,,	3½	4	47	18	4	3	13	6	18 ,,	30 ,,	4·73	80·27	4·30	5·05
58	,,	.. ,,	29 ,,	3	3½	44	17	5	2	10	6	21 ,,	30 ,,	3·80	64·21	3·57	4·00
59	,,	.. ,,	28 ,,	3½	3	43	18	4	2	11	6	20 ,,	30 ,,	4·17	70·15	3·90	4·30
60	Federation*	.. ,,	21 ,,	3½	3	42	18–19	2	3	15–16	6	14 ,,	30 ,,	5·97	100·00	5·54	6·40
61	Purple Straw†	.. ,,	27 ,,	3	3	45	19	4	3	14	6	18 ,,	30 ,,	4·92	85·71	4·55	4·95
62	,,	.. ,,	27 ,,	3	3	46	19–20	3–4	3	14–15	6	15 ,,	30 ,,	6·09	110·52	5·54	6·30
63	,,	.. ,,	27 ,,	3	3½	46	18	4	3	11	6	17 ,,	22 ,,	3·97	75·19	3·59	5·00
64	,,	.. ,,	21 ,,	3½	3½	45	19	1–2	3	12–13	6	14 ,,	22 ,,	4·87	96·43	4·38	5·35
65	Federation*	.. ,,	21 ,,	3½	3	43	17–18	3	2–3	13	6	14 ,,	30 ,,	4·82	100·00	4·38	4·50
66	Purple Straw†	.. ,,	28 ,,	3	4	46	21	3	3	12–13	6	18 ,,	22 ,,	6·06	117·35	5·68	6·16
67	,,	.. ,,	31 ,,	3½	4	46	19	5	3	17	6	19 ,,	22 ,,	6·06	110·02	4·90	7·48
68	Purple Straw †	.. ,,	30 ,,	3	3½	49	19	3–4	2	15	6	19 ,,	30 ,,	4·68	79·98	4·47	5·90
69	,,	.. ,,	30 ,,	3½	3	44	17	6–7	2	11	6	18 ,,	30 ,,	3·44	55·52	3·26	3·60
70	Federation*	.. ,,	22 ,,	3½	3	44	19	2–3	2–3	16–17	6	14 ,,	4 Jan.	6·54	100·00	5·90	6·03
71	Purple Straw†	.. ,,	27 ,,	3	4	47	19	4	3	17	6	20 ,,	4 ,,	6·39	102·01	5·63	7·50
72	,,	.. 13 June	27 ,,	3	4	47	20	3	3	14–15	6	20 ,,	24 Dec.	5·97	99·69	5·35	7·94

* Selected seed. † A selected plant from a crop of,

Trial of Varieties of Wheat—*continued.*

No. Plot	Variety.	Date Sown, 1909.	Began to Ear, 1909.	Maximum (5). Tillering Qualities	Maximum (5). Amount of Foliage.	Height of Crop (inches).	No. in average Ear. Fertile Spikelets.	No. in average Ear. Sterile Spikelets.	No. Grains per Average Spikelet.	No. Heads per Average Plant.	No. Plants Threshed.	Date Ripe, 1909.	Date Harvested, 1909–10.	Average Yield per Selected Plant Ungraded. Actual (drams).	Average Yield per Selected Plant Ungraded. Percentage.	Average Yield per Selected Plant Graded (drams).	Yield best Selected Plant Graded (drams).
73	Purple Straw† ..	13 June	27 Oct.	3	4	47	19	3	2–3	16	6	20 ,,	24 Dec.	5·76	100·84	5·39	5·60
74	,, ..	,,	27 ,,	3½	3½	47	19	3–4	2–3	13	6	19 ,,	4 Jan.	3·74	68·80	3·50	4·07
75	Federation* ..	,,	22 ,,	3½	3	43	19	2–3	2–3	15	6	15 ,,	4 ,,	5·16	100·00	4·42	5·57
76	Australian Talavera†	,,	1 Nov.	3	3½	45	17–18	4	2–3	13	6	21 ,,	4 ,,	5·00	94·62	4·76	6·33
77	,, ..	,,	30 Oct.	3	3½	44	16	5	3	14	6	18 ,,	4 ,,	5·01	92·64	4·70	5·20
78	,, ..	,,	1 Nov.	3	3½	44	18	3	3	11–12	6	21 ,,	4 ,,	4·45	80·44	4·09	4·66
79	,, ..	,,	1 ,,	3	3½	44	17–18	3–4	2–3	12	6	21 ,,	4 ,,	5·20	91·93	4·52	5·50
80	Federation* ..	,,	22 Oct.	3½	3	44	20	3	2–3	16	6	15 ,,	4 ,,	5·78	100·00	5·13	5·98
81	Australian Talavera†	,,	2 Nov.	3	3½	47	17	4–5	2	9	9	21 ,,	4 ,,	3·85	66·84	3·38	4·36
82	,, ..	,,	3 ,,	3½	3½	48	19	4–5	2	18	6	22 ,,	4 ,,	5·17	90·07	4·96	5·93
83	,, ..	,,	2 ,,	3	3½	44	17	4	2	11	6	17 ,,	4 ,,	4·18	73·07	3·69	5·66
84	,, ..	,,	1 ,,	3	4	50	19	5	2	18	6	17 ,,	4 ,,	6·04	105·96	5·90	6·85
85	Federation* ..	,,	23 Oct.	3½	3	43	20–21	2	3	15	6	15 ,,	4 ,,	5·68	100·00	5·22	5·69
86	Australian Talavera†	,,	1 Nov.	3	3½	44	15	5	3	12	6	18 ,,	4 ,,	4·00	72·12	3·59	4·75
87	,, ..	,,	30 Oct.	3	3½	46	16	5	3	13	6	17 ,,	4 ,,	5·00	92·38	4·55	5·00
88	,, ..	,,	2 Nov.	3	3½	48	15	7	2–3	9–10	6	21 ,,	4 ,,	2·87	54·37	2·23	2·70
89	,, ..	,,	1 ,,	3	3½	44	17	4	2–3	13–14	6	19 ,,	4 ,,	5·23	101·67	4·27	5·01
90	Federation* ..	,,	22 Oct.	3½	3	44	20	2–3	3	14	6	15 ,,	4 ,,	5·01	100·00	4·55	6·05
91	Australian Talavera†	,,	3 Nov.	3	4	52	19–20	6	2	14	6	21 ,,	4 ,,	5·13	96·50	4·90	6·00
92	,, ..	,,	26 Oct.	3	3½	50	18	2–3	2–3	16	6	15 ,,	22 Dec.	6·33	112·59	5·80	7·25
93	,, ..	,,	26 ,,	3	3½	50	16–17	3	2	16	6	15 ,,	22 ,,	4·96	83·67	4·51	5·28
94	,, ..	,,	2 Nov.	3½	3½	42	18	4	2–3	14	6	23 ,,	4 Jan.	5·35	85·82	4·71	6·39
95	Federation* ..	,,	25 Oct.	3½	3	42	19–20	2	2–3	17	6	13 ,,	4 ,,	6·54	100·00	6·00	6·67
96	Australian Talavera†	,,	30 ,,	4	4	46	16	4–5	2–3	16	6	20 ,,	4 ,,	5·60	86·84	5·19	6·38
97	,, ..	,,	3 Nov.	3½	3½	42	18	5	2	14–15	6	21 ,,	4 ,,	4·94	77·72	4·57	5·68
98	,, ..	,,	2 ,,	3½	3½	45	18	3–4	2–3	16	6	19 ,,	5 ,,	6·28	100·25	5·28	6·17
99	,, ..	,,	3 ,,	3½	3½	46	20–21	2–3	2	16	6	22 ,,	5 ,,	5·11	82·79	4·73	6·29
100	Federation* ..	15 June	23 Oct.	3½	3	41	19	2	3	15	6	16 ,,	5 ,,	6·08	100·00	5·58	6·95
101	Federation (Jones' Crop)† ..	,,	26 ,,	3½	3	39	19	2	2–3	15	6	17 ,,	5 ,,	5·61	91·16	5·08	6·30
102	,, ..	,,	25 ,,	3½	3	39	20	2	3	17	6	17 ,,	5 ,,	6·52	104·68	5·84	6·70
103	,, ..	,,	26 ,,	3½	3	39	19–20	2	2–3	15	6	17 ,,	5 ,,	5·49	87·11	5·04	5·35
104	,, ..	,,	25 ,,	3½	3	39	20	2	2–3	15	6	17 ,,	5 ,,	5·69	89·24	5·30	5·70
105	Federation* ..	,,	25 ,,	3½	3	40	19–20	2–3	3	16–17	6	17 ,,	5 ,,	6·45	100·00	5·87	7·00
106	Purple Straw (Jones' Crop)† ..	,,	30 ,,	..	4	48	21	2	3	14	6	..	5 ,,	5·12	77·95	4·38	5·68

* Selected seed. † A selected plant from a crop of.

Trial of Varieties of Wheat—*continued.*

No. Plot.	Variety.	Date Sown, 1909.	Began to Ear, 1909.	Maximum (5). Tillering Qualities	Maximum (5). Amount of Foliage.	Height of Crop (inches).	No. in average Ear. Fertile Spikelets.	No. in average Ear. Sterile Spikelets.	No. Grains per Average Spikelet.	No. Heads per Average Plant.	No. Plants Threshed	Date Ripe, 1909.	Date Harvested, 1909–10	Average Yield per Selected Plant Ungraded. Actual (drams).	Average Yield per Selected Plant Ungraded. Percentage.	Average Yield per Selected Plant Graded (drams).	Yield best Selected Plant Graded (drams).
107	Federation (Jones' Crop)†	15 June	26 Oct.	3½	3	40	19	2	2	15	6	17 Dec.	5 Jan.	5·02	75·08	4·64	5·59
108	,, ..	,,	25 ,,	3½	3	39	19	2	2–3	17	6	17 ,,	5 ,,	5·93	87·15	5·46	6·35
109	,, ..	,,	25 ,,	3½	3	39	19–20	2–3	2–3	17	6	17 ,,	5 ,,	6·14	88·70	5·79	7·70
110	Federation* ..	,,	25 ,,	3½	3	40	20–21	2	3	16	6	17 ,,	5 ,,	7·04	100·00	6·41	7·33
111	Federation (Jones' Crop)† ..	,,	26 ,,	3½	3	39	19	2	3	15	6	17 ,,	5 ,,	5·66	80·88	4·88	5·58
112	,, ..	,,	25 ,,	3½	3	39	19–20	2	3	17	6	17 ,,	5 ,,	7·13	102·50	6·41	8·35
113	,, ..	,,	25 ,,	3½	3	39	18	2	2–3	14	6	17 ,,	5 ,,	5·17	74·77	4·82	5·68
114	Plover†	,,	22 ,,	3	4	48	18	3	3	14	6	20 ,,	22 Dec.	6·13	89·20	5·75	7·08
115	Federation (bulk seed)	,,	25 ,,	3½	3	39	20	2	3	16	6	17 ,,	5 Jan.	6·83	100·00	6·33	8·25
116	World's Wonder (from Willenabrina) ..	,,	28 ,,	3	3	39	19	3	3	15	6	‡ ..	5 ,,	7·05	101·61	6·48	8·58
117	Schultz's Purple Straw (from Sheep Hills)	,,	30 ,,	3½	3½	42	19	3	3	15	6	‡ ..	5 ,,	5·58	79·19	5·07	5·96
118	Schultz's Purple Straw (from Horsham) ..	,,	30 ,,	3½	3½	42	19	3	3	15	6	‡ ..	5 ,,	6·03	84·28	5·48	7·68
119	A variation from Federation ..	,,	25 ,,	3½	3	38	20	1	3	16–17	6	17 ,,	5 ,,	6·40	88·13	6·01	6·50
120	Federation (bulk seed)	,,	25 ,,	3½	3	39	20–21	2	3	16–17	6	17 ,,	5 ,,	7·37	100·00	6·82	7·90
121	A variation from Federation ..	,,	26 ,,	3	3	33	20–21	0–1	3–4	14–15	6	18 ,,	5 ,,	7·51	103·41	6·89	8·90
122	,, ...	,,	26 ,,	3	3	34	19–20	1–2	3	18	6	17 ,,	5 ,,	6·44	90·02	5·89	9·66

* Selected seed. † A selected plant from a crop of. ‡ Same season as Dart's Imperial.

SUPPLEMENTARY TRIAL OF VARIETIES OF WHEAT in plots 1 chain long, single seeds dropped 5 to 6 inches apart.

No. Plot	Variety.	Date Sown, 1909.	Began to Ear, 1909.	Maximum (5). Tillering Qualities.	Maximum (5). Amount of Foliage.	Height of Crop (inches).	No. in average Ear. Fertile Spikelets.	No. in average Ear. Sterile Spikelets.	No. Grains per Average Spikelet.	No. Heads per Average Plant.	No. Plants Threshed	Date Ripe, 1909.	Date Harvested, 1909–10.	Average Yield per Selected Plant Ungraded. Actual (drams).	Average Yield per Selected Plant Ungraded. Percentage.	Average Yield per Seleced Plant Graded (drams).	Yield best Selected Plant Graded (drams).
479	Federation (bulk seed)	10 June	25 Oct.	3½	3	39	19	2	3	16–17	6	17 Dec.	5 Jan.	6·23	100·00	5·54	8·02
480	Marshall's No. 3† ..	..	2 Nov.	3½	4	45	17–18	3	2–3	16–17	6	23 ..	5 ..	5·31	87·33	4·78	6·67
481	,, ..	..	3 ..	4	4	44	19	3	3	19–20	6	.. ..	5 ..	6·32	106·57	5·01	5·66
482	Australian Talavera†	..	1 ..	3½	3½	40	16	5	3	11–12	6	18 ..	5 ..	3·70	64·01	3·22	4·58
483	Purple Straw† ..	..	28 Oct.	3½	3½	43	18	3–4	3	15	6	17 ..	6 ..	5·23	92·89	4·15	5·35
484	Federation (bulk seed)	..	25 ..	3½	3	39	19–20	2–3	3	14	6	17 ..	5 ..	5·48	100·00	4·97	5·95
485	Percy	..	8 Nov.	4	3½	42	17	4	2	16	6	23 ..	6 ..	3·12	51·98	2·40	3·00
486	Blount's Lambrigg†	..	11 ..	4½	4½	..	20	4	2–3	15	6	..	6 ..	4·94	75·72	2·55	2·90
487	Standard Red ..	..	12 ..	4	5	..	19	4	2–3	12	6	..	6 ..	3·29	46·69	2·11	2·28
488	Red King	..	12 ..	4½	5	..	17	4–5	2–3	13	6	6 Jan.	6 ..	3·04	40·17	0·69	1·00
489	Federation (bulk seed)	..	26 Oct.	3½	3	38	20–21	1–2	3	18	6	19 Dec.	6 ..	8·09	100·00	7·16	9·60
490	Pedigree Emperor White	..	..	4½	5	.	..	..	..	..	2	8 Jan.	6 ..	2·33	28·41	1·49	2·58
491	Pedigree Rentpayer ..	..	22 Nov.	5	5	.	19–20	2	3	16	6	6 ..	6 ..	5·54	66·66	2·59	2·52
492	Pedigree Essex Conqueror	..	20 ..	3½	5	..	20	4	3	14	6	6 ..	6 ..	5·78	68·64	3·33	4·33
493	Pedigree Squarehead's Master	..	18 ..	4	5	.	22	3	3	16	6	6 ..	6 ..	5·59	65·53	3·77	4·00
494	Federation (bulk seed)	..	27 Oct.	3½	3	36	20	2	3	19	6	19 Dec.	6 ..	8·64	100·00	7·70	10·45
495	Red Fife (from Canada)	11 June	11 Nov.	5	1	..	19–20	3	2–3	17	6	..	6 ..	4·51	52·87	2·57	3·90

II.—RUST AND SMUT RESISTANCE IN WHEAT AND SMUT EXPERIMENTS WITH OATS AND MAIZE.

D. McAlpine, Vegetable Pathologist.

The experiments carried out in connection with the Wheat Improvement Committee relate to Rust and Smut resistance and have been continued and extended during the past season. But experiments with Oat and Maize Smut have also yielded important results.

In 1908, Smut was found on Wild Oats for the first time in Australia and it was important to determine if the smut on the wild and tame oat were mutually infective. Seed of the wild oat was taken and infected with smut from both the wild and the tame oat, and the result was that 6 out of 19 plants were smutted in the former case and 4 out of 19 plants in the latter, or 31 and 21 per cent. respectively. Seed of the tame oat was infected with smut of the wild oat (*Ustilago avenæ*), and one out of 23 plants was smutted or over 4 per cent. The same smut therefore occurs on both the tame and wild oat, although it is exceedingly rare on the latter.

The mode of infection of the smut affecting maize in Victoria was not known, and experiments were carried out to determine it and treatment of the seed was tried at the same time. A special article is given in this *Journal* stating how infection occurs and the best means of preventing it.

In connection with wheat, the main objective is to produce a variety which, while fulfilling all the conditions usually required by the farmer, will have in addition the important quality of rust-resistance. For this purpose it is necessary in crossing to have one of the parents at least possessed of this property, and not only different varieties but different species of wheat are being tested for this purpose.

RUST RESISTANCE.

For these experiments 21 varieties of wheat were used and the different species or sub-species of *Triticum.* Samples of all the known cultivated species and sub-species were obtained from Germany, with the exception of Club-head or *T. compactum* which had been originally obtained from Biffen by Sutton and a portion of the seed forwarded to me. The seed from Germany varied so much in age, that in some cases very few grains germinated. However, fresh specimens to be tested during the forthcoming season have been kindly supplied by Professor Patrick Wright of the West of Scotland Agricultural College. The classification by Hackel. which is now generally followed, will show the relation of the different cultivated forms. He recognises three distinct species of Triticum viz., *T. monococcum*, *T. sativum*, and *T. polonicum*. Then *T. sativum* is further subdivided as shown in the following table:—

Triticum ...
- *monococcum* L., Einkorn or One-grained Wheat
- *sativum*, Lam.
  - *dicoccum* Schrank, Emmer.
  - *spelta* L., Spelt
  - *tenax*
    - *vulgare* Vill., Common Wheat
    - *compactum* Host, Club or Dwarf Wheat
    - *turgidum* L., Poulard or Rivet Wheat
    - *durum* Desf., Durum or Hard Wheat
- *polonicum* L., Polish Wheat

The wheats recorded in the table were sown on 28th June, 1909, and generally produced a clean crop, with the exception of Spelt wheat which was badly rusted, the rust even appearing on the ears, and the Polish wheat which was also rusty with a little on the ear. The germination was so uneven, however, that no definite conclusions could be drawn as to relative susceptibility.

Of the 21 different varieties or selections sown on 30th June, 1909, 5 were received from Utah, 2 from Sweden, 2 originally from France, 6 from New South Wales and 6 from Mr. Pye, Principal, Dookie Agricultural College.

The wheats from Utah were sent through the United States Department of Agriculture and grown there under typical arid conditions. The Station is located in the Rocky Mountains, at an elevation of 6,000 feet, and the average rainfall is 15.6 inches. When grown here they were all rusty, some very slight and others bad. Those varieties which were only slightly rusty had very poor ears and were rejected along with the others. The two Swedish wheats were sent from the Experiment Station at Ultima, where they were practically immune towards the Yellow rust (*Puccinia glumarum*) for some years. This rust, however, does not occur in Australia. Both varieties were too late and developed rust, one of them being badly rusted on stem, flag and ear.

The two French wheats were received from Vilmorin in 1908 and grown in the plots that year. They were retained for further trial and sown again in 1909. Rieti is a bearded wheat and was free from rust, but weak in the straw. Red Egypt is also a bearded wheat and practically clean but inferior to Rieti. There were six varieties sent direct from Mr. Sutton, Wheat Experimentalist of New South Wales. Of these Thew, Cedar and Warren were practically clean, while John Brown and Upper Cut were very slightly affected. White Loaf was such a poor wheat, that although practically free from rust, it was rejected.

Six selections from crosses made by Mr. Pye were specially tested for rust. All had rust more or less, but two selections from Tripola × Tardent's Blue were retained. No. 4 selection was practically free, having only a few specks, but No. 6 selection, although it was slightly rusty on the stem, was the best wheat of the lot.

As the result of the tests during 1909, there was only one absolutely clean variety, viz., Rieti, and there were five practically free, viz., Red Egypt, Thew, Cedar, Warren and Selection No. 4 of Tripola × Tardent's Blue.

SMUT RESISTANCE.

Just as it is necessary to test different varieties in order to discover a rust-resistant wheat, it is equally so for a smut-resistant wheat to be used as one of the parents in crossing. There is a great variation among different varieties in their susceptibility, under the same conditions, and different species as well as different varieties were tested.

Different species and sub-species of Triticum.—The seven cultivated forms already referred to, together with ordinary wheat, were sown alongside each other, one portion of the seed being dusted with the spores of Stinking smut and the other clean. On account of the imperfect germination, in most of the plots, the results are not comparable, but in the case of *Triticum compactum* or Dwarf wheat, there was decided susceptibility. The seed was quite fresh, as it was grown at Burnley

Horticultural Gardens the previous season, and while the uninfected seed produced a clean crop, the infected seed yielded 96 per cent. of smutted plants.

Results of Infection in different varieties of Wheat.—Federation was chosen, as being one which is extensively grown, and in some instances, every plant produced by the infected grain was smutted. For comparison, two other varieties were sown alongside. The one, Ohio, had already proved itself to be highly smut-resistant as well as very rapid in its germination and the other, Genoa, was taken from a plot grown at the Burnley Gardens in 1908 and found to be perfectly clean, even although the seed was dusted with smut spores from both the smooth-spored (*T. Levis*) and net-spored (*T. tritici*) species. Only one plant was affected in each of these plots as shown in the following table:—

Results of Infection without Treatment.

Plot.	Variety.	Grains Sown.	Grains Germinated.	Infection.	Percentage of Germination.	Percentage of Bunt.
22	Federation	25	23		92	2 plants = 8·7
23	,,	25	25	Smut-ball in contact with each grain	100	22 ,, = 88
30	,,	25	20	*Tilletia levis*	80	19 ,, = 95
58	,,	25	20		80	
72	,,	25	25	...	100	2 plants = 8
74	,,	25	14	*Tilletia levis*	56	14 ,, = 100
70	,,	25	25	... ...	100	25 ,, = 100
71	,,	25	20	*Tilletia tritici*	80	20 ,, = 100
56	Ohio	25	24	... ...	96	...
57	,,	25	23	*Tilletia levis*	92	1 plant = 4·3
20	Genoa	25	24	... ...	96	...
21	,,	25	22	*Tilletia levis*	88	1 plant = 4·5

In two of the plots of Federation wheat, where the grain was sown without artificial infection, there was 8 per cent. of infected plants, so that the wheat to begin with was not perfectly clean.

Selections from Pye's Crosses.—Mr. Pye, of Dookie Agricultural College, has been engaged for a number of years in carrying out extensive experiments with the object of securing bunt-resisting wheats. Numerous varieties and crosses have been tested and during 1908, the only variety found to be absolutely free, after thorough infection of the seed, was Medeah, and crosses in which Medeah was used as one of the parents, such as Bobs × Medeah and Bobs × Medeah. He kindly supplied me

Tripola

with samples of each of these, in order to test how far the smut-resistance was hereditary. The seed was sown at Dookie, in June, 1908, and the seed obtained from these plots was sown at Burnley in June, 1909. The results are given in the first table on page 287.

The percentage of bunt varied from 43 to 100 where the seed was infected and only in one instance did the uninfected seed show any trace of the disease. Medeah, which was bunt proof at Dookie in 1908, turned out to be quite susceptible with us in 1909, having 46.6 per cent. of bunt

Plot.	Cross.	Selection.	Grains Sown.	Grains Germinated.	Infection.	Percentage of Germination.	Percentage of Bunt.
31	Tripola Bobs × Medeah	7	25	17	...	68	...
32	"	7	25	16	*Tilletia levis*	64	7 plants = 43·7
33	"	8	25	17	...	68	...
34	"	8	25	17	*Tilletia levis*	68	13 plants = 76·4
35	"	9	25	23	...	92	...
36	"	9	25	23	*Tilletia levis*	92	21 plants = 91·3
37	Bobs × Medeah	10	25	20	...	80	...
38	"	10	25	23	*Tilletia levis*	92	21 plants = 91·3
39	"	11	25	22	...	88	2 plants = 9
40	"	11	25	24	*Tilletia levis*	96	23 plants = 96
41	"	12	25	24	...	96	..
42	"	12	25	19	*Tilletia levis*	76	17 plants = 89·4
43	"	13	25	23	.	92	...
44	"	13	25	21	*Tilletia levis*	84	20 plants = 95·2
45	"	14	25	22	..	88	..
46	"	14	25	24	*Tilletia levis*	96	24 plants = 100
63	Medeah	.	25	15	*Tilletia levis*	60	7 plants = 46·6

Comparison of Various Fungicides for Bunt.

There are several preparations on the market for smut and other diseases, and it was considered desirable to test them in comparison with such recognised substances as bluestone and formalin. The powder known as "Fungusine" was applied to the seed wheat according to the instructions given and a 2 per cent. solution of phenol was also tried.

The variety of wheat chosen for treatment was naturally infected as it came from the machine, and it was certainly as smutty a sample as had ever come under my notice. The seed wheat was all treated at the same time and sown on the same day (28th June) in ground which was as nearly as possible equal throughout; 500 grains were sown in each plot, arranged in rows of 100 each, and the results were taken on 30th December, when the wheat was fully ripe.

The following table shows the relative efficiency of each of the substances tested, compared with the untreated or check plot, in which there was 88 per cent. of bunt:—

Plot.	Grains sown.	Grains Germinated.	Treatment.	Percentage of Germination	Percentage of Bunt.
1	500	405	Fungusine	81	78 plants = 19·2
2	500	363	Bluestone	73	8 " = 2·2
3	500	339	Formalin	68	28 " = 8·2
4	500	355	Phenol	71	68 " = 16·3
5	500	428	... ...	85	379 " = 88·0

Apart altogether from the relative efficiency of the various substances used, the fact stands out prominently of the great saving effected in comparison with no treatment at all, although, of course, no intelligent farmer would ever dream of sowing such a smutty sample of seed, notwithstanding its relatively high germinating power.

RELATIVE EFFECTS OF BLUESTONE AND FORMALIN ON GERMINATION, INFECTION AND YIELD.

Five plots were sown under ordinary farming conditions at Longerenong Agricultural College, with the assistance of the Principal, Mr. Sinclair. The variety used was Jade, which had a little smut with smut-balls scattered through it.

Each plot was carefully laid out and measured and contained .776 of an acre. One portion of the seed was treated with bluestone and formalin respectively on 12th March, 1909, in order to test the effect of treating the grain some considerable time before sowing. Another portion was treated similarly on 17th June, and the whole was sown on 28th June of the same month. The earlier-treated was left in the bags side by side on the barn floor and at sowing time they were still moist, but were dried before being placed in the seed-drill. The seed treated with bluestone solution was mouldy and a large proportion of the grains soft and rotten, while that treated with formalin was a little mouldy, but there were much fewer rotten grains than in the other.

The plots were critically examined for Stinking Smut, and afterwards stripped with the following result:—

Plot.	Seed Treatment.	Date of Treatment.	Gross Yield.		Yield per Acre.		Percentage of Bunt.
			bus.	lbs.	bus.	lbs.	
1	Bluestone ...	12th March, 1909	1	39	2	7	...
2	Formalin ...	" "	6	59	9	0	1 plant affected
3	Untreated ...	... .	15	12	19	35	·85
4	Bluestone ...	17th June, 1909	11	55	15	21	1 plant only affected
5	Formalin ...	" "	12	47	16	28	..

The experiments are at least suggestive, if not conclusive, and, as far as they go, they are strictly comparative.

In Plot 1 the seed was so rotten that no one would think of sowing it but for experimental purposes. The crop was very inferior, and the plants so scattered that they were only stripped for comparison.

In Plots 4 and 5 the treated seed was kept for eleven days before sowing on account of the weather. The treatment was practically effective in preventing the Stinking Smut and the germination, as judged by the yield, was in keeping with previous experiments. A special test was made with 1,000 grains each of the same variety of wheat sown at the same time and under similar conditions, with the following result:—Untreated, 88 per cent.; Formalin, 74 per cent.; and Bluestone, 60 per cent. of grains germinated.

EXPERIMENTS WITH FLAG SMUT.

Since it is now known that Flag Smut may arise, either from the soil or the seed, these experiments were mainly designed to test the relative virulence of the disease when seed was sown in clean ground with the spores of the fungus upon it, and when clean seed was sown in ground containing the diseased straw from the previous crop; also, the effect of different treatments of the seed both before and after infection. There were ten small plots altogether, each sown with 25 grains of Federation wheat on 30th June, 1909, and three of these were used as a check to compare with the others. Both spores and diseased straw were used for purposes of infection. The following table gives the relative results:—

Plot.	Grains Sown.	Grains Germinated	Mode of Infection and Treatment of Seed.	Results.
47	25	19	... ...	Clean
48	25	24	Dusted with spores ...	20 plants flag-smutted = 83 per cent.
49	25	25	Dusted with spores and dipped in bluestone solution	Clean
50	25	18	Dusted with spores and diseased straw added	15 plants flag-smutted = 83 per cent.
51	25	21	Diseased straw only added...	11 plants flag-smutted = 52 per cent.
52	25	24	Treated with bluestone solution and diseased straw added	7 plants flag-smutted = 29 per cent.
53	25	25	Treated with bluestone solution and spores added	Clean
54	25	25	... ...	Clean
55	25	24	... ...	Clean
62	25	25	Treated with corrosive sublimate and diseased straw added	11 plants flag-smutted = 44 per cent.

When seed dusted with spores was sown in clean ground, there was 83 per cent. of infection, and when clean seed was sown in ground containing diseased straw, there was 52 per cent. of infection. The addition of diseased straw to grain already dusted with spores did not increase the virulence of infection.

As regards different treatments, when the seed was dusted with spores and afterwards treated with bluestone solution, the resulting plants were all clean, and when the grain was treated with bluestone before the addition of the spores no infection occurred. If, however, the grain was treated with bluestone and diseased straw added there was infection to the extent of 29 per cent. Even when the grain was treated with corrosive sublimate and diseased straw added there was 44 per cent. of infection. This infection could easily be accounted for, from the young shoots being attacked which had necessarily no protective coating of the fungicide.

Thus, the general results already obtained are corroborated, that if the spores are only on the grain and no Flag Smut in the soil, treatment with bluestone solution is a preventive. But if the diseased straw is already in the soil from a previous crop, neither treatment of the seed with bluestone nor corrosive sublimate is effective.

* * * * * * * *

Experiments will be continued this season in connection with rust and smut. The different cultivated species and sub-species of *Triticum* will be thoroughly tested, as well as the seed of various crosses supplied by Mr. Biffen, of the Agricultural Department, Cambridge, who has succeeded in breeding wheats immune to the Yellow Rust (*Puccinia glumarum*) but not to the Black Rust (*Puccinia graminis*) which is the special scourge of our wheat-fields.

THE SMUT OF MAIZE AND ITS TREATMENT.

D. McAlpine, Vegetable Pathologist.

The Smut of Maize is increasing in many of the districts where this crop is largely grown, and it is becoming too common to escape the notice of the growers, who are beginning to make inquiries as to the best methods of treatment. Since it was first observed in New South Wales in 1891, practically nothing has been done to check it, because its true nature was misunderstood, and the consequence is that it is slowly but surely gaining ground. I am indebted to the Commonwealth Statistician for the following table, which shows that while Victoria is very much behind New South Wales and Queensland in the total area of maize grown for grain, the average yield is considerably higher. During the season 1908-9, there has been the largest area yet recorded for Victoria, but it is also the smallest average, and attention must be paid, not only to a rotation of crops, but to the prevention of any disease which reduces the yield.

State.	Acreage under Maize.		Average Yield per acre.	
	1907-8.	1908-9.	1907-8.	1908-9.
			Bushels.	Bushels.
Victoria ...	10,844	14,004	46·92	46·45
New South Wales	160,980	180,812	28·13	28·85
Queensland ..	127,119	127,655	24·34	21·68
South Australia	549	1,223	11·41	15·57
Western Australia	87	181	12·41	11·80

The smut has not yet found its way into the new districts being opened up for maize-growing, but in the old established districts it is more or less common in every paddock. I therefore propose to give such an account of this smut, as will enable growers to understand how it is propagated and spread and to adopt measures for checking it.

TWO MAIZE SMUTS.

When the Smut of Maize was first discovered in Australia, it was naturally considered to be the Corn Smut common in America and named accordingly, but when its true character was determined it was found to be quite a different smut. While in some cases the determination of the particular fungus will not help us much in the way of treatment, in others, where its nature and mode of attack are known, it may afford a clue of considerable value. "What's in a name?" is a question often asked, as if it mattered little; but in this instance it will be seen to have important bearings on the result.

The common maize smut of America, or American Corn Smut, as I have called it, for the sake of distinction, makes its appearance on any portion of the plant above ground and gives rise to smut-boils which may sometimes, as in the case of the cob, attain the size of a man's head.

This local infection of the young and tender tissues, whether of the seedling, or of the leaves and stems, or of the male and female flowers, may take place at any time during the growing season and consequently cannot be controlled. But, fortunately for us, the smut so far found in Australia is a different sort. It attacks the cobs and tassels (Figs. 1 and 2) and is usually confined to them, but in exceptional cases a few patches of smut may appear on the upper leaves or on the enveloping bracts (Fig. 3). This smut also occurs in America, but it is rather uncommon there. As Clinton, an American authority, says of it—"This is one of our most conspicuous, but rather uncommon, smuts. It has been introduced into this country, probably from Europe." The explanation of this statement is, that the same smut is found in Europe on sorghum, and it was probably introduced by means of this host-plant. Then it spread to maize, as it is found on both plants in the United States, and now it has probably been introduced here from America, although not a native of that country.

The importance of distinguishing which of the two maize smuts we possess is evident, when it is realized that the one may be amenable to treatment and the other not. The two smuts will now be briefly considered, and naturally the one which occurs in Australia, and is therefore at hand for investigation, will receive most attention. The description of the other will enable any grower to recognize it when he sees it and to take the necessary measures for removing the diseased plants.

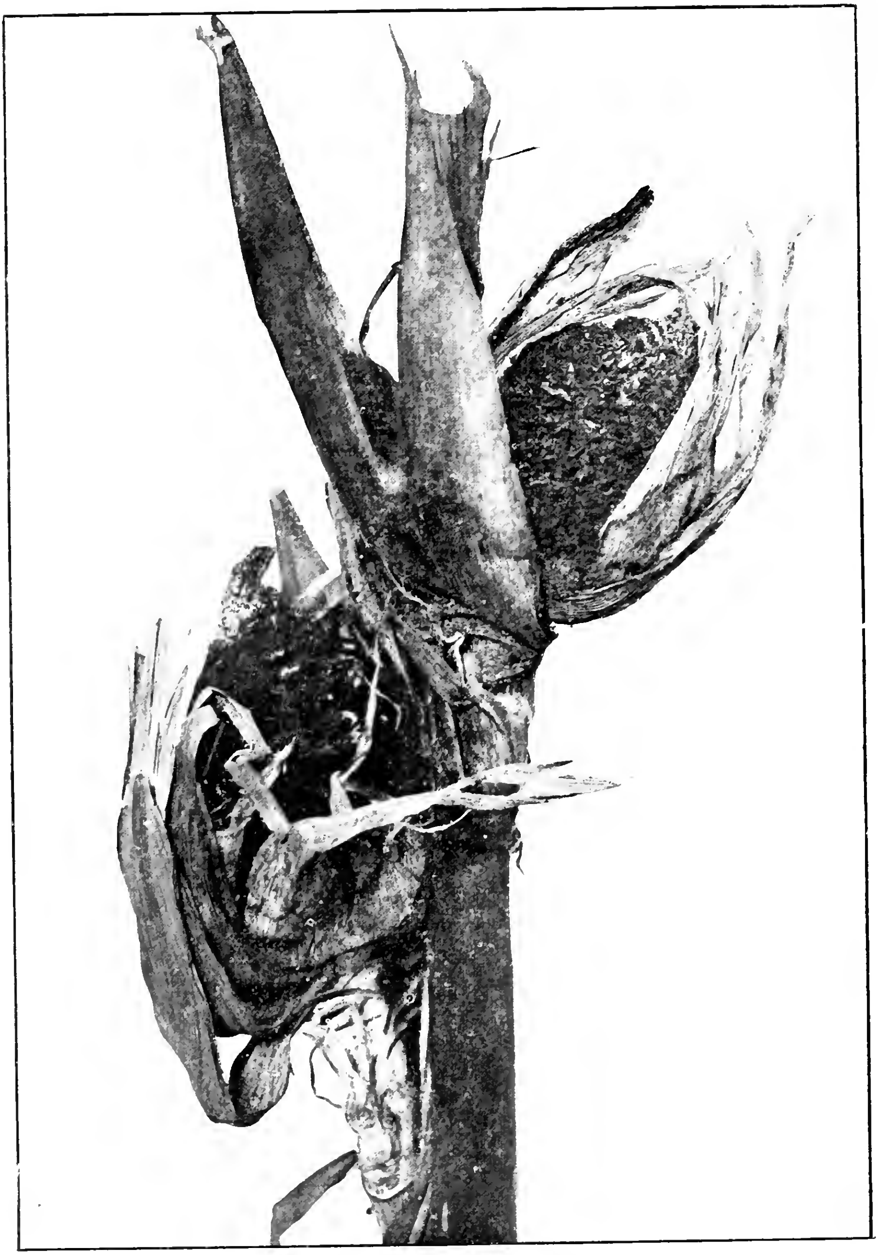
I.—Head Smut of Maize.

(*Sorosporium reilianum* (*Kuehn*) *McAlp.*)

This smut receives its common name, because it is usually confined to the head or ear. It is enclosed at first in a pinkish or whitish skin which soon ruptures in order to allow the escape of the spores. It is distinguished from the American Corn Smut by not excessively enlarging the ears and forming large smut-boils, by generally confining itself to the cobs and tassels and not attacking the leaves and stems, and by the character of the spores. To show how fundamental the difference is, the Head Smut belongs to the genus *Sorosporium* in which the spores are arranged in clusters (Fig. 4) forming, particularly in the young stage, closely compacted spore-balls, while the American Corn Smut belongs to *Ustilago*, in which the spores are all separate and distinct.

Diseased and Healthy Plants.

When the smut is fully developed, it is very conspicuous, but even before the spore-masses are exposed, it may be readily detected. The smutted maize plant remains longer green than the healthy plant; it is also more brittle and easily broken; it is more succulent and very sweet to the taste. If it appears on the tassel at the top, all the cobs beneath are usually smutted, although in exceptional cases there may be an odd healthy cob, but the tassel may also be perfectly clean and all the cobs beneath smutted. When the mode of infection is considered, it will be easily understood how this happens, and not only may entire cobs be clean on an otherwise diseased plant, but only certain grains of a cob may produce spores (Fig. 4). Both the tassel and the cob may be only partially smutted and even smut-pustules may be developed on the enveloping

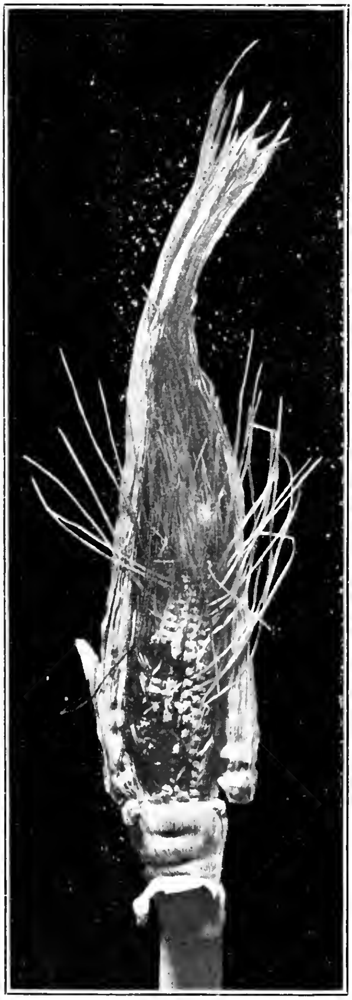


1. MAIZE COB WITH HEAD SMUT. (HALF NATURAL SIZE.)

2. MAIZE TASSEL WITH HEAD SMUT. (TWO-THIRDS NATURAL SIZE.)

bracts (Fig. 3). The healthy cob is surrounded by a variable number of leaves (in some cases I have counted 21) and these bracts, as they are called, when surrounding the flower, are burst by the swelling smut spores and exposed to view.

There is one interesting fact about smutted maize plants which is worthy of mention and that is, that cows are very fond of them. I have seen such diseased plants fed to milking cows and they greedily ate them up, smut and all. They preferred them to the ordinary healthy maize and there was often a struggle to get possession of them. I am assured by a grower that he fed them to one milking cow without any injurious effects, either to the animal, or its milk. The American Corn Smut, on the other hand, has similar properties to Ergot, and it would be an interesting subject for investigation, if the Head Smut affected cattle in a different manner from the other. But, apart altogether from their nutritive value, this practice is not to be recommended, since the spores would pass through the alimentary canal of the animal uninjured, and in this way become widely distributed.



3. Maize cob partially smutted.
(Two-thirds natural size.)

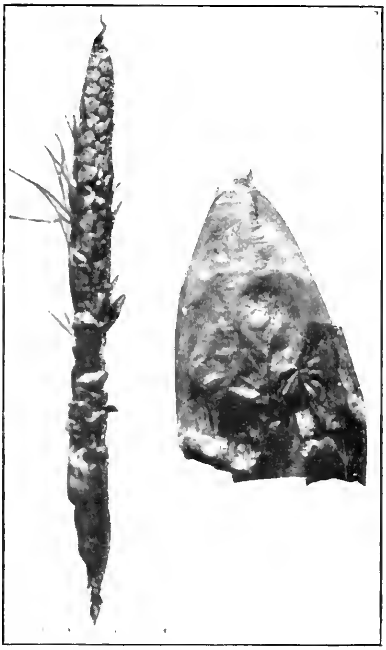
Germination of Spores.

The spores are at first in clusters, but these soon break up (Fig. 5). They are shown much magnified in Fig. 6 where they are seen to be generally globose with fine warts all over their surface. The maize from which the spores were obtained for germination was taken from the crop about the middle of March, and the smutted cobs were still contained within their enveloping leaves. The smut spores were placed in tap water on a microscopic slip and placed under a bell-jar and in 17 hours several had formed germ tubes (Figs. 7 and 8) with two to four partitions across. In 21 hours the minute reproductive bodies or *conidia* were formed, both at the end and sides of the tube, but the conidia at the end were always formed first (Fig. 9). Occasionally the germ-tube may branch as in Fig. 10. Sometimes a single spore may produce three germ-tubes as in Fig. 11, and thus the number of conidia are immensely multiplied. The conidia thus formed bud in a yeast-like manner (Fig. 9) and chains arise by sprouting, so that a single spore may give rise to innumerable conidia and secondary conidia.

The spores are not only able to germinate during the same season in which they have been produced, but they have been kept for about eight years and then they germinated. The sprouting conidia are comparatively delicate, but they retain their germinating power for several months, if kept dry.

INFECTION.

It is most important to know how infection occurs in order to prevent it. If the spores, for instance, are on the grain and they germinate with it, so that the germ-tube can penetrate the tender seedling, then the evident course is to prevent the germination of the spores by some "steep," as in the case of Stinking Smut of Wheat.



4. SMALL COB WITH SCATTERED GRAINS SMUTTED AND SMUT PUSTULE ON OUTER SURFACE OF ENVELOPING BRACT. (NATURAL SIZE.)

The first step then was to discover how the maize plant became infected and up to the present season no definite answer could be given as to the mode of infection. There are at least four principal modes of infection known at the present time, and experiments were carried out to settle which mode occurs in this smut.

1. The most common mode is that in which the young seedlings are infected as in Oat Smut. (Seedling infection.)

2. Another way is where any young and growing portion of the host-plant is capable of infection, as in the American Corn Smut, which, however, is not known in Australia. (Local infection.)

3. Infection may also take place through the flower and the mycelium or spawn of the fungus lies dormant in the ripe grain, as in Loose Smut of Wheat. (Flower infection.)

4. Infection is also known to occur through the young shoots, as in Carnation Smut. (Shoot infection.)

To answer this question, maize was planted at the Horticultural Gardens, Burnley, in a plot where this cereal had not been grown before, and the variety known as Hickory King was used. Various plots were sown on 5th November, 1909, in a very dry seed-bed and each of the above modes of infection was tested by using smut-spores of the previous season, which still retained their vitality. The spores were germinated and fully 50 per cent. of them put forth a germ-tube which bore conidia. The plants grew in every plot, some of them reaching a height of over 7 feet, and both flowered and fruited.

The following table shows the results of the different modes of infection and treatment:—

Plot.	Grains sown.	Grains germinated.	Mode of Infection and Treatment.	Results.
1	20	11	Check	Clean—some plants over 7 feet high
2	20	13	Seed dusted with spores ...	4 cobs smutted on one plant, tallest about 6 feet high
3	20	15	Plants dusted with spores in tender centre, 17.1.10	Clean—tallest nearly 7 feet high
4	20	11	All the tassels and silks dusted with spores, 16.2.10	Clean—tallest between 5 and 6 feet high
5	20	12	Plants cut back level with ground and dusted with spores, 17.1.10	Clean—second growth reaching a height of about 4 feet
6	20	16	Seed dusted with spores and treated with 2 per cent. bluestone solution	Clean—average 5 feet high, tallest 7 feet
7	20	14	Seed treated with bluestone solution and then dusted with spores.	Clean—average $5\frac{1}{3}$ feet high, tallest $6\frac{1}{2}$ feet

Only one plant was smutted and this was in Plot 2, where the seed was infected. The individual plant was 3 ft. 8 in. high and while the male flower or tassel at the top was clean, there were four cobs smutted. The smutted cobs were all on one side of the plant. Two of the largest were close together and uppermost only separated by a short node, below that was clean, then the next was only partially smutted (Fig. 4) and the lowest was very small but entirely smutted. Thus one plant out of thirteen was smutted, or nearly 8 per cent. and this is a larger proportion than has hitherto been met with in the worst infected paddocks. In the Gippsland district I found that about 1 per cent. of the plants was affected this season. The mode of infection then is through the young seedling by means of spores adhering to the grain and the experiments both as to infection and treatment will be carried out on a larger scale in maize-growing districts during the coming season. But there is sufficient evidence at present to justify us in recommending the treatment of the seed, along with other measures.

Explanation of Plate Opposite.

SPORES AND THEIR GERMINATION.

5. Spore-balls from a very young smutted cob of maize × 250.

6. Spores of various shapes and sizes × 500.

7. and 8. Germinating spores with formation of conidia × 500.

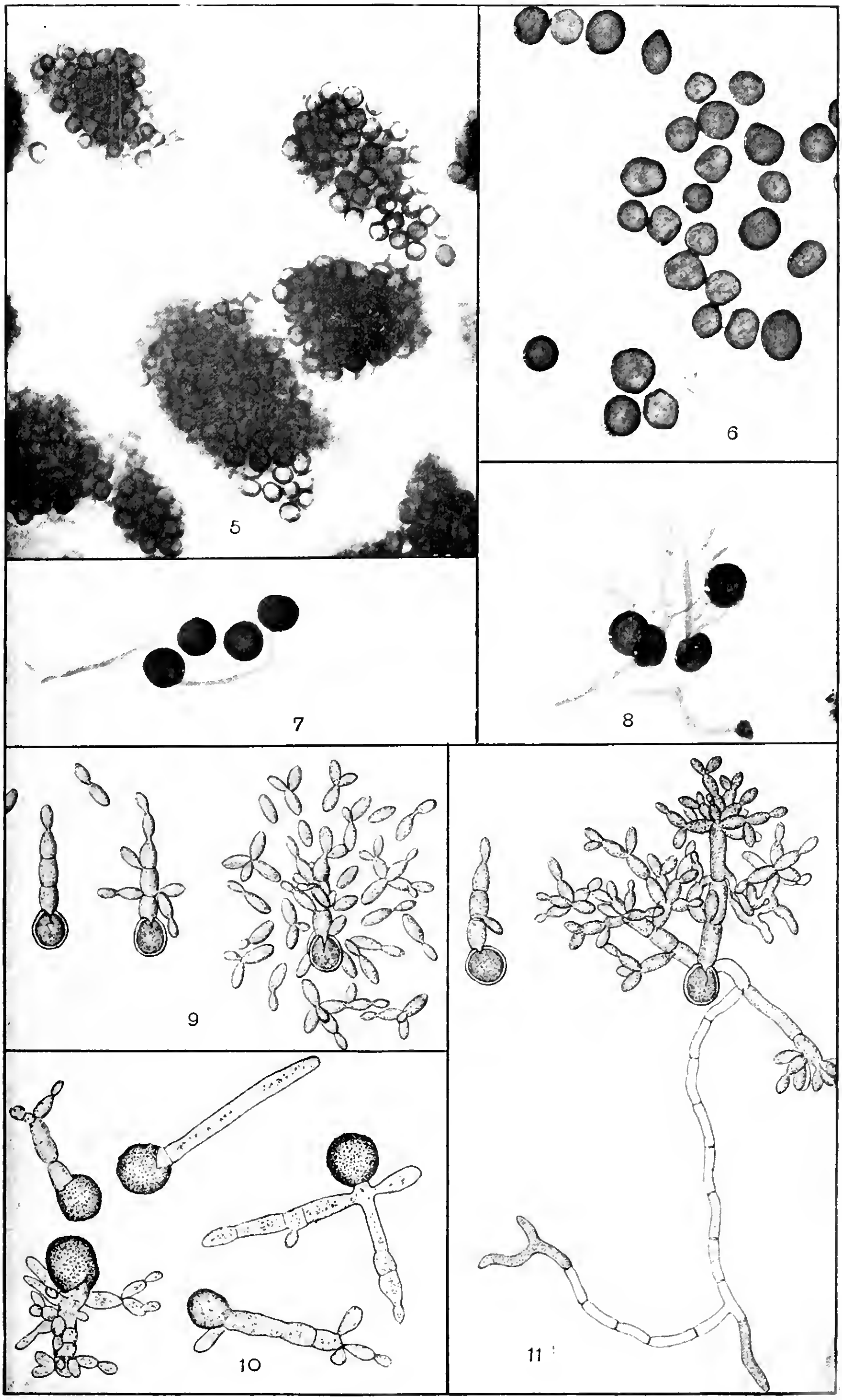
9. Spore germination in nutritive solution (after Brefeld) × 350.

The successive development of the germination is shown, the conidia finally becoming detached and sprouting in a yeast-like manner so as to form small colonies.

10. Germination of spores after being three days in water (after Norton) × 600.

11. Spore germination in nutritive solution (after Brefeld) × 350.

The spore on the right has produced three germinal tubes, bearing numerous conidia, some of which have formed germ-tubes while still attached.


5
6
7
8
9
10
11

Treatment.

The fact that seedling infection occurs in this smut suggests the advisability of treating the seed, whereas in the American Corn Smut this is found to be of no avail, since infection comes not from the seed, but from conidia in the air which reach the growing plant.

Some growers in the Lindenow district have treated the seed with bluestone at my suggestion and have stated that it reduced the smut, but definite field experiments will be undertaken, not only with bluestone but with other fungicides and the exact result recorded. Where the seed was treated with bluestone solution (Plots 6 and 7), the germination was just as good as in the other plots sown with untreated seed and the plants seemed to grow just as well and as tall.

The following measures for dealing with this smut are recommended :—

1. Since infection occurs through spores carried on the seed, the affected plants scattered through the crop should be removed, care being taken to prevent the scattering of the spores, and either destroy the smutted ears by burning preferably, or by placing them in boiling water. This is a practicable method and would alone considerably reduce the amount of infection.
2. All imported seed should be disinfected, as the spores might unwittingly be conveyed and sown along with it.
3. Seed should be treated with a 2 per cent. solution of bluestone, or 1 lb. of sulphate of copper to 5 gallons of water, and only left sufficiently long in the liquid to allow of every grain being wetted.

A test was made of the effect of formalin on the germination of the spores. The usual strength was used, 1 lb. in 40 gallons of water, and the spores were kept in this solution for five, ten and fifteen minutes respectively. In every case the spores were found to germinate, the examination being continued for seven days, so that formalin of this strength is not a preventive.

II.—American Corn Smut.

(*Ustilago zeae* (Beckm.) Unger.)

Since this smut has not hitherto been found in Australia, it will not be necessary to treat it at great length.

The smut-boils have already been referred to and the spores are produced in countless myriads. These spores under favourable conditions of heat and moisture and with suitable food material, give rise to germ-tubes which bear numerous conidia. The conidia sprout like yeast and the numerous secondary conidia, formed in this way, are carried by the wind or other agency to fresh plants, where infection occurs if the tissues are young and tender. The smut-spores are likewise able to rest through the winter and germinate in the spring when fresh food is available. The infection is purely local, and the smut-boils may appear at the point where this has taken place in about three weeks; showing how rapidly the fungus can reproduce itself. While any young and growing portion of the plant may be attacked, and all through the growing season, yet it is the cob which most frequently suffers. The food stored up in the grains offers a splendid opportunity for the fungus, and the production of spores is simply enormous.

Treatment of the seed corn with bluestone or formalin has not prevented the smut, and all smut-boils and spore masses should be carefully removed and destroyed, so as to lessen the risk of fresh infection.

A PIONEER MAIZE CROP IN THE WIMMERA.

J. M. B. Connor, Agricultural Superintendent.

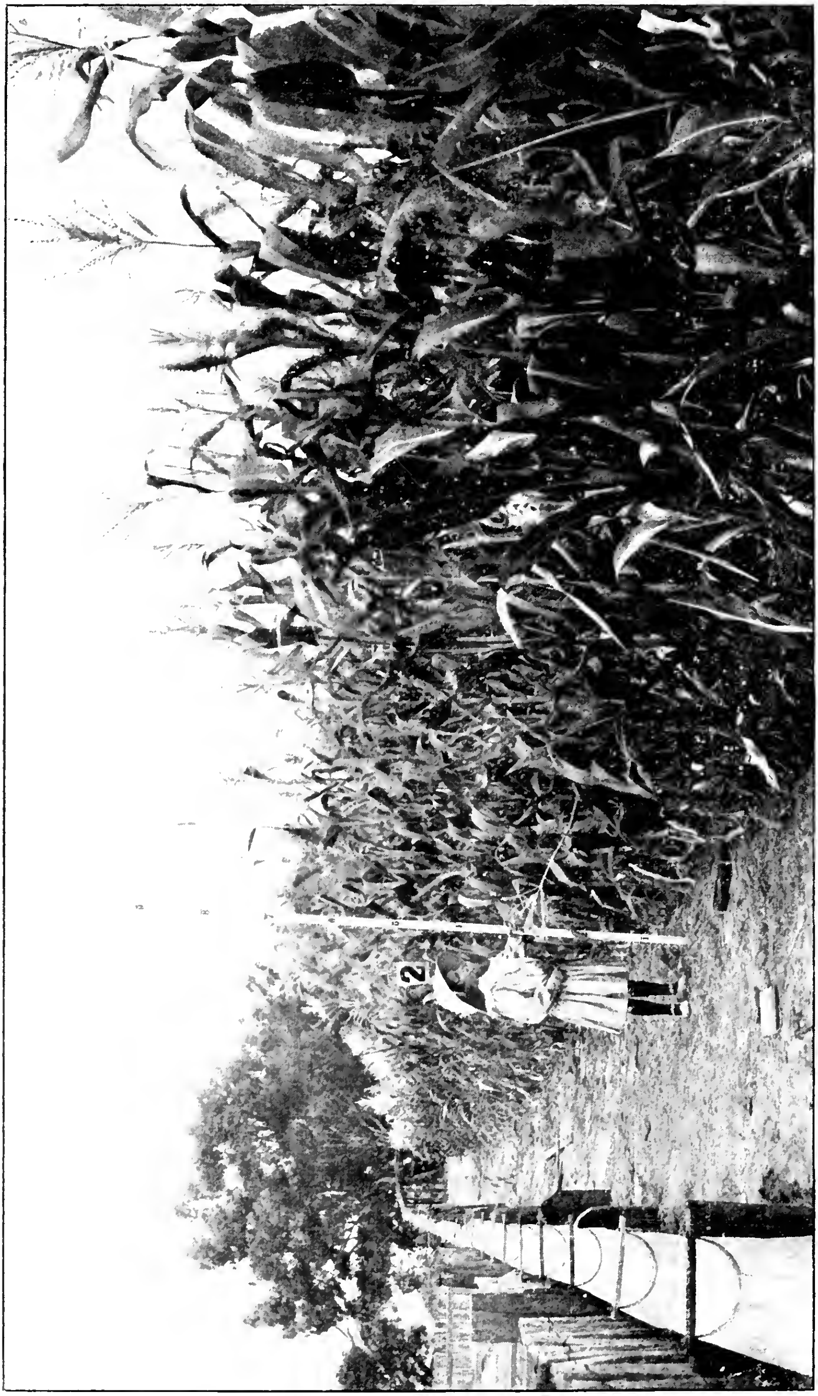
That maize can be successfully grown in the heart of the Wimmera district, to supplement the dry feed during the summer months, has been clearly demonstrated by the practical results obtained on the pioneer plot of 4 acres on the farm of Mr. James E. Hutchings, of Wimmera Park, Glenorchy.

In these days of scientific and up-to-date methods of cultivation, rotation of crops, and the successful growing of fodder crops on what has been, in the past, thought to be unsuitable land, many old ideas regarding agricultural pursuits are losing caste. The opinion generally held by the average farmer is that maize can only be grown on rich river flats. The experiment now recorded conclusively proves that the area of successful culture is not so limited.

BILLABONG FROM WHICH WATER FOR IRRIGATION IS OBTAINED.

The plot of 4 acres was sown on the 12th October, 1909, with the following ten varieties of maize:—Silvermine, Sandford White Flint, Blood Red, Early Yellow Dent, Funk's Yellow Dent, Boone County Special, Yellow Moruya, Hickory King, Eclipse, and Sunshine. The soil consists of a light chocolate loam for the first 12 inches, then a similar depth of red clay, overlying 10 feet of dry sand. It was thoroughly worked by the owner into a fine tilth, and manured at the rate of 1 cwt. of superphosphate to the acre. During its growth, the plot was watered three times from the billabong illustrated, viz., on the following dates:—24th November, 11th December, and 24th January, and was hoed once only (13th December).

The photograph on page 301 shows the crop of Yellow Moruya which averaged 9 feet in height with abundance of luscious green leaves and stems. It cobbed well, and when harvested on the 26th February, yielded 9 tons



HICKORY KING MAIZE, 8 FT. 6 IN. HIGH. (Fluming used for conveying water is also shown.)

of green fodder to the acre. Another very strong growing crop of Yellow Moruya, sown for seed purposes, was just coming into flower at the time of my visit (26th February). It had stooled well and was cobbing freely. In order to prevent cross fertilization this plot was planted in a suitable site apart from the other varieties. Although late in coming to maturity, its suitability for the Wimmera district is evident. Eclipse gave a return at the rate of 14 tons of green fodder to the acre and, although coming to maturity about a fortnight later than most of the other varieties sown, it would appear from its luxuriant growth to be another suitable variety to grow in the Wimmera. By the remaining illustration it will be seen that the crop of Hickory King was very even. This maize has done remarkably well in most districts and by its uniform growth of succulent foliage has become a general favourite. In this instance it yielded at the rate of $9\frac{1}{2}$ tons of green fodder to the acre, and averaged between 8 and 9 feet in height. The difference in these weights is mainly due to the advanced

YELLOW MORUYA MAIZE, 9 FEET HIGH.

stage of the crop at the time of harvesting. The Eclipse, being later than either of the other two, held more sap, and consequently weighed heavier. If the weighing had been carried out a fortnight earlier, the Yellow Moruya and Hickory King would have been heavier. The Sunshine variety came to maturity earlier; it stooled and cobbed more freely than any of the others, and was ready for feeding purposes early in January. Sunshine averaged but 5 feet in height, being the shortest of all. It would appear to be more of a seed, than a fodder, variety for this particular district.

Mr. Hutchings is very gratified with the results obtained and during the coming season he intends to extend the fodder area, and to include lucerne. That suitable varieties of maize and lucerne can be successfully grown on the Wimmera plains I feel sure of, especially along the banks of the billabongs adjacent to rivers that frequently become flooded, and of which at the present time, but little use is made. The success, or otherwise, of such an experiment as the one under review depends in no small measure upon the stamp of man and his enthusiasm. Fortunately, in Mr. Hutchings, the Department has the co-operation of an enthusiast who enters thoroughly into the work, and gives valuable assistance at all times.

LANG LANG FODDER CROP COMPETITION.

J. S. McFadzean, Dairy Supervisor.

The competition held under the auspices of the Lang Lang Agricultural Society was for the best 4 acres of maize, and 1 acre of other fodders of not less than two kinds. In awarding points, I have considered these two sections to be of equal value; the smaller area being on the line of an experimental plot for the district, while the larger one dealt with the crop that was most generally grown at this season.

There were five competitors, and I have placed them in the following order:—

1st. Mr. A. T. Priestly,
2nd. Mr. G. Wildes,
3rd. Mr. D. J. Gardiner,
4th. Mr. D. Cochrane,
5th. Mr. T. Patullo.

All the competing farms have first class flat land; but the soils on the situations chosen for the crops vary somewhat throughout in colour, quality and friability, some shewing a much larger humus content than others. Only on one farm, Mr. Priestly's, had manure been used; and, as a general rule, it does not appear to be required here. Still, where Mr. Cochrane's crops were sown, the condition of the land suggested that it might have been improved by a dressing of well-rotted farm refuse, for it was rather cloddy and dry looking.

Mr. Cochrane's farm is at Caldermeade, and was the first inspected. In this case, the 4 acres of maize were sown by hand on 15th November in rows 3 feet wide, the seed having previously been steeped in water to insure a more even and quick germination. The variety used was Hickory King; and the crop was of fair quality, but rather thin, which was mainly due to only 15 lbs. of seed per acre having been sown. This is too light a sowing for fodder purposes, except under particularly favourable conditions and with a first class germination. The ground between the rows had been twice scarified, and the crop was fairly clear of weeds. This was the first time the paddock had been cropped, and the ground was not in its best condition; consequently, the maize had not made the profuse growth that is more generally characteristic of it in this district. It was only about $5\frac{1}{2}$ to 6 feet high, and equal to 7 tons of green fodder per acre; the cobs were then but partly developed. It had also been slightly touched by frost. The other acre on this farm contained pumpkins, mangolds, millet and cabbage crops in varied proportions. The pumpkins and millet had done fairly well, but the ground where the mangolds and cabbage were grown was very poorly cropped. The vacant part of the mangold area had been recently filled in with transplanted roots, but they had not yet set. This ground had also been recently worked between the rows, and was in very fair order as regards weeds. There were only two rows of millet, which was about $3\frac{1}{2}$ to 4 feet high, and well headed. There was a single row of cabbage, but such hearts that had formed were small. The pumpkins occupied more than half of this acre and promised to be a fair crop with favourable weather, showing then equal to 5 tons $6\frac{3}{4}$ cwt. per acre.

The next farm inspected was that of Mr. D. Gardiner of Lang Lang. The maize crop was of Hickory King and Sydney Flat Red varieties, sown broadcast at the rate of 2 bushels to the acre without manure at the end of November. There was no noticeable difference between the varieties under this system of sowing, the crop being about 8 feet high, with close-growing stalks, fine in stem, narrow in leaf, and with almost no sign of cobbing. The soil here is a rich loam and free in texture; and the seed had germinated well, making a large bulk of fodder, but of poor quality. The crop, however, was at its best, and cut equal to $22\frac{3}{4}$ tons per acre. The other acre was of mangolds and pumpkins; both very fair crops and in good condition. No manure had been used on either. The mangolds were sown about the end of November, in rows about 28 inches apart, and at the rate of 3 lbs. of seed to the acre, Long Red, Long Yellow, and Globe varieties each being tried. The last were, if anything, the best: and on the whole, the crop showed equal to $21\frac{1}{2}$ tons to the acre at this stage.

As on each of the other farms, the pumpkins were a mixed sowing of different varieties. About $1\frac{1}{2}$ lbs. of seed per acre were sown, in rows 8 feet apart, and the plants thinned as required to give them room. As a crop, they were but half grown, but showed equal to 16 tons 8 cwt. per acre when seen.

The farm of Mr. T. Patullo of Yannathan was next dealt with. It adjoins the Lang Lang Creek, and the soil is a dark friable loam of exceptional quality. The maize crop was of Sydney Flat Red, sown broadcast on 24th November, at the rate of 50 lbs. to the acre, and fairly evenly distributed. It had made a very profuse sappy growth, running from 10 to 11 feet high, with thick stalks; but the cobs had not yet developed. Some Ninety Day maize sown beside it was about 8 feet high with heavy stalks and a fair proportion of cob, serving to demonstrate the quality and productiveness of the soil. The greater portion of the crop had been beaten down by the recent rain, the big succulent stalks being too heavy for the roots to support in such free soil. For height, thickness of stalk, and evenness, this was an exceptional crop of broadcast sown maize; and it weighed at the rate of slightly over 21 tons per acre.

None of these broadcast maize sowings had been given any further attention as regards cleaning either the crop or headlands, and there was a heavy growth of weeds all through them, up to 3 and 4 feet high, and full of seed. Besides this, both here and on Mr. Wildes' farm adjoining, a large portion of the land is a wilderness of weeds and thistles, tons of which are allowed to ripen their seed and foul the land, when they might be advantageously ensiled for stock fodder. The land being so extremely fertile, it is an impossibility under the present working conditions for the weeds to be kept in check over the amount of ground that is being cultivated by each owner. It is land admirably adapted to intense cultivation in connexion with dairy farming. Mr. Patullo was unfortunate in having put half of his acre section in with a late sowing of oats; which, at the time of inspection, had made little headway—not enough to be considered as fodder in such a competition. All crops have to be estimated on their appearance at the time of judging, and not on their future possibilities; and the more forward a crop is, the better must be its chance of gaining points for its owner.

The rest of the acre section was in pumpkins, and this crop was also the least forward of its kind inspected. The fruit, however, had set well, and were developing nicely; and the crop in this stage would weigh about 18 tons per acre.

In order of inspection, the next farm was that of Mr. Wildes, of Lang Lang, on the opposite side of the creek. Mr. Wildes' 4 acres of maize were included in a crop of several acres that was being cut and fed to the milking stock. It was of Hickory King, sown broadcast in the second week in October at the rate of 2 bushels to the acre. It came up thinly, probably not more than one-third of the seed germinating; but it came fairly evenly, and made excellent growth. It was the best quality maize inspected, being fairly well cobbed throughout, about 8 feet high, and running 20 tons $6\frac{1}{4}$ cwt. to the acre.

Pumpkins and mangolds made up the other acre of fodder here. Both these crops were sown at the end of October, and the rows had been kept clear of weeds till the end of the year. The pumpkins were the most forward crop seen; a good proportion of the fruit was very large and well matured, and they showed equal to $38\frac{3}{4}$ tons per acre. The mangolds were the Long Red variety, sown with 3 lbs. of seed to the acre, in drills about 3 feet apart, thinned, and kept clear of weeds. In places, the sowing might have been a little more even; but the plants were making good growth, the crop being equal to $10\frac{3}{4}$ tons per acre. This paddock had been in grass for some six years past, and was broken up for this season's cropping.

From the condition of these fodder crops, I would consider that they could be sown earlier than is the rule in this district. Maize sown in drills early in October, at the rate of about 35 lbs. to the acre, and kept clear of weeds, would have every chance of cobbing out well before the autumn frosts. Several maize crops have already been slightly affected by frosts, and few of them are showing cob.

The last crop to be inspected was that of Mr. Priestly of Yannathan. This maize was in drills 26 inches apart, and was sown by a lad dropping it by hand from a potato-planter. The amount used had not been noted, but it was far too heavy a seeding, for the plants were crowding each other. It was put in on 22nd November, with 1 cwt. of bonedust and superphosphate to the acre. It had been horse-hoed once, and hand-cleaned twice; and it was the cleanest and best cared for crop of maize inspected. Notwithstanding its being too thickly sown, there was still a fair proportion of cobs showing. It was about 8 feet high, and weighed out equal to 20 tons 13 cwt. per acre.

The acre section was in mangolds, turnips, and field carrots. The first two were splendid crops; but the carrots were somewhat unevenly sown, and not very forward. This ground was sown with onions in September; but as they did not show up well it was ploughed again, and the several crops sown with a hand-drill. It previously had been given a good dressing of farmyard manure.

The mangolds were a very even crop of Long Red, well cleaned, and fairly well grown; and were estimated to yield at the rate of 29 tons 13 cwt. per acre. Two kinds of turnips were sown, Purple Top Swede and Purple Top Aberdeen, the latter producing the larger and more even roots. However, both were good, and the crop was estimated to yield at the rate of 35 tons 8 cwt. per acre. Two kinds of carrots also were sown, white and yellow, and they gave every promise of a good crop. All the crops on this acre were kept clean, and well cultivated; and had a very attractive appearance.

The points awarded in judging each section are given herewith.

Lang Lang Fodder Crop Competition.

Owner.	Crop.	Preparation of Land.	Manuring.	Variety of seed.	Apparent seeding.	Evenness of sowing.	Method of sowing.	Weeding and after cultivation.	Quality of crop.	Yield.	Total Points.
		10	5	5	10	5	10	20	10	25	200
A. T. Priestly, Yannathan	Maize ..	.. 10	.. 5	.. 5	.. 6	.. 4	.. 5	.. 12	.. 6	.. 19	72
	Mangold ..	10	5	5	10	5	10	17	7	23	
	Turnip ..	10 av. 10	5 av. 5	5 av. 5	10 av. 9	5 av. 4	10 av. 10	17 av. 17	8 av. 6	25 av. 18	84 } 156
	Carrot ..	10	5	5	8	3	10	17	4	4	
G. Wildes, Lang Lang	Maize ..	.. 10	..	.. 5	.. 8	.. 4	..	..	.. 9	.. 18	54
	Pumpkin ..	10 av. 10	..	5 av. 5	10 av. 9	5 av. 4	10 av. 9	17 av. 17	8 av. 7	25 av. 18	} 133
	Mangold ..	10	..	5	8	4	8	17	5	12	79
D. J. Gardiner, Lang Lang	Maize ..	.. 10	..	.. 5	.. 2	.. 4	..	..	.. 3	.. 21	45
	Pumpkin ..	10 av. 10	..	5 av. 5	10 av. 9	5 av. 4	10 av. 10	15 av. 15	5 av. 7	16 av. 18	78 } 123
	Mangold ..	10	..	5	8	4	10	15	8	20	
T. Patullo, Yannathan	Maize ..	.. 10	..	.. 5	.. 8	.. 4	..	..	.. 8	.. 19	54
	Pumpkin ..	10 av. 10	..	5 av. 5	10 av. 10	5 av. 4	10 av. 5	10 av. 8	3 av. 1	17 av. 9	52 } 106
	Oat ..	10	..	5	10	4	..	6	..	..	
D. Cochrane, Caldermeade	Maize ..	.. 8	..	.. 5	.. 6	.. 5	.. 10	.. 8	.. 6	.. 4	52
	Pumpkin ..	8	..	5	10	5	10	15	3	4	
	Mangold ..	8	..	5	2	2	10	15	3	2	
	Millet ..	8 av. 8	..	5 av. 5	10 av. 6	4 av. 3	10 av. 10	15 av. 15	8 av. 4	5 av. 3	54 } 106
	Cabbage ..	8	..	5	..	1	10	15	3	2	

YIELD OF RECONSTITUTED VINEYARD AT THE RUTHERGLEN VITICULTURAL COLLEGE: VINTAGE 1910.

G. H. Adcock, F.L.S., Principal.

After the vintage of 1909, at the request of a large number of vignerons and others who were deeply interested in the reconstitution of vineyards, a short article was published on the yield of the College vineyard. In this paper, which appeared in the May issue of the *Journal* for last year, were shown the returns in weight per vine and per acre, and also the cash value per acre of the crop estimated at the then current local rates, viz., £5 per ton. As the publication of those data apparently roused considerable interest, it has been considered advisable to give in the present article the experience and results of the current year's vintage.

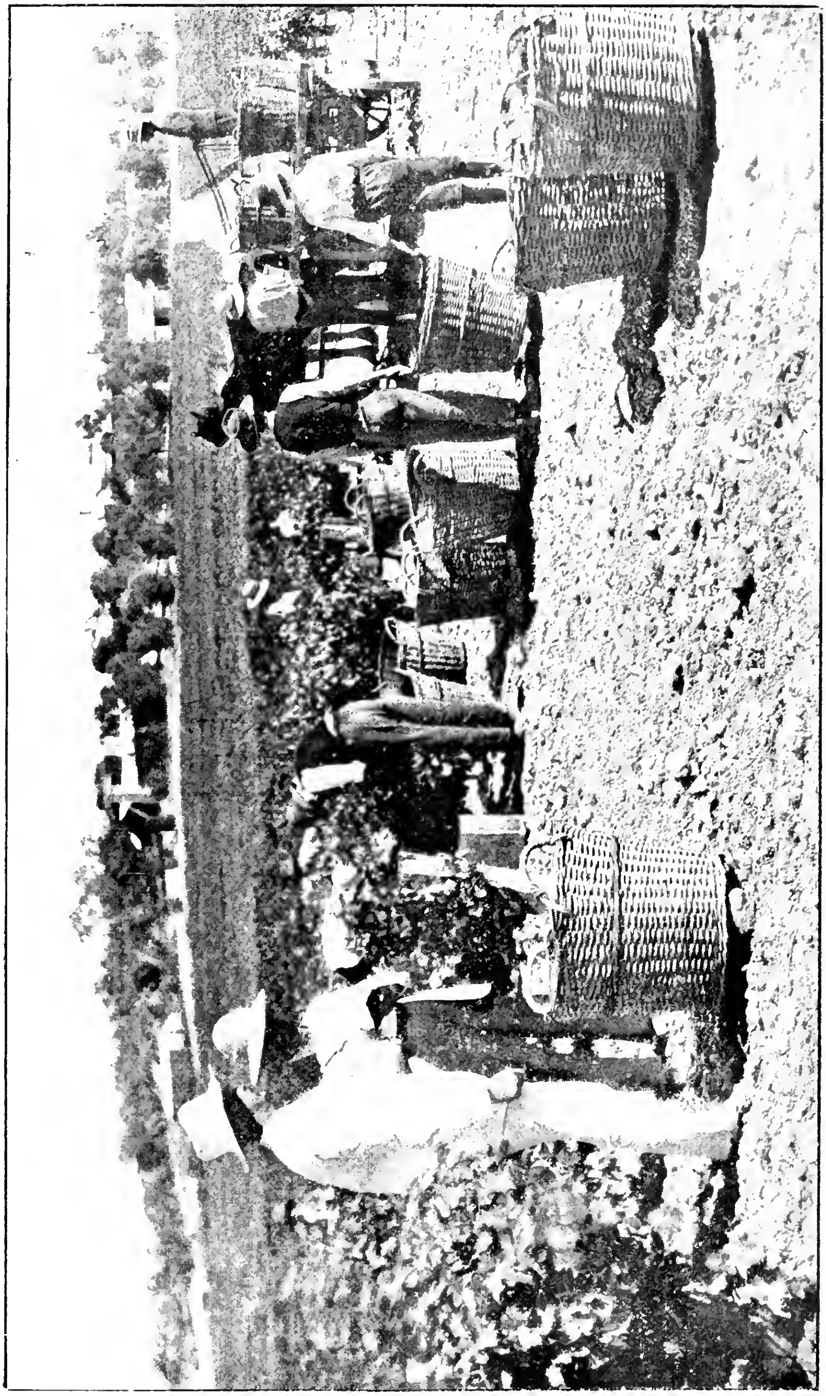
In accordance with the system adopted under the present management, careful records are kept of all experiments made. The results of this year's vintage are submitted to show that the good returns tabulated last vintage were not the accidental consequences of a single successful season, but have been in most cases surpassed by the yields of the present year.

It must not be forgotten that the soil of the College vineyard is by no means the best, and that the grafted resistant stocks were planted immediately on the site whence dead and dying vines had been uprooted. The site of this plantation, too, was not prepared as thoroughly as is now deemed essential, and it was at first surrounded with infected vines. This was quaintly compared in a rather mixed metaphor to "an island of vines in a sea of phylloxera."

During the winter of 1909 we had exceptionally heavy rains resulting in floods. For some weeks our vineyard was practically submerged. This gave the subsoil a thorough soaking which has enabled the vines to carry on in the absence of later rains. For, at the most critical time for the crop, we were without any appreciable quantity of rain for a prolonged period. Had the usual early summer rains fallen there is no doubt we should have had even better yields than those recorded.

As was the case last year, we have again lost heavily of our ripe grapes. Birds have caused serious losses, but can hardly be blamed for helping themselves to the tempting, succulent fruit. We had reluctantly to shoot a few, and the rest took the hint. This year the useful magpie rather disgraced himself by his depredations among the grapes, though perhaps he considers himself justly entitled to some compensation for the great assistance he renders during the greater portion of the year in devouring voracious grubs and caterpillars. The peculations of men and boys are much more serious. The same complaint is heard from all whose vineyards are near the highways. Probably if an example were made of some of the worst offenders by prosecuting, this growing evil might be minimised.

In spite of these drawbacks the returns speak favourably for the reconstituted vine, and emphasize the fact that with proper attention and ordinary care there is money in reconstitution. We cannot overlook the fact that thorough cultivation, green manuring and fertilising have all added their quota to the results recorded, and these are not only indispensable but form a sound investment. All the growers who have started to reconstitute have proved the value of these operations. The newer



VINTAGE SCENE AT THE RUTHERGLEN VITICULTURAL COLLEGE.

plantations are generally receiving much greater attention in these respects, as well as in the initial preparation of the land, than the older ones did, and the results cannot fail to be satisfactory and payable. Too much emphasis, however, cannot be placed on the necessity for constant cultivation in a dry district such as this, to conserve the sparse and erratic rainfall, and also allow the atmospheric agencies to assist in the good work of rendering active some of the dormant constituents of the soil.

As the writer has so constantly insisted, the best land cannot long stand the steady withdrawal of its most important constituents unless some of these are renewed from time to time by judicious manuring. It is just as reasonable to expect one's bank balance will stand a constant drain without corresponding additions. Many vineyards, orchards and farms, by their impoverished appearance and diminished yields, unmistakably proclaim what the odious letters N.S.F. signify on a dishonored cheque.

During the past year, as formerly, we have had a large number of interested visitors who watch with the keenest interest the success of our experiments and the progress of our reconstituted vineyard. Without a single exception, all have been lavish in their praise of the results obtained which are due largely to Mr. H. Wilkinson's unflagging and intelligent interest and energy.

To insure a fair comparison with the former records, the value of the crop has again been computed at £5 per ton—a price that can be readily exceeded in this district at the present time.

YIELDS, COLLEGE VINEYARD: VINTAGE 1910.

Variety, Date of Planting, and Stock.	Sp. gr. Must.	Yield per vine.	Yield per acre.				Value per acre at £5 per ton.		
		lbs.	tons	cwt.	qrs.	lbs.	£	s.	*d.*
Shiraz (1903)—									
Hybrid 3306	1·125	10·07	2	8	3	23	12	4	9
Rupestris metallica (Cape) ...	1·120	8·79	2	2	2	22	10	13	6
A.R.G. 1	1·110	7·84	1	18	0	10	9	10	5
Rupestris du Lot	1·120	7·28	1	15	1	17	8	17	0
Hybrid 3309	1·127	7·26	1	15	1	3	8	16	5
Burgundy (1904)—									
Hybrid 3309	1·106	7·39	1	15	3	19	8	19	7
Riparia grand glabre	1·110	7.14	1	14	2	25	8	13	7
Malbec (1904)—									
A.R.G. 1	1·106	12·66	3	1	2	3	15	7	7
Riparia grand glabre	1.110	11.59	2	16	1	5	14	1	6
Rupestris metallica (Cape) ...	1·105	9·23	2	4	3	9	11	4	2
Hybrid 3309	1·108	9·14	2	4	1	20	11	2	1
,, 101-14	1·110	6·07	1	9	2	0	7	7	6
Rupestris du Lot	1·103	5·4	1	6	1	0	6	11	3
Cabernet (1904)									
A.R.G. 1	1·115	9·4	2	5	2	20	11	8	4
Hybrid 3306	1·125	8·43	2	0	3	25	10	4	10
Rupestris metallica (Cape) ...	1·123	8·21	1	19	3	18	9	19	6
,, ,, (France) ...	1·124	7·95	1	18	2	14	9	13	2
Hybrid 3309	1·122	7·91	1	18	1	23	9	12	3
Riparia grand glabre	1·115	7·58	1	16	3	12	9	4	3
Rupestris Martin	1·118	6·17	1	9	3	25	7	9	10

The following show increases over the 1909 yield:—

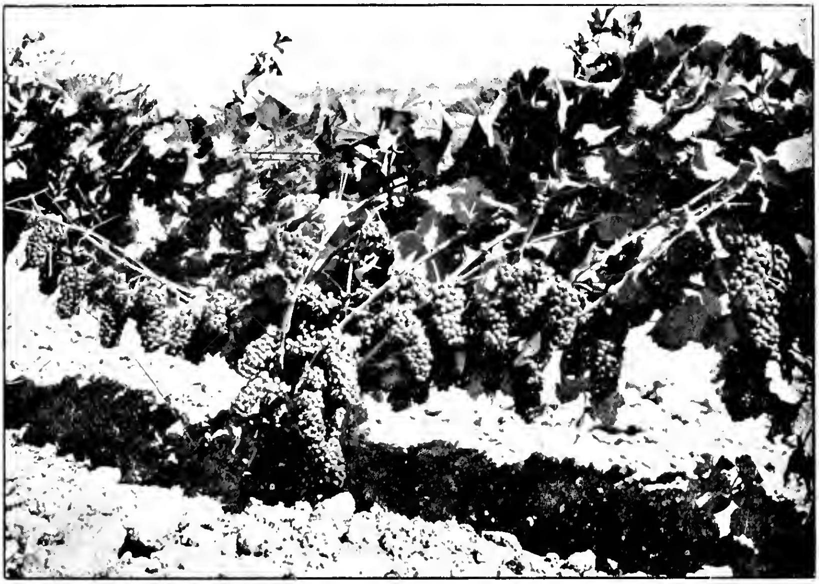
Variety and Stock.	Increase per vine.	Increase per acre.	Increased Returns per acre.
	lbs.	cwt. qrs. lbs.	£ s. d.
Shiraz—			
Rupestris du Lot	1·96	9 2 3	2 7 8
A.R.G. 1	1·87	9 0 9	2 5 5
Rupestris metallica (Cape) ...	1·43	6 3 18	1 14 7
Hybrid 3306	·71	3 1 23	0 17 3
,, 3309	·26	1 1 3	0 6 5
Burgundy—			
Hybrid 3309	2·95	14 1 8	3 11 8
Riparia grand glabre	1·9	9 1 2	2 6 4
Malbec—			
A.R.G. 1	3·8	18 1 23	4 12 3
Riparia grand glabre	3·59	17 1 21	4 7 3
Hybrid 10114	3·01	14 2 14	3 13 2
Rupestris metallica (Cape) ...	1·73	8 1 17	2 2 1
Hybrid 3309	1·63	5 3 22	1 9 9
Cabernet—			
Hybrid 3306	·65	3 0 20	0 15 10
Rupestris Martin	21	1 0 1	0 5 1

The following show less crop in 1910 than at the previous vintage:—

Variety and Stock.	Decrease per vine.	Decrease per acre.	Decrease in Returns per acre.
	lbs.	cwt. qrs. lbs.	£ s. d.
Cabernet—			
Riparia grand glabre	·22	1 0 4	0 5 2
A.R.G. 1	·45	2 0 18	0 10 10
Rupestris metallica (France) ...	1·03	5 0 3	1 5 1
,, ,, (Cape) ...	1·39	6 2 11	1 13 0
Hybrid 3309	2·13	10 1 7	2 11 7

As pointed out in the former article, the vines are planted 10 ft. x 8 ft., are trellised on two wires, and pruned on the rod and spur system. It will be noticed that some of the stocks used when our vineyard was established, have since been discarded as not altogether reliable. With regard to the returns recorded, it is necessary to state that the disparity in the yields must not be wholly attributed to the stocks. For example, in the Malbec, those grafted on Rupestris du Lot appear lowest in the list. The explanation is that these vines are rather unfairly situated, being planted at the intersection of two roads and near a belt of timber. Here they suffered more from feathered and human thieves than any other. Till the grapes were nearly ripe, the grafts on this stock gave promise of an exceptional yield, and compared more than favourably with any other. Increases are shown, except in the case of some stocks in the Cabernet section. It will, however, be remembered that the previous crop was exceptionally good, and required something "extra special" to beat it.

Vines of Aramon, Aramon Bouschet, Alicante Bouschet, Asperan noir, and Grand noir de la Calmette, though only planted in October, 1907,



BURGUNDY ON 3309.

averaged 6 lbs. per vine, which is equivalent to 1 ton 9 cwt. 16 lb. per acre and is worth at £5 per ton the sum of £7 5s. 9d. as the return for an acre.

MALBEC ON 3309.

THE WINE INDUSTRY IN SOUTHERN FRANCE.

(*Continued from page 226.*)

F. de Castella, Government Viticulturist.

MAIN FEATURES.

The department of Hérault comprises that strip of land, roughly twice as long as it is broad, between the Cevennes Mountains, which form the southern fringe of the great central plateau of France and the Mediterranean coastline, which in this part runs approximately from north-east to south-west. This roughly rectangular area, which averages 70 miles long by 35 wide, is bounded on the east by the river Vidourle and on the west by the river Aude. It is traversed, in a northerly to southerly direction, by the rivers Orb, Hérault and Lez, on the last of which is situated the town of Montpellier, the capital of the department. As Professor Crova points out, the department constitutes a sort of inclined plane, falling away from the flanks of the Cevennes to the Mediterranean. The height above sea level thus varies from nothing, to over 3,000 feet, the average for the whole department being 738 feet. In marked contrast to one another are the broken and twisted ranges of the northern portion and the large expanse of level or undulating land, in the vicinity of the sea shore, almost wholly devoted to the culture of the vine.

Including, so far as altitude is concerned, so wide a range, nearly every situation and climate in which the vine will grow in France is to be met with. Nevertheless, the vast majority of the vineyards are situated at but a slight elevation above sea level.

Orographically, the department may be divided into two distinct regions of approximately equal area, known respectively in the south ot France as *La Montagne* and *La Plaine* (see page 72). The former consists of the uplands, more stony and dry, in spite of the more abundant rainfall; the latter, the level or undulating ground on which are the heavy bearing vineyards. The former is in a general way, furthest inland whilst the latter is nearer the sea. It is the coastal portion with its heavy bearing vineyards to which I propose to devote most attention in the present articles, for it is the one which is truly characteristic of the region and in which intense culture is so admirably carried out. The uplands vineyards are more similar to those of many other parts.

In the vicinity of the sea, especially along the eastern portion of the coast, are large salt lakes or lagoons, known locally as etangs, bordered often by low sand hills, on which ungrafted viniferas can live in spite of Phylloxera, as we shall see presently.

SOILS.

H. Marès, one of the best known writers on the viticulture of the region, divides its soils into three categories —

1. Rich alluvial soils formed by rivers.
2. Soils of the plains away from the rivers.
3. Hillside soils or Garrigues.

It is those of the second group which are of the greatest importance, so far as the vine is concerned. On them are planted the majority of the heavy bearing vineyards, though some of them are also to be found in the rich alluvial soils. The first and second group between them constitute what is known as *La Plaine*, the 3rd group *La Montagne*.

The most striking difference between the soils of Hérault, and those of the vine-growing districts of Victoria, consists in the prevalence of lime in the former case. This is in marked contrast to its scarcity with us. The rocky hills to be seen everywhere are of limestone, chiefly of secondary geological age, and they forcibly strike a Victorian by their marked differences from our primary schists so abundantly in evidence in Victoria.

Vast accumulations of limestone rock are almost everywhere in evidence, and it is the prevalence of this element which constitutes the most vital difference between our own and southern French soils, a difference which has an important bearing on the question of reconstitution, and which needs to be thoroughly realized when it is being considered.

The soils of the second category are often termed locally *Terres de Soubergue*. They are intermediate between the other two and, so far as the heavy bearing vineyards are concerned, they play the most important part in the viticulture of the department.

Geologically considered, one finds considerable variety in the Hérault soils; the most important formations, in order of area they occupy in the vine-growing region, are the following:—

Tertiary formations occupy a most important place, especially among the soils of the second group. The soils resulting from their decomposition are amongst those most frequently to be met with in the vineyard lands. They comprise blue and yellow marls and what is known as Montpellier sands. The latter type, of Pliocene age, covers a large area of country. The soils resulting from the decomposition of this soft sandstone are very rich in lime and have given much trouble in connexion with reconstitution. In them, the majority of stocks suffer severely from chlorosis. The frequency with which one meets with this word, unknown, fortunately, in Australia, is well known to any one conversant with French viticultural literature.

An analysis of a sample of typical soil of this character appears on the next page. This and those following were made by Mr. P. R. Scott, Acting Chemist for Agriculture.

Secondary formations are also largely represented, but chiefly in the higher levels. The hillside soils, known as Garrigues, belong to this epoch. They are chiefly of Jurassic age and consist of hard, but fissured rock. Nevertheless, formations of this description are to be met with here and there in the lower lands of the department, mainly as out-crops, for the majority of them are, more or less, covered by extensive tertiary deposits. The soils resulting from the decomposition of these hard limestone rocks are much freer from excess of lime than those of Tertiary age. Chlorosis is seldom troublesome, so much so that the chestnut is often found growing in these soils, a tree which is as susceptible to excess of lime as any American vine. This seeming anomaly is explained by Professor H. Lagatu in the following words:—

> The upper Jurassic is constituted by hard magnesian limestones . . . . (lithographic limestones). Though these can be broken into fairly large angular fragments, natural agencies fail to reduce them to a state of powder. Hence it is that the soil results solely from chemical attack; progressive removal of the calcareous portion, by water saturated with carbonic acid, leaves a clayey and ferruginous residue, very plastic and containing at most a few hundredths of lime (carbonate) often 1 to 2 per cent. . . . .

Taken as a whole, secondary formations play a lesser part than Tertiary in the vineyard soils of Hérault. Among these, Jurassic plays the greatest part. Trias and Cretaceous rocks being less often met with. The vineyards of Frontignan are situated on Jurassic limestone formation.

ANALYSIS OF SOIL FROM NEAR MONTPELLIER SCHOOL.

—	Soil.	Subsoil.
	Parts per 100,000.	Parts per 100,000.
Chemical.		
Nitrogen	109	64
Phosphoric Acid	200	210
Potash..	251	219
Lime	24,420	26,650
Magnesia	150	191
Chlorine	Nil	Nil
Reaction	Alkaline	Alkaline
Available—		
Phosphoric Acid	36	15
Potash..	80	67

		Soil. Dry.	Soil. Ignited.	Soil. Loss on Ignition.	Subsoil. Dry.	Subsoil. Ignited.	Subsoil. Loss on Ignition.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Mechanical.	Mms.						
Stones ..	.. ..	Nil	Nil	Nil	Nil	Nil	Nil
Fine Gravel ..	2 – 1	2·0	1·3	0·7	2·85	1·9	0·95
Coarse Sand ..	1 – ·5	2·4	1·5	0·9	3·6	2·35	1·25
Medium Sand ..	·5 – ·25	2·3	1·5	0·8	2·35	1·6	0·75
Fine Sand ..	·25 – ·1	11·8	9·4	2·4	12·05	9·85	2·2
Very fine Sand ..	·1 – ·05	33·6	27·5	6·1	24·45	20·1	4·35
Silt	·05 – ·01	2·7	2·2	0·5	9·05	6·95	2·1
Fine Silt ..	·01 – ·005	28·9	20·7	8·2	31·35	21·65	9·7
Clay	under ·005	14·2	11·2	3·0	12·3	9·95	2·35
		97·9	75·3	22.6	98·0	74·35	23·7
Moisture ..	.. ..	2·1	2·1	..	2·0	2·0	..
Loss on ignition	.. ..	..	22·6	..	..	23·65	..
		100·0	100·0	..	100·0	100·0	..

	Soil.	Subsoil.
	Per cent.	Per cent.
Loss on ignition	22·6	23·65
CO_2	19·2	21·0
Organic Matter, Water, &c. ..	3·4	2·65

Alpine Diluvium. The quaternary formation, known in French as *Diluvium Alpin* and also as *Diluvium des Cevennes*, covers a considerable area of the lower portion of the department and plays a very important part in the viticulture of the region; especially in the neighbourhood of Montpellier is this type abundant, numerous vineyards being situated on it.

The following analysis of a sample of Verchant soil, taken by the writer, will give some idea of its composition:—

ANALYSIS OF VERCHANT SOIL.

Chemical Analysis.

	Parts per 100,000.
Nitrogen	01
Phosphoric acid	62
Potash	118
Lime	118
Chlorine	1
Reaction...	Very slightly alkaline

Mechanical Analysis.

Contains Carbon Dioxide —

	mm. mm.	Per cent.
Fine Gravel	2 — 1	3·95
Coarse Sand	1 — ·5	7·77
Medium Sand	·5 — ·25	6·66
Fine Sand	·25— ·1	32·61
Very Fine Sand ..	·1 — ·05	20·07
Silt	·05— ·01	9·68
Fine Silt	·01— ·005	1·88
Clay	Under ·005	14·73
		97·35
Moisture	... ...	0·85
Loss on Ignition (Organic matter only)	... ..	1·79
		99·99
Stones	.. ...	63·4

The characteristic appearance of this type of soil, the surface of which appears, in most cases, to be composed almost solely of waterworn pebbles, is not easily forgotten—at Verchant these amounted to no less than 63.4 per cent. of the total soil (see analysis).

The following is the analysis of a sample of soil taken from St. Michel, near Lunel, one of the largest "submersion vineyards."

ANALYSIS OF SOIL FROM ST. MICHEL, NEAR LUNEL.

Chemical Analysis.

	Parts per 100,000.
Nitrogen	117
Phosphoric acid	132
Potash	297
Lime	22,800
Magnesia	1,120
Chlorine	1
Reaction	Alkaline
Available in 1 per cent Citric Acid. —	
Phosphoric Acid	46
Potash	96

Mechanical Analysis.

Stones 0·7 per cent.

Contains Carbon Dioxide

	mm. mm.	Per Cent.
Very Coarse Sand ..	2 — 1	0·50
Coarse Sand	1 — ·5	1·00
Medium Sand	·5 — ·25	0·85
Fine Sand	·25— ·1	5·55
Very Fine Sand... ..	·1 — ·05	20·05
Silt	·05— ·01	16·65
Fine Silt	·01— ·005	19·45
Clay	under ·005	12·30
		76·35
Moisture	... ...	1·83
Loss on Ignition	... ...	21·76
		99·94

To quote Professor Lagatu, who has made numerous analyses of soils of this type: —

They are all poor in phosphoric acid and lime. The non-pebbly forms contain sufficient proportions of potash and magnesia, whereas the forms composed of coarser elements are poor (in them). On the other hand, in the diluvium, the American vine finds a medium appropriate to its needs and gives, with abundant manuring, satisfactory yields.

This similarity of composition with that of many Australian vine soils is striking, especially in the direction of freedom from excess of lime and poverty in phosphoric acid. The fact that these were the soils which gave least trouble as regards reconstitution is significant and one which should inspire great confidence as to the success of reconstitution in Victoria. Some of the best wines produced in the department, notably those of St. George, are grown on this type of soil.

Alluvial Soils abound in the department, especially in the vicinity of the rivers. They may be divided into two classes—ancient and recent deposits. The former are usually very gravelly and less rich than the latter. According to Professor Lagatu—

The richest are those of the River Orb, which are ideal soils. The alluvial soils of the Hérault, not so well constituted, are nevertheless rich; they respond particularly well to nitrogenous manuring. Those of the Lez, though excessively calcareous, are rich in phosphoric acid though poor in potash. Those of the Vidourle, very rich but a little too calcareous, give in the east of the department, vineyards which, under irrigation, are extremely productive.

It is chiefly within recent years that vines have been extensively planted in these very rich soils. Formerly the vine was relegated to soils in which little else could be profitably cultivated. The high prices of "vin ordinaire" in the early days of reconstitution led to the selection of very rich soils as the sites for many of the new vineyards—a marked change from former methods. Cereals, fodder crops, &c., gave place to the vine. According to many, this change was largely responsible for the viticultural crisis, which was so keenly felt in France some three years ago. Over-production and the action of the inexorable law of supply and demand are no doubt the direct causes of the crisis. Other causes, however, aggravated the situation and their recent suppression has had a most salutary influence on the viticultural situation in France.*

It is in this class of soil that vineyards are protected from Phylloxera, by means of submersion, as will be described later. The total area thus treated in the department amounted last year to over 7,000 acres.

Sea Sand.—Prior to the appearance of Phylloxera, the low dunes of almost pure sand, which here and there fringe the Mediterranean, were considered to be practically valueless. It was soon found that European vines growing in such sand did not suffer from the attacks of Phylloxera; the insect was powerless to injure them.

Large areas were then planted, and in spite of the heavy manuring necessary in order to render productive such poor soils, they proved exceedingly profitable, yielding large fortunes in the years from 1880 to 1895, when wine sold readily at high prices. At the present day these vineyards occupy nearly 7,000 acres, and are still yielding profitable returns. Though situated in close proximity to vineyards in stiffer soil, which promptly succumbed, and have long since been reconstituted on resistant roots, they have never shown any signs of suffering from Phylloxera.

These sand vineyards are of great interest to Victoria. We possess large areas of exceedingly sandy soils, and the extent to which the resistance to Phylloxera of these soils will equal those of Hérault is a

* The glut in the wine trade is often attributed to the inflation of supplies by wholesale adulteration. There is no doubt that, since active steps have been taken to suppress fraud, wine values have hardened by over 50 per cent. in France.

matter which merits careful study. We already have several cases which are, to say the least, very promising, notably that of Château Tabilk, and several sandy vineyards in the neighbourhood of Wahgunyah.*

The sea sand vineyards of Hérault also give us much valuable information as to the results of manuring. Deficient in plant food elements, as they originally were, it is only by abundant artificial additions that the heavy yields now being vintaged have been rendered possible. These vineyards are also interesting on account of the enormous wineries situated on some of them, capable of treating vast quantities of grapes. They are, in fact, amongst the most complete mechanical winemaking establishments in Europe.

In a future article some of these sea sand vineyards will be described in detail.

Other Formations.—Though of much lesser importance, so far as the vine is concerned, several other formations are also to be met with. Primary rocks, represented by schists of Silurian and Devonian age, as well as Primitive rocks, such as gneiss, mica schists, &c., and even basalt, porphyry, and a little granite. These are not of sufficient importance to merit more than passing mention here. Diversity is a striking feature of the region. To once more quote Professor Lagatu—

> In the many coloured fan† which our department offers to the dazzling light of the Midi, there are fringes of gneiss, of schist, of older limestone, and of sandstone, quite different from the very fertile marly centre; there are patches of poor dry jurassic, and diluvian masses of sterile silica. When one realizes that the vine prospers everywhere, one cannot help admiring the flexibility of this culture and the skill of the viticulturists of Languedoc.

To a Victorian, the most salient feature is the abundance of lime in the great majority of these soils.

Climate.

We have already seen that the department includes a great variety of climates. The following remarks apply only to the lower portion in which the majority of the vineyards are situated, and more particularly to the town of Montpellier.

The climate differs in several respects from any we know in Victoria. Being one of the warmest parts of France, several species of palm grow well, as will be seen in several of the photographs reproduced in the last issue, plants which constitute an unusual feature in most other parts of France. The following remarks by Professor Houdaille might almost be written of northern Victoria:—

> The general features common to the Hérault vineyards are the dryness of its summers, the prolongation of the high temperatures of that season, the irregularity of its rainfall, the extreme temperatures which may be observed in certain years, both in winter and in summer.

The Muscat of Alexandria grape ripens its fruit more easily than it does in Melbourne.

In marked contrast to the above are the heavy falls of snow often experienced in winter, and the low temperatures occasionally registered.

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*At Tabilk, Phylloxera made its appearance in 1899. Within a few years it had destroyed nearly 100 acres of stiffer land. In the sandy soils, however, but little damage was done at first, the vines recovering entirely as they became accustomed to depend on their lower roots. At the present day, the 200 acres situated in sandy soil at Tabilk are as healthy as ever they were. They show no signs of suffering from Phylloxera.

†In shape, the department of *Hérault* somewhat reminds one of the open fan.

Winter minima of from 10° to 12° C. (13° to 10.40° F.) are not uncommon. So intense is the cold in certain winters that Australian Eucalypts cannot be successfully grown in the open air. At the Montpellier school, several species have been tried, but none of these are of any size as they have been cut down to the ground every fourth or fifth year by winter cold. A good many have been killed outright.

The majority of these trees are *Eucalyptus globulus* (Blue Gum); one species alone, *E. urnigera*, from southern Tasmania, has so far resisted the cold satisfactorily. As M. Marès points out—

As compared with the rest of France, the southern region possesses a climate which is dry and hot, excessive in its variations as regards heat, drought and moisture.

SNOW SCENE AT MONTPELLIER.

The following data are taken from an article by the late Professor Houdaille:—

Rainfall.—Careful records have long been regularly kept. These show that during the course of a century, one may observe alternate moist and dry periods. The observations collected by Poitevin, first President of the *Société Centrale de l'Hérault*, show from 1767 to 1791 an annual average of 820 mm. (32.3 inches). This average has varied a little during the course of the century, as is shown by the comparison of four different series of rainfall observation made at Montpellier:—

	mm.	inches.
Observations of J. Castelnau (1835-49) ...	669	26.3
Observations of E. Roche (1857-66)	900	35.4
Observations of Ch. Martins (1852-72) ...	800	31.5
Observations of Ecole d'Agriculture, Montpellier (1873-88)	745	29.3

Great variations are often observed between different years. In 1875 1,037 mm. (40.8 inches) fell, whilst in 1884 only 533 mm. (21 inches) were recorded.

The distribution of this rainfall for the 1873-88 period was as follows:—

	mm.		inches.	Winter. mm.	inches.		mm.		inches.	Summer. mm.	inches.
December	50·1	=	2·0	194·9 =	7·7	June ..	49·0	=	2·0	119·3 =	4·7
January	103·1	=	4·1			July ...	24·4	=	1·0		
February	41·7	=	1·6			August	45·9	=	1·7		

	mm.		inches.	Spring. mm.	inches.		mm.		inches.	Autumn. mm.	inches.
March ...	48·0	=	1·9	193·4 =	7·6	September	80·7	=	3·2	234·5 =	9·2
April ...	96·3	=	3·8			October	76·2	=	3·0		
May ...	49·1	=	1·9			November	77·6	=	3·0		

For the above period (16 years) the average annual rainfall would thus be 742.1 mm. equals 29.2 inches. This average distribution may vary very much from one year to another; the only character which is at all constant is the scarcity of the summer rains. In 1884, during the three months of June, July, and August, only 8 mm. (3 points) of rain were recorded. G. Foex gives the average annual rainfall as 651 mm. (25.6 inches), which falls in 53 days of the year only, a lesser number of rainy days than anywhere else in France. He assigns the rainfall as follows:—

Winter	25 per cent	Summer ...	11 per cent
Spring	24 per cent.	Autumn ..	41 per cent.

Moisture of the Air and Evaporation.—These are given as follows by M. Houdaille:—

Mean Hygrometric State at 9 a.m.			Mean Daily Evaporation—Piche's Instrument. mm.		
December	... 79·7	Winter, 79·3.	December ..	... 3·42	Winter, 3 mm. ·62.
January ..	... 81·8		January ...	... 3·23	
February	... 76·4		February ...	.. 4·20	
March ...	. 69·8	Spring, 66·3.	March ...	... 5·55	Spring, 5 mm. ·84.
April ..	... 67·		April ...	... 5·60	
May ...	.. 62·		May ...	... 6 38	
June ...	... 58·3	Summer, 57·1.	June ...	... 7 92	Summer, 8 mm. ·72.
July ...	... 55·6		July ...	... 9·35	
August ...	.. 57·4		August ...	.. 8·88	
September	.. 66·4	72·4.	September	... 6·06	Autumn, 5 mm. ·13.
October ...	70·7		October ...	... 4·80	
November	... 80·2		November	... 3·52	
Mean annual hygrometric state, 68·7			Mean annual daily evaporation, 5 mm. ·83		

Temperature.—At Montpellier, the annual average temperature is 14.2° C. equals 57.5° F. At Béziers, a few miles south-west, it is 14.4° C. equals 58° F.

The figures given on the next page are from observations taken at the Montpellier School.

Here, again, great variations are occasionally to be met with. The January average was 2.90° C. (37.2° F.) in 1893 and 9.21° C. (48.6° F.) in 1899.

As regards minima, in a good many winters the temperature does not fall below − 7° or − 8° C. (19.4° or 17.6° F.), but during the course of each century there are some winters during which the temperature falls to − 15° C. (5° F.), sometimes even to − 18° C. (− 0.4° F.) in certain aspects. The vine, which in other regions withstands even more intense cold, may, in Hérault, occasionally suffer from winter cold.

Average Monthly Temperatures.

		Series 1850–89. C. F.	Series 1890–99. C. F.
Winter	December	6.40=43.6	6.73=44.2
	January	5.46=40.0	6.03=42.8
	February	7.77=46.0	7.74=45.9
Spring	March	9.70=49.5	10.60=51.1
	April	12.65=54.8	14.19=57.4
	May	16.70=62.1	17.43=63.5
Summer	June	20.49=68.9	21.48=70.6
	July	23.34=74.0	23.99=75.1
	August	23.00=73.4	23.48=74.2
Autumn	September	19.61=67.3	20.56=69.0
	October	14.26=57.6	15.58=60.0
	November	10.39=50.6	11.04=51.9
Whole Year		14.15=57.47	14.8 =58·64

Spring frosts are far more dangerous. Frosts with a temperature as low as − 6° C. (21.2° F.) may damage the vineyards at the end of March or during the first days of April. Less severe frosts may occur until the end of May.

A good many spring frosts are caused by excessive nocturnal radiation in air already cooled by the north winds passing over the Southern Cevennes Mountains. An observatory at l'Aigoual in these mountains, now telegraphs particulars to Montpellier, as to probable occurrence of such frosts, in order that precautions in the way of smudge fires, &c., may be taken in due time.

Summer shade maximum may in the vineyards reach as high as 40° C. (104° F.). During the three months of July, August, and September, the maxima may oscillate, almost without interruption, between 30° and 35° C. (86° and 95° F.). In 1899, a dry, warm year, on 23 days out of 30 in July, and on 30 days out of 31 in August, the daily maxima exceeded 30° C. (86° F.). They exceeded 35° C. (95° F.) eight times in July and eight times in August, reaching 37.9° C. (100.3° F.) in the last days of July.

Sunlight.—Out of 4,330 hours during which the sun is above the horizon, it is obscured by clouds during 2,100 hours, so that the district obtains 50 per cent. of the possible direct sunlight. This proportion falls to 33 per cent. at the extreme limit of the vine zone (Lorraine)—at London it is 23 per cent.

Winds.—Strong winds are frequent in the region. During the winter the cold north-west wind, known as *Mistral*, or if it comes from the north, as *Tramontane,* prevails. Whereas, in spring and summer, sea breezes from the south and south-east are the general rule. These winds play a most important part in determining the climate of the region; it is the Mistral which brings from the north, spells of cold weather sufficiently intense to cut down Eucalypts and Pepper trees. There is a vast difference between the situation of Victoria and southern France, which must be borne in mind when comparing the climates of the two countries. The Midi is the warm side of a cold continent, whilst we are the cool side of a warm continent. Our cold winds are tempered by the Southern Ocean by which they are charged with moisture, and thus prevented from causing excessive evaporation, with consequent lowering of temperature. Hence, it is that cold spells, common in Montpellier, are unknown to us in Victoria. Even in our alpine regions, where snow often falls, Eucalypts which fail at Montpellier are indigenous; a striking example of the difference in the climate of the two countries.

These same factors apply to the warm winds and their bearing on the question is of equal, if not greater, importance from a viticultural point of view. Our hot winds traverse the heated plains of central Australia, and occasionally bring us heat waves of an intensity quite unknown in France. But it is in the amount of moisture contained by these hot winds that the leading difference between the two climates lies. In marked contrast to our dry hot north winds, are the sea breezes at Montpellier. These, after crossing the Mediterranean (in the northern hemisphere the warm winds come from the south), are charged with moisture. When the sea wind blows it is hot, muggy and unpleasant, although the thermometer indicates a much lesser temperature than a Victorian, accustomed to our dry north winds, would anticipate. At night, the difference is especially noticeable, and cold surfaces, such as the flagstones in the footpaths of the streets, become moist with deposited dew.

This moist atmosphere causes evaporation to be much less active than it is with us. When the sea wind blows regularly a short time before vintage, it considerably assists in the swelling of the berries, which seem to be able to absorb some of the dew deposited at night. In this way it enables a good yield to be relied on in spite of a long dry summer, frequently almost devoid of rain. In this manner these moist, warm winds are decidedly useful.

But there are compensating disadvantages. The dew drops deposited at night-time, in the warm atmosphere, constitute an ideal hatching ground for spores of parasitic fungi, and it is only by repeated sprayings, so as to insure each dew or rain drop being enabled to dissolve its trace of copper salts, that the vine can be protected against fungus diseases, which are prevalent to an extent quite unknown in Victoria.

Unless protected by several sulphurings, Oïdium prevents the vintaging of any crop in southern France; yet, in Victoria, during the past few years sulphuring has been frequently omitted altogether without much damage resulting to the crop. Downy Mildew (*Plasmopara*) is fortunately unknown to us as yet. As this fungus requires even more moisture for its development than oïdium, it is exceedingly doubtful if ever it will obtain a footing in Victoria, at least in the districts where we cultivate the vine. Our dry hot winds, so absolutely different from the moist ones of southern France, are an invaluable natural defence against these insidious pests.

Notwithstanding these drawbacks, thanks to energetic and timely execution of sprayings and sulphurings, the intelligent and highly trained growers of the Hérault find little difficulty in protecting their vineyards and in vintaging, in good order, the enormous yields already mentioned.

(*To be continued.*)

ORCHARD STUDIES.

II.—THE LATERALS OF APPLE TREES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

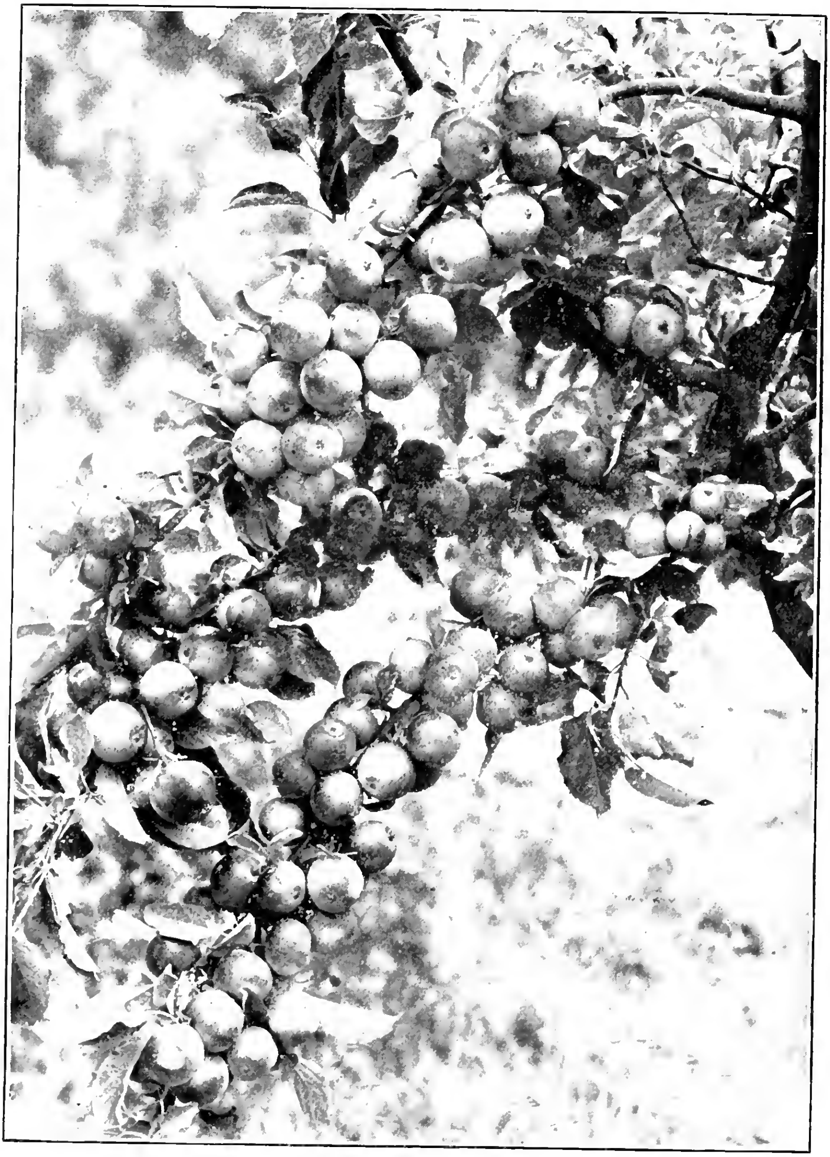
The question of lateral management is often one of great concern to apple growers, and the resultant tree and its generous crop depends entirely upon the treatment that the tree laterals receive. In tree-building, therefore, the study of laterals is of the utmost importance.

First of all, the definition of a lateral must be decided upon. To serve the purpose of the present study, the wood of apple trees above the trunk may roughly be classified into two classes, viz., leaders and laterals. The leaders comprise the wood that forms the framework of the tree, and they terminate at the growing points. At various intervals along the leaders, buds are placed, and these buds break out into growth, forming much weaker growths than the leading points, and also growing at varying angles from the leaders. Sometimes these buds develop into short fruiting spurs attached immediately to the leaders, but more often they continue their growth until they are some inches, and even feet, in length. These are the laterals, and these are the growths that should carry the crop of the tree. There are very few varieties of apple trees which carry their fruit spurs directly on the leaders; the majority in general cultivation produce the fruiting spurs on the laterals, and these therefore are a valuable consideration.

According to the situation of the lateral on the tree, so is its vigour determined; the nearer to the termination of the leader, the stronger becomes the lateral. Laterals in this position often show a desire to become a leader, so strong does their growth occur. Strong laterals should never be encouraged on the tree, as the fruiting wood requires to be fairly weak in development and in character. All strong growing laterals, therefore, particularly those near the top of a leader, and which often show an ambition to become a leader where one is not required, may be suppressed or removed altogether.

Where the lateral growth is very generous, and where thus an excess occurs, the superfluous ones may be removed. But it should not be forgotten, that when once a lateral is removed, it can rarely be replaced. Apple trees do not always possess dormant buds at the base of the laterals; and should the lateral be cut out it cannot always be replaced by another lateral, or by fruit spurs. Even should the trees possess the power to spur at the base of every lateral after its removal, it is an open question as to whether this is an eminently desirable attribute. Suppose these spurs were heavily laden with fruit, and, owing to either the weight of the fruit, or to careless picking, the fruiting spurs were broken off, that portion of the tree would become permanently barren. But such a possibility is far less likely to happen when the laterals remain.

Assuming then that the trees have a fair amount of weak, angular or pendant laterals, it may be confidently accepted that these will ultimately bear the requisite crop of fruit. There is no necessity to shorten back these laterals in their early growths. They may be rigorously left alone until they have borne their first fruits. They will generally do this towards the end. The weight of the fruit will bend down the lateral, restricting the sap flow, and thus causing spur development gradually along the lateral right to the base. This result may be actually seen in the illustration showing three bearing laterals of the apple "Clarke's Seedling." The



CLARKE'S SEEDLING APPLE LATERALS.

lateral in the uppermost part of the illustration is carrying its crop all along its lower region, while during the same season, it has formed its new spurs right up to the base.

When the lateral has, to use an every-day term, "spurred up," it may be shortened back, or it may be left severely alone, according to the necessities of the situation, the productiveness of the soil, and other considerations to be studied by the grower.

SECTION OF JONATHAN APPLE TREE.

There is always the danger that if the laterals are left unpruned for any length of time, the basal spurs, which are the weaker, will gradually lose strength, and ultimately die. This effect is shown clearly in the illustration showing a section of a Jonathan apple tree. The two prominent laterals in the centre of the picture have produced their spurs along the whole length. The lateral was left unpruned, and the spurs gradually died along the stronger and back portion, fruiting only towards the termination. This, of course, is most undesirable, and the laterals should be kept under constant observation to prevent this. Once any signs of weakening appear in the spurs towards the base of the lateral, it should be considerably shortened back, to conserve strength, and to prevent final barrenness.

The illustrations show 1st, three laterals of a "Clarke's Seedling" apple, carrying 39, 41, and 51 apples respectively; and 2nd, a section of a "Jonathan" apple tree, eleven years old, carrying a 10-bushel crop. This last-named tree has averaged 10 bushels annually since it came into bearing.

The illustrations are from the orchard of Mr. James Cowan, of Bacchus March.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

Pests and Diseases.

All codlin moth bandages should at once be removed; and if not destroyed, they should be boiled as soon as they are taken off the trees. As soon as possible the trees should receive a thorough cleaning up, scraping and burning all the loose bark, cleaning out crevices and cracks, and cutting clean all cracked and broken ends of limbs. Every hiding place of the codlin larvæ should be thoroughly searched and every possible grub destroyed. This is half the battle for the coming season. It is advisable to do this in the autumn; as if it be left until spring, the incoming rush of work may prevent the grower from having it done at all. Where growers have sprayed thoroughly to combat this pest during the past season, very satisfactory results have been obtained, and the moth has been considerably reduced in numbers.

At the Burnley School of Horticulture, the spraying during the season was carried out with regularity, most of the orchard being sprayed five times. One block of dwarf apples was only sprayed four times, the first spraying being omitted; the result was that nearly one half of the crop on these trees was destroyed by the attack of the first brood. In all other sections the loss from the first brood was inconsiderable. As soon as any apples were attacked, they were picked from the trees, and all fallen apples were gathered and destroyed. Up till the middle of January, not 2 per cent. of the crop was so lost. Two sprayings were given after that time, and there was no further loss. Of the resultant crop, not 1 per cent. was found to be moth-infested; in fact, many trees carrying a crop of one bushel and over were gathered without showing a single infested fruit.

The main lesson taught this season is that the early spray should never be neglected. The first spray is one of the most important, and it should be put on as early as consistent with the dropping of the petals. Another lesson is the value of gathering affected apples from the trees as soon as they are observed, in preference to using bandages. No bandages were used in the Burnley orchards, the methods of continual spraying, and of gathering infested fruits being relied upon to give good results. And the satisfactory results show that, if these two operations are carried out thoroughly and systematically, they are all that is needed.

Trees should now be sprayed wherever any scale insect, bryobia mite, woolly aphis, or peach aphis has occurred during the past season. The best winter spray for any or all of these pests is the red oil emulsion. Some growers prefer the emulsion of crude petroleum; while others still use the lime, sulphur and salt spray; all of them are good, and may be used with good effects. The spraying should be given as early as possible, so that, if any failure occur, or if the pest spread again during the winter months, a second spraying may be given early in August, so as to insure clean trees for the rest of the season. Experiments carried out during last winter seem to show that one of the successful methods of coping with peach aphis is to spray the dormant trees with red oil during the winter. A full account of the experiments will be given in a later issue. Growers should make themselves familiar with an article entitled "Treatment of Orchard Pests," which appeared in the September, 1909 number of this *Journal*. Copies of the article may be obtained on application to the Secretary for Agriculture.

CULTURAL AND GENERAL OPERATIONS.

The autumn has again turned out generally dry, and as a result ploughing has been delayed. Wherever possible, all cultural operations should be pushed on, so as to leave plenty of time for spraying and pruning. Leguminous plants should now be all sown for green manures, and all preparations completed for planting new areas. Drainage and sub-soiling should still be continued, particularly where young trees are to be planted. Stiff clay soils, sour soils, and soils of a firm texture should this month receive a dressing of 4 to 5 cwt. of lime per acre. Lime is a wonderful improver of soils, and frequent light applications improve the soil to a great degree.

A dressing of stable manure is beneficial at this season, but it should not be used in conjunction with lime. If these two substances are used at the same time a certain and sure loss occurs. No manurial substance, whatever, should be applied to the soil until at least three or four weeks after the lime dressing has been harrowed in.

If it can be obtained, a surface dressing of fresh new soil will renovate the orchard soils to a very considerable extent; top dressings of peat and leaf mould are also invaluable. Wherever wood ashes and charcoal are obtainable, their use in the orchard as a manure is productive of very good results, and these should never be wasted.

Vegetable Garden.

If no rain has fallen, the seedlings, and young vegetables planted out must be kept watered so as to keep them in a state of good growth.

All beds in preparation should be manured; and cabbages may be planted out. Seeds of peas, broad beans, parsnips and carrots may be planted out.

Asparagus beds may still be manured; and wherever possible a good dressing of lime should be applied to all unoccupied vegetable plots.

This is especially necessary on land that has grown French beans, tomatoes, or potatoes. The various insects that attack these plants so freely, such as red spider, various caterpillars, aphis, &c., are destroyed by the lime dressing.

Keep all weeds hoed out, and thin out all seedling vegetables.

Flower Garden.

The fairly dry season has necessitated an extra amount of autumn watering, and, unless the flower garden has been well trenched or drained, gardeners will have many losses during the winter; as, owing to the continued waterings, the winter rains on top of these will, provided they come as usual, render the soil to a very sodden condition. Hence, if there are any plants of a delicate nature, or plants that will suffer from an over wet soil, they should be lifted to a drier situation; or they may be even stored in dry sand in a cool place. Even in well drained gardens, it is advantageous to lift and store a large number of herbaceous perennials, so that the beds may present a more tidy appearance; and also to allow the soil to be thoroughly renovated and ventilated. Wherever possible, a good top dressing with fresh soil is very desirable; and also an addition of peat, leaf mould, or well rotted stable manure. A dressing of lime is always an advantage in the autumn; the value of lime for garden soils cannot be too much emphasized. In addition to its manurial properties, lime improves the physical character and qualities of the soil in many desirable ways. The lime should not be placed in immediate contact with the growing plants, and it should be left on the surface for some considerable time before digging in. Further, lime must never be used in conjunction with stable manure; the soil should be dressed with lime at least three or four weeks before adding the manure.

By this time all bulbs and tubers for spring flowering will be planted; and in many instances these are above ground. They should be protected from the ravages of slugs, snails, and other pests. Summer flowering bulbs and allied plants, such as Iris and Lilium, may now be planted. A planting of seeds of hardy annuals, particularly, sweet peas, may now be sown. In growing annuals, a great mistake is frequently made in sowing the seeds too closely. Plenty of room should be given to each individual plant, and the plants should not be in any way overcrowded. Quick growing plants are generally gross feeders, and to have a large number of plants, all in need of considerable nourishment, will only return one result—stunted plants, and dwarfed blooms. It is better only to have four or five sweet pea plants in one clump, well spaced; the plants will be more vigorous, and the flowers will be of the finest character possible.

All flowering shrubs and trees that have flowered may now be pruned and cut back into reasonable bounds. There are very few shrubs that are not amenable to such treatment; and they will always repay with good results. Even strong wooded shrubs as Acacias, and such trees as Eucalypts, may be headed back, so as to allow them to branch out and form a more bushy habit.

Chrysanthemums, delphiniums, dahlias, perennial phlox, polygonum and other herbaceous perennials may now be cut down, and if necessary lifted for storing.

Preparations may be made for the planting of rose cuttings; these will be planted in June, after the ordinary pruning.

Artificial Manures Acts.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACTS.

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.								Potash.		Estimated Value of the Manure per ton.
						Water Soluble.		Citrate Soluble.		Insoluble.		Total.				
			Found.	Found.	Guaranteed.	Found.	Guaranteed.	Found	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
			%	%	%	%	%	%	%	%	%	%	%	%	%	£ s. d.
696	Superphosphate, Florida	Cuming, Smith, and Co., Melbourne	9·32	..	..	17·32	17·00	0·96	1·00	3·65	2·00	21·93	20·00	..	..	4 11 9
699	,, ,,	,, ,, ,,	9·60	..	..	17·50	17·00	1·33	1·00	2·97	2·00	21·80	20·00	..	..	4 12 3
692	,, Hasell's	A. H. Hasell, Melbourne	12·44	..	..	17·70	18·00	1·00	1·00	..	1·00	18·70	20·00	..	..	4 3 8
690	,, No. 1	Mt. Lyell M. and R. Co., Melbourne	8·14	..	..	16·20	17·00	0·87	1·00	1·88	2·00	19·05	20·00	..	..	4 1 7
693	,, ,,	,, ,, ,,	7·13	..	..	17·10	17·00	1·75	1·00	1·79	2·00	20·64	20·00	..	..	4 8 10
694	,, ,,	Wischer and Co., Melbourne	5·60	..	..	15·30	17·00	1·57	1·00	2·58	2·00	19·45	20·00	..	..	4 2 2
697	,, ,,	,, ,, ,,	6·27	..	..	16·42	17·00	0·64	1·00	2·25	2·00	19·31	20·00	..	..	4 2 7
698	,, ,,	,, ,, ,,	5·05	..	..	18·70	17·00	1·01	1·00	1·10	2·00	20·81	20·00	..	..	4 11 2
702	Bonedust and Superphosphate, A.	Cuming, Smith, and Co., Melbourne	4·89	1·43	1·50	9 66	8·50	3·30	0·50	8·44	10·00	21·40	19·00	..	..	4 17 1
701	Leguminous Manure ..	Mt. Lyell M. and R. Co., Melbourne	7·22	..	..	13·62	11·50	2·55	2·00	1·10	1·50	17·27	15·00	4·23	4·75	4 17 4

P. RANKIN SCOTT,
Acting Chemist for Agriculture.

Government Laboratory,
Melbourne, 22nd April, 1910.

HEREDITARY UNSOUNDNESS IN HORSES.

NOTES ON EVIDENCE AS TO THE HEREDITARY CHARACTER OF CERTAIN PATHOLOGICAL CONDITIONS CONSTITUTING UNSOUNDNESS IN HORSES (PRINCIPALLY OSSIFICATION OF THE LATERAL CARTILAGES—SIDEBONE) FURNISHED BY EXAMINATION OF 2,636 CASES.*

S. S. Cameron, M.R.C.V.S., (Lond.), D.V.Sc., (Melb.).

PRESENT LACK OF RECORDED EVIDENCE.

Ossification of the lateral cartilages of the foot of the horse, commonly known as "Sidebone," has been somewhat indefinitely classified as an "hereditary unsoundness" by various writers during the last half century. On the other hand, perhaps the majority of breeders and a number of authors have strenuously denied the influence of heredity as a casual factor, alleging that the ossification developed as a result of external injury or the unequal incidence of concussion brought about by the use of calkin shoes. Arguments, and experience of isolated instances, have been relied on by both sides, and no definite proof has been given whereby the doubts of the contenders might be set at rest. It does not seem to have been realized that the controversy was one capable of settlement by observation and record of the occurrence or otherwise of sidebone in the progeny of side-boned or sound parents throughout a series of generations in different families of horses; or perhaps if it was so realized, the opportunity for making such observations and records has not been presented in most countries. At all events no such observations have been recorded.

As late as twenty years ago, when the British Royal Shire Horse Society was contemplating the introduction of compulsory veterinary examination at its annual show, the question of the unsoundnesses to be classed as "hereditary" was remitted to a Committee of the Council of the Royal College of Veterinary Surgeons. No definite records being available, the Committee included sidebone amongst the unsoundnesses "considered" to be hereditary. Since then, the same lack of definite records is apparent, and I have not been able to unearth any statistics relating to the subject. Even modern authors have been content to repeat the "general idea" as to the hereditary character of Sidebone without furnishing evidence of records of examination. As instancing the unsatisfactory character of the evidence available on the point, the following quotations from present day standard authors may be adduced:—

WILLIAMS (*Principles and Practice of Veterinary Surgery*):—

It is generally admitted that the predisposition to sidebone is hereditary, and many breeders of the best class of cart horses, being aware of the fact, are careful not to breed from an animal with them.

HAYES (*Veterinary Notes*—7th edition, 1906, page 280) :—

Hereditary predisposition is well marked in this disease.

REEKS (*Diseases of the Foot of the Horse*, 1906; pages 365, 369, 370):—

Sidebone constitutes one of the recognised hereditary diseases. Is sidebone hereditary? We can best answer that by saying that some several years ago the Council of the Royal College of Veterinary Surgeons, at the request of the Royal

* One of four contributions to a Thesis presented to the University of Melbourne for the degree of Doctor of Veterinary Science, November, 1909.

Commission on horsebreeding, drew up a list of those diseases "which by heredity rendered stallions unfit as breeding sires," and that in that last list was sidebone. Sidebones therefore are hereditary.

Axe (*The Horse in Health and Disease*—1st edition, vol., 6, page 387):

Sidebone is one of the most pronounced of hereditary diseases. Its tendency to arise in the progeny of affected animals is now known to every horsebreeder of experience.

Mollar and Dollar (*The Practice of Veterinary Surgery*, page 630):—

The causes are (1) congenital predisposition, in heavy coarse-bred horses.

Other pathological conditions constituting unsoundness which are generally regarded as hereditary, are:—

Ringbone (Exostosis at the distal extremity of the *os suffraginis* and on the *os corona*);

Bone Spavin (Anchylosis with exostosis of the small bones of the tarsus—*the cuniform parvum, medium and magnum;*

Curb (Sprain of the *calcaneo-cuboid* ligament);

Roaring (Paralysis with atrophy of all the intrinsic muscles of larynx on the left side except the *crico-thyroideus*).

The following are also, but less commonly, classed as hereditary unsoundnesses:—

Bog Spavin (Bursitis with permanent distension of the synovial capsule of the tibio-astragalus articulation or true hock joint);

Thoroughpin (Bursitis with permanent distension of the sheath of the *flexor pedis perforans* tendon of the hind limb);

Navicular Disease (Caries of the bursal surface of the *os naviculare*;

Nasal Disease (Osteo-porosis), and

Chorea. ("Shivering" or "Nervy.")

The remarks made with regard to the absence of definite observations concerning the hereditary character of Sidebone may be even more forcibly applied to all but one (Roaring) of the above-mentioned unsoundness. Concerning the others, no exact evidence has ever been recorded to my knowledge. The following references from standard authors, relating to the more important of these unsoundnesses, indicate the usual attitude adopted when discussing their hereditary character. The tendency is for each author to launch an *ipse dixit*, rather than to furnish proof or refer to evidence:—

Ringbone.—

Williams (*Principles and Practice of Veterinary Surgery*):—

Hereditary predisposition is sufficiently proved and acknowledged. I therefore simply advise breeders of horses never to breed from a sire or dam having ringbones.

Goubaux and Barrier (*The Exterior of the Horse-French*):—

The influence of hereditary has been recognised for a long time. Certain families of horses invariably transmit them to their descendants.

Axe (*The Horse in Health and Disease*—vol. 5, page 205):—

Horses with upright pasterns, and animals with pasterns of undue length are specially predisposed to it.

Mollar and Dollar (*The Practice of Veterinary Surgery*, page 607):—

The existence of the disease in two or more feet suggests hereditary predisposition, and may often be traced to small badly-shaped joints or defects in the formation of the limbs. . . . Such conformation, being perpetuated in the progeny, renders it easy to understand why the disease is often inherited.

Bone Spavin.—

Hayes (*Veterinary Notes*—7th edition, 1906, page 254):—

Hereditary predisposition plays a large part in its production. . . . Bad conformation of the hocks has undoubtedly a predisposing influence.

Mollar and Dollar (*The Practice of Veterinary Surgery*, page 721):—

The intimate structure of the bones and ligaments may predispose to disease, as shown by the inheritance of spavin, and its occurrence in entire strains whose hock joints appear perfectly formed.

Curb.—

Axe (*The Horse in Health and Disease*.—vol. 5, page 300):—

The causes . . . must be considered under two heads, viz., predisposing and exciting; of the former, heredity is a marked factor quite apart from conformation, for it is noticeable that the produce of some horses and mares . . . show a special liability to the disease.

Hayes (*Veterinary Notes*—7th edition, 1906; page 56):—

Animals which have suffered from curb ought not, as a rule, to be used for stud purposes, for the conformation that renders a horse liable to this injury is often transmitted to the offspring.

Examinations Made.

The systematic examination of stallions organized by me as Chief Veterinary Officer, and carried out under my direction during the past three seasons in Victoria, has afforded an opportunity of ascertaining the proportionate incidence of most of these unsoundnesses in the different breeds or classes of horses, and the age-period at which they occur, and also of determining in some degree the extent to which certain of them run in families.

The observations which have been made—together with the records of relationship of sound and unsound horses—will, I think, furnish a material contribution to the evidence establishing the hereditary character of Sidebone at all events. It is unfortunate that the records in most cases have reference to only the paternal side of the breeding of the individual horses examined; for there is no reason to believe that the hereditary influence of the dam is other than equally as potent as that of the sire. Indeed, the conclusion is almost irresistibly forced that, in the case of some of the families dealt with, the number of unsound descendants recorded would have been much greater but for the preponderating influence of "sound" blood on the dam's side.

Up to the present, under the Victorian scheme for the Government Examination of Stallions for Soundness,* a total of 2,636 horses have been examined; 779 light horses, 558 ponies and 1,299 draught horses.

Certificates of freedom from hereditary unsoundness have been issued in respect of 1,954 horses (74.5 per cent.), and 417 (15.75 per cent.) have been refused certification as being found affected with one or other of the listed unsoundnesses. The examination has not been confined to high class horses. Practically all horses standing for public service in the State have been examined, and as showing the range as regards quality, it should be mentioned that 265 (10 per cent.) of the total number examined have been refused the Government Certificate on the ground that they were below a reasonable standard for Government approval as regards breed, type and conformation.

* What this system is, how it was introduced, and the work that has been carried out under it, may be gathered from a perusal of the three first (1907, 1908, and 1909) Departmental Reports concerning it, which are published in the December, 1907, July, 1909, and April, 1910, issues of this Journal.

There has been examined, therefore, it may be claimed, a sufficiency both as regards numbers and type from which to generalize concerning the incidence of the various unsoundnesses in different breeds or types, the age-period of their development and, in a lesser degree, their occurrence in certain families of horses and non-occurrence in others.

Incidence of Unsoundness as Regards Breed.

An analysis of the unsoundnesses met with in the different breeds of horses will be found in the following tables. The first three tables relate to examinations made in the separate years, 1907, 1908 and 1909; the fourth table gives the aggregate figures regarding all horses examined to date :—

Analysis of Unsoundnesses of Stallions Refused Certificates, 1907.

Unsoundnesses.	Draughts. Number Examined, 403.		Lights. Number Examined, 301.		Ponies. Number Examined, 214.		Totals. Number Examined, 91 .	
	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.
Sidebone	82	20·35	3	·99	..	..	85	9·25
Ringbone	9	2·23	4	1·32	2	·93	15	1·63
Spavin (bone)	3	·74	15	4·95	1	·46	19	2·06
Curb	..	..	6	1·99	6	2·80	12	1·30
Bog Spavin and Thoroughpin	2	·49	4	1·32	..	..	6	·65
Cataract (eye)	..	..	..	..	1	·46	1	·10
Totals	96	23·82	32	10·63	10	4·67	138	15·04

Analysis of Unsoundnesses of Stallions Refused Certificates, 1908.

Unsoundnesses.	Draughts. Number Examined, 501.		Lights. Number Examined, 295.		Ponies. Number Examined, 199.		Totals. Number Examined, 995.	
	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.
Sidebone	99	19·76	1	·33	..	..	100	10·05
Ringbone	20	3·99	7	2·37	3	1·50	30	3·01
Spavin (bone)	3	·59	8	2·71	..	..	11	1·10
Curb	..	..	8	2·71	2	1·00	10	1·01
Bog Spavin and Thoroughpin	15	2·99	3	1·01	..	..	18	1·80
Roarer	..	..	2	·67	..	..	2	·20
Totals	137	27·33	29	9·83	5	2·50	171	17·17

Analysis of Unsoundnesses of Horses Refused Certificates to 5/10/09 (Figures exclusive of 32 N.Z. Exams.).

Unsoundnesses.	Draughts. Number Examined, 395.		Lights. Number Examined, 183.		Ponies. Number Examined, 145.		Totals. Number Examined, 723.	
	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.
Sidebone	81	20·50	..	..	..	..	81	11·20
Ringbone	11	2·80	3	1·64	1	·69	15	2·07
Spavin (bone)	1	·25	2	1·09	1	·69	4	·56
Curb	..	..	5	2·73	2	1·38	7	·97
Bog Spavin and Thoroughpin	..	..	1	·55	..	..	1	·14
Totals	93	23·55	11	6·01	4	2·76	108	14·94

Aggregate Analysis of Unsoundnesses in Stallions Refused Certificates during the Seasons 1907-8-9.

Unsoundnesses.	Draughts. Number Examined, 1,299.		Lights. Number Examined, 779.		Ponies. Number Examined, 558.		Totals. Number Examined, 2,636.	
	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.
Sidebone	262*	20·17	4	·51	..	..	266	10·09
Ringbone	40	3·08	14	1·79	6	1·08	60	2·28
Spavin (bone)	7	·54	25	3·21	2	·36	34	1·29
Curb	..	..	19	2·44	10	1·79	29	1·10
Bog Spavin and Thoroughpin	17	1·31	8	1·03	..	..	25	·94
Cataract (eye)	..	..	..	..	1	·18	1	·04
Roarer	..	..	2	·26	..	..	2	·08
Totals	326	25·10	72	9·24	19	3·41	417	15·82

* Thirteen horses rejected for other causes also had Sidebone, making a total of 275 draught horses with Sidebone.

Among the conclusions to be drawn from the results set out in the above tables, the following are of first importance:—

A.—Concerning Breeds of Horses.—

1. That hereditary unsoundness exists in draught horses to a much greater extent than in other breeds—to two and a half times greater extent than in light horses, and eight times greater than in ponies;
2. That light horses are much less subject to hereditary unsoundness than draught horses, but much more so than ponies;
3. That ponies are, of all breeds, least subject to unsoundness of an hereditary character.

B.—Concerning Hereditary Unsoundnesses.—

1. As regards *Sidebone* that—
   (*a*) Ponies do not develop sidebone as a form of hereditary unsoundness;
   (*b*) In light horses sidebone is so rare that it may be considered negligible;
   (*c*) This form of unsoundness is practically confined to draught horses, and is the most common of all forms of hereditary unsoundness in draught horses, and further that its incidence in draught horses is practically six and a half times greater than that of any other hereditary unsoundness, either in draught horses or in any other breed
2. As regards *Ringbone* that—
   (*a*) In ponies and light horses the occurrence of ringbon is rare;
   (*b*) In draught horses ringbone is, next to sidebone, the most common form of hereditary unsoundness.
3. As regards *Bone Spavin* that this form of unsoundness—
   (*a*) Is practically confined to light horses.
   (*b*) Is the most common form of hereditary unsoundness in light horses.
   (*c*) Is so rare in ponies and in draught horses as to be regarded as practically negligible.
4. As regards *Curb* that—
   (*a*) Curb may be regarded as being an hereditary unsoundness in light horses and ponies only;
   (*b*) Curb is the most common form of hereditary unsoundness in ponies;
   (*c*) Curb is rare in draught horses and negligible as a form of hereditary unsoundness.
5. As regards *Bog Spavin*, *Thoroughpin*, *Cataract*, and *Roaring*, the figures are insufficient for any reliable conclusions to be drawn.

Age-period of Development of Unsoundness.

No horses under two years old have been examined. Next to aged horses (six years and over) the age at which the greatest number has been submitted is three years. The excess of three-year-olds over four- and five-year-olds, is accounted for by the fact that during the second and third years there was the influx of an additional crop of colts of this age entering on a stallion career. The figures in some cases (*e.g.* ponies), and as regards the more uncommon unsoundnesses, are scarcely sufficient from which to generalize as to the age-period of development of unsoundness. As regards the more common unsoundnesses, however, it will be seen from the tables given below, that the percentage proportion of unsoundness is least in two- and three-year-olds and increases each year until the age of maturity, at which age-period (six years and over) the greatest percentage of unsoundness is found in all breeds. Indeed, it is quite likely that the proportion of unsoundness in aged horses is even greater than is shown in the tables, for the reason that a large number of horses past a showing age, and which were known by their owners to be unsound, have not been submitted for examination.

The tables referred to are as follow:—

TABLE V.

AGE-PERIOD OF UNSOUNDNESSES IN DRAUGHT HORSES.

Unsoundness.	2 Years.				3 Years.				4 Years.				5 Years.				6 Years and Over.				Totals.			
	Exd.	C.	N.C.	% N.C.	Exd.	C.	N.C.	% N.C.	Exd.	C.	N.C.	% N.C.	Exd.	C.	N.C.	% N.C	Exd.	C.	N.C.	% N.C.	Exd	C.	N.C.	% N.C.
	58	40	18	31·08	454	365	89	19·60	208	139	64	31·52	135	86	49	36·28	449	245	204	45·48	1,299	875	424	32·63
Sidebones ..	..	..	3	5·17	..	..	52	11·45	..	..	37	18·23	..	..	27	20·00	..	..	143	31·84	..	..	262	20·22
Ringbones ..	..	..	..	..	..	..	4	·88	..	..	5	2·46	..	..	4	2·97	..	..	27	6·03	..	..	40	3·05
Spavin.. ..	..	..	..	..	..	..	2	·44	..	..	..	..	..	..	3	2·22	..	..	2	·44	..	..	7	·53
Bog Spavin, &c.	..	..	..	..	..	..	6	1·32	..	..	4	1·97	..	..	1	·74	..	..	6	1·33	..	..	17	1·29
Totals ..	58	..	3	5·17	454	..	64	14·09	208	..	46	22·66	135	..	35	25·93	449	..	178	39·64	1,299	..	326	25·09

TABLE VI.

AGE-PERIOD OF UNSOUNDNESSES IN LIGHT HORSES.

Unsoundness.	2 Years.				3 Years.				4 Years.				5 Years.				6 Years and Over.				Totals.			
	Exd.	C.	N.C.	Re-jects. %	Exd.	C.	N.C.	Re-jects. %	Exd.	C.	N.C.	Re-jects. %	Exd.	C.	N.C.	Re-jects. %	Exd.	C.	N.C.	Re-jects. %	Exd.	C.	N.C.	% Re-jects.
	22	17	5	22·7	130	101	29	22·8	102	83	19	18·6	80	68	12	15·0	445	362	83	18·65	779	631	148	18·99
Sidebones ..	..	..	..	..	..	..	1	·76	..	..	..	..	..	..	..	..	..	..	3	·67	..	..	4	·51
Ringbones ..	..	..	..	..	..	..	1	·76	..	..	1	·98	..	..	..	..	..	..	12	2·68	..	..	14	1·79
Spavin ..	..	..	..	..	..	..	3	2·30	..	..	2	1·96	..	..	2	2·50	..	..	18	4·02	..	..	25	3·61
Bog Spavin, &c.	..	..	..	..	..	..	1	·76	..	..	1	·98	..	..	2	2·50	..	..	4	·90	..	..	8	1·08
Curb	..	..	4	18·18	..	..	5	8·86	..	..	3	2·94	..	..	1	1·25	..	..	6	1·86	..	..	19	2·44
Roarer ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	·45	..	..	2	·26
Total ..	22	..	4	18·18	130	..	11	8·44	102	..	7	6·86	80	..	5	6·25	445	..	45	10·08	779	..	72	9·24

TABLE VII.

AGE-PERIOD OF UNSOUNDNESSES IN PONIES.

Unsoundness.	2 Years.				3 Years.				4 Years.				5 Years.				6 Years and Over.				Totals.			
	Exd.	C.	N.C.	% N.C.	Exd.	C.	N.C.	% N.C.	Exd.	C.	N.C.	% N.C.	Exd.	C.	N.C.	% N.C	Exd.	C.	N.C.	% N.C.	Exd.	C.	N.C.	% N.C.
	18	10	8	44·44	102	73	29	28·48	79	61	18	22·78	70	60	10	14·28	289	244	45	15·57	558	448	110	19·71
Ringbones ..	..	..	..	..	..	..	1	·98	..	..	..	..	..	..	1	1·48	..	..	4	1·40	..	..	6	1·08
Curb	..	..	..	..	..	..	1	·98	..	..	8	3·79	..	..	3	4·28	..	..	1	1·04	..	..	10	1·79
Spavin ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	·71	..	..	2	·36
Bog Spavin ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cataract ..	..	..	..	..	..	..	1	·98	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	·18
Totals ..	18	..	..	..	102	..	3	2·94	79	..	3	3·79	70	..	4	5·71	289	..	9	3·15	558	..	19	3·41

TABLE VIII.

AGE-PERIOD OF UNSOUNDNESSES IN ALL BREEDS (DRAUGHT HORSES, LIGHT HORSES, AND PONIES.

Unsoundness.	2 Years.				3 Years.				4 Years.				5 Years.				6 Years and Over.				Totals.			
	Exd	C.	N.C.	% N.C.	Exd.	C.	N.C.	% N.C.	Exd.	C.	N.C.	% N.C.	Exd.	C.	N.C.	% N.C	Exd.	C.	N.C.	% N.C.	Exd.	C.	N.C.	% N.C.
	98	67	31	31·63	686	539	137	19·99	384	283	101	25·80	285	214	71	24·91	1,183	851	332	28·07	2,636	1,955	682	25·87
Sidebones ..	..	..	3	3·06	..	..	54	7·87	..	..	37	9·63	..	..	27	9·48	..	..	146	12·35	..	..	267	10·09
Ringbones ..	..	..	..	..	..	..	5	·74	..	..	6	1·56	..	..	5	1·75	..	..	43	3·63	..	..	60	2·28
Spavin ..	..	..	..	..	..	..	5	·74	..	..	2	·52	..	..	5	1·75	..	..	22	1·85	..	..	34	1·29
Bog Spavin ..	..	..	..	..	..	..	7	1·01	..	..	5	1·81	..	..	3	1·05	..	..	10	·85	..	..	25	·94
Curb	..	..	4	4·08	..	..	6	·87	..	..	6	1·56	..	..	4	1·40	..	..	9	·76	..	..	29	1·10
Cataract (Eye)..	..	..	..	..	..	..	1	·14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1·04
Roarer ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	·16	..	..	2	·08
Total ..	98	..	7	7·14	686	..	78	11·37	384	..	56	14·58	285	..	44	15·43	1,183	..	232	19·61	2,636	..	417	15·82

Evidence of Hereditary Character of Sidebone.

Amongst light horses only four (.51 per cent.), and amongst ponies none have been found to have sidebone; so that the records as regards these classes are of no positive value in estimating the hereditary character of the unsoundness. As negative evidence, however, the fact of so infinitesimal a proportion of the light breeds being found affected is of the greatest significance; especially when it is remembered that these horses are, by the nature of their work and paces, subject in a much greater degree than draught horses to one of the alleged principal exciting causes of ossification of the lateral cartilages, viz., concussion.

No thoroughbred horse and no pony have been found affected with sidebone. The four light horses in which it has been found have all shown some signs in their type and conformation of admixture of draught blood. One notable instance of this was the imported English hackney "X——— G———" rejected for sidebone. His round nuggety conformation, broad flat feet, round bone, fetlock tuft, long curly hair growing from the coronets, and his high but laboured action all proclaimed the bar sinister of draught horse blood to such an extent as to belie his published pedigree. Another of these sidebone light horses, "M——— G———," although having "light" characteristics at the time of examination, has been found, according to his breeding, to be actually a draught horse.

By the time the first hundred or so of draught horses had been examined, it appeared evident that valuable information concerning the transmission from sire to son of a predisposition to the formation of sidebone could be obtained. To that end, I determined that the pedigrees and relationship of the different horses examined should be ascertained at the time of examination. This has been done, and as a result I am able to present a series of tables of family groups of horses examined—some families in which there is a great preponderance of sidebone in the progeny, and some, the members of which are virtually all sound.

In perusing the tables of sideboned families, attention should be given to the ratio of sideboned to sound progeny. Such ratio in each case, when compared with the general percentage (20.17) of sideboned horses—as shown in the previous tables, will be found to be greatly in excess. Similarly, in the case of the sound families, only those have been tabulated in which the percentage of sound animals greatly exceeds the general percentage.

For the reason already mentioned, viz.—that the influence of the dam in any given case cannot be calculated—the deductions to be drawn from these tables are not as exact as is desirable, but there is one family (*See* Table IX., Family "A") in which it would appear that when the horse was mated with mares belonging to a sidebone sire family, the offspring developed sidebones, but when mated with outside mares the offspring remained sound. Seven sons of this sire "T——— I———" have been examined. Three of these, viz.:—"C——— M———," "I——— M———," and "I——— Q———," were ex. "Q——— of B———" mares, and all of them were rejected for sidebone. The other four were ex. mares of sound sire blood, and were found sound.

(*Note.*—(1) In the tables following, for obvious reasons, the actual names of the horses are not given. The names are indicated by the use of a cipher consisting of initial letters bearing a similar relationship in all cases to the actual names of the horses concerned. A duplicate series of tables containing the actual names, together with the cipher key, has been furnished to the Melbourne University examiners, the Minister for Agriculture, and the Editor of this *Journal.*)

Table IX.—Unsound Families.

Family "A."

Sire .. .. Q—— of B—— (not examined).

	Age.	Sideboned (24).	Age.	Sound (15).
Sons ..	Aged	E—— P'D——	Aged	Z—— Q——
	Aged	U—— B——	Aged	T—— B——
	Aged	E——		
	Aged	C—— D——		
	Aged	C—— B——		
	Aged	Z—— Q—— of B——		
	Aged	U—— C——		
	Aged	T—— S——		
	Aged	B—— S——		
Grandsons	6 years	S—— P'N——	Aged	T—— C——
	6 years	C—— S——	Aged	C—— L——
	5 years	P—— D——	Aged	Z—— B——
	5 years	K—— T——	5 years	L—— B——
	5 years	C—— P——	5 years	B—— Q——
	4 years	Z—— E——	3 years	Q—— B——
	4 years	N—— D——	3 years	W—— Q——
	4 years	M—— M——	3 years	N——
	4 years	I—— Q——	3 years	M—— N——
	4 years	I—— M——	3 years	B—— C——
	4 years	C—— M——	3 years	S—— Q——
	3 years	S—— E——	3 years	E—— B——
	3 years	P'D—— Q—— ..	3 years	B—— W——
	3 years	U—— P——		
	3 years	Q—— of B——		

Remarks.—61·5% of examined progeny sideboned; 38·5% sound.
81·8% sons sideboned; 18·8% sound.
53·5% grandsons sideboned; 46·5% sound.

The influence of sound blood on the dam's side in the case of the grandsons may be presumed, each grandson only carrying one-quarter of "Q—— of B——" blood against three-quarters outside blood. This family is an instance of what has been observed throughout, viz., that the influence of the foundation sire, whether in the direction of soundness or unsoundness, lessens with each generation, unless there is introduction of sound or of unsound blood, as the case may be, on the dam's side in the younger generations.

Family "B."

Sire .. .. T—— Q—— (not examined).

	Age.	Sideboned (15).	Age.	Sound (10).
Sons ..	Aged	M—— N——	4 years	T—— Q——
	Aged	H—— T—— Q—— ..	3 years	K—— T——
	Aged	H—— N——	3 years	M—— C——
	Aged	T—— X——	3 years	Q——
	Aged	W——		
	6 years	T—— N——		
	5 years	T—— C——		
	5 years	T—— F——		
Grandsons	6 years	E——	Aged	C—— D——
	4 years	C—— Q——	5 years	Z—— D—— I——
	4 years	P—— I——	4 years	U—— L——
	3 years	T—— M——	4 years	Q—— of P——
	3 years	Z—— D——	3 years	D—— D——
	3 years	Z—— N—— I—— ..	3 years	B—— D——
	3 years	I——		

Remarks.—60% of examined progeny sideboned; 40% sound.
66·7% sons sideboned; 33·3% sound.
53·7% grandsons sideboned; 46·3% sound.

Table IX.—Unsound Families—*continued*.

Family "C."

Sire .. .. Z—— D—— I—— (not examined).

	Age.	Sideboned (5).	Age.	Sound (1).
Sons ..	Aged	G—— I——		
	Aged	D——		
	6 years	O——		
	Aged	Z—— D——		
Grandsons	4 years	D—— D——	3 years	Z—— Q—— of D——

Family "D."

Sire .. .. O—— C—— (not examined).

	Age.	Sideboned (4).	Age.	Sound (1).
Sons ..	Aged	W—— C——	4 years	Z—— O—— X——
	5 years	C—— C——		
	4 years	C—— C——		
Grandson	6 years	C—— X——		

Family "E."

Sire .. .. D—— of the O—— (not examined).

	Age.	Sideboned (4).	Age.	Sound (*nil*).
Grandsons	Aged	E—— N—— H——		
	Aged	T—— X——		
	3 years	P—— D——		
Great Grandson	6 years	I——		

Family "F."

Sire .. .. U—— D—— (examined—sideboned).

	Age.	Sideboned (3).	Age.	Sound (*nil*).
Sons ..	Aged	O—— A—— D——		
	5 years	N—— D——		
	3 years	D—— of the J——		

Table X.—Sound Families.

Family "A."

Sire .. .. T—— M—— (not examined).

	Age.	Sound (35).	Age.	Sideboned (7).
Sons ..	Aged	N—— S——	3 years	T—— M——
	Aged	Q——		
	Aged	I——		
	Aged	P—— T——		
	6 years	T—— Q——		
	6 years	Q——		
	6 years	T—— Q——		
	5 years	H——		
	5 years	S—— T——		
	5 years	X——		
	4 years	I—— M——		
	4 years	L—— M——		
	3 years	I——		
	3 years	NdM——		
	3 years	S—— T——		
	3 years	U—— X——		
	3 years	O—— Q——		
	3 years	T—— Q——		
	2 years	D—— K——		
Grandsons	5 years	N—— N——	Aged	Q—— of the N——
	5 years	N—— N—— E—— ..	6 years	N—— S——
	5 years	N—— N——	5 years	N—— N——
	4 years	N—— K——	5 years	C—— P——
	4 years	S—— B——	4 years	D—— Q——
	4 years	Q—— S——	3 years	H—— S——
	4 years	F—— H		
	3 years	N—— H——		
	3 years	S—— I——		
	3 years	F—— of R——		
	3 years	U—— C——		
	3 years	L—— E——		
	3 years	T—— Q——		
	3 years	D—— M——		
	3 years	C—— T——		
Great Grandson	3 years	M—— N——		

Remarks.—83·3% of progeny sound : 16·7% sideboned.
95% of sons sound ; 5% sideboned.
72·7% of grandsons and great grandsons sound ; 27% sideboned.

Clearly the increase in number of sideboned grandsons over sons is due to the introduction of sidebone blood through the dams, especially seeing the preponderance of aged sound horses amongst the sons.

Family "B."

Sire .. .. C—— Q—— (not examined).

	Age.	Sound (31).	Age.	Sideboned (1).
Sons ..	Aged	B—— C——		
	6 years	S——		
Grandsons	Aged	N—— N——	3 years	B——
	Aged	Q—— of O——		
	5 years	C—— N——		
	4 years	C—— G——		
	4 years	D—— N——		
	3 years	C—— D——		
	3 years	C—— H——		
	3 years	C—— T——		
	3 years	T—— D——		
	3 years	C—— D——		
	3 years	C—— D——		
	3 years	D—— C——		
	3 years	T—— D——		

TABLE X.—SOUND FAMILIES—*continued.*

FAMILY "B"—*continued.*

	Age.	Sound.	Age.	Sidebonea.
Great Grandsons	4 years	D—— N——		
	3 years	L—— M.M——		
	3 years	T—— D——		
	3 years	U—— D——		
	3 years	C—— K——		
	3 years	N—— F——		
	3 years	N—— U——		
	3 years	D—— G——		
	3 years	E——		
	3 years	T—— J—— O——		
	3 years	C—— C——		
	3 years	C—— O——		
	3 years	O—— T——		
	3 years	Q——		
	3 years	K—— C——		

Remarks.—The quality of soundness must have been particularly "dominant" in this sire, for it is not likely that 31 of the 32 dams of his stallion progeny were free from sidebones. The grandson, "Q—— of O——," himself sound, is the sire of ten of the sound great grandsons.

FAMILY "C."

Sire .. .. M—— E—— (examined sound).

	Age.	Sound (19).	Age.	Sideboned (1).
Sons ..	5 years	F—— of E——	2 years	H——
	5 years	M—— E——		
	5 years	F—— E——		
	4 years	M—— D——		
	4 years	M—— I——		
	4 years	T—— E——		
	4 years	E—— (2)		
	4 years	S—— D——		
	3 years	M—— E——		
	3 years	M—— E——		
	3 years	M—— F——		
	3 years	Z—— M—— E——		
	3 years	T—— Q——		
	3 years	X—— N—— H——		
	3 years	E——		
	3 years	I—— Q——		
	3 years	M—— X——		
	2 years	E—— (I)		
	2 years	M—— I——		

Remarks. It is regrettable that the pedigree of "H——" on dam's side cannot be traced. She must belong to a pronouncedly sideboned family, seeing that her colt had well-developed sidebones at two years old, although got by sire whose every other son kept as a stallion is sound.

FAMILY "D."

Sire .. .. T—— X—— (not examined).

	Age.	Sound (12).	Age.	Sideboned (*nil*).
Sons ..	4 years	Z—— T—— X——		
	3 years	M—— P'C——		
	3 years	H—— B——		
	3 years	H—— X——		
	3 years	D—— L——		
	3 years	T—— S——		
	3 years	T—— S——		
	3 years	L—— X——		
	2 years	H——		
	2 years	J—— X——		
	2 years	M—— of C——		
	2 years	T—— X——		

TABLE X.—SOUND FAMILIES—*continued.*

FAMILY "E."

Sire .. .. D— — the T— — (not examined).

	Age.	Sound (11).	Age.	Sideboned (1).
Sons ..	Aged	N— — —		
	5 years	G— — U		
	4 years	D— — —		
	4 years	D — —		
	4 years	M — — N E		
	3 years	T — D		
	3 years	D S		
	3 years	X		
Grandsons	Aged	S T	Aged	S M
	3 years	M N T		
	3 years	N.H G		

FAMILY "F."

Sire .. .. L — of L — — (not examined).

	Age.	Sound (10).	Age.	Sideboned (*nil*).
Grandsons	Aged	Q — of L		
	5 years	C — Q		
	4 years	C D		
	4 years	T		
	4 years	D — Q		
	4 years	C— Q		
	4 years	Z C		
	3 years	N E		
	3 years	S D		
	3 years	C— Z		

FAMILY "G."

Sire .. .. J — — I — — (not examined).

	Age.	Sound (10).	Age.	Sideboned (2).
Sons ..	5 years	U I —	4 years	J N —
	4 years	C I	3 years	J B —
	4 years	I T —		
	3 years	J C		
	3 years	J M		
	3 years	J— O —		
	3 years	M — T		
	3 years	Z I		
	3 years	J Q		
	2 years	J— N		

Remarks.—This may not turn out to be a particularly sound family. The percentage of sideboned sons is already 16·7, and amongst the sound sons there is a heavy proportion of two and three year olds, some of which may develop sidebones later on.

TABLE X.—SOUND FAMILIES—*continued.*

FAMILY "H."

Sire .. .. B—— (not examined).

	Age.	Sound (8).	Age.	Sideboned (*nil*).
Sons ..	Aged	D——		
	6 years	C—— L——		
	4 years	H——		
	3 years	B—— Z——		
	3 years	E——		
	3 years	P——		
	3 years	U—— N——		
Grandson	3 years	T—— D——		

FAMILY "I."

Sire .. .. Q—— S—— (not examined).

	Age.	Sound (7).	Age.	Sideboned (*nil*).
Grandsons	4 years	Q—— of H——		
	4 years	I——		
	3 years	F—— of H——		
	3 years	D—— H——		
	3 years	O—— T——		
	3 years	S—— S——		
Great Grandson	3 years	M—— N——		

FAMILY "J."

Sire .. .. D—— of the T—— (not examined).

	Age.	Sound (4).	Age.	Sideboned (*nil*).
Sons ..	5 years	M——		
	4 years	N—— D——		
	3 years	D—— T——		
	2 years	D—— I——		

LOCATION OF SIDEBONE AS EVIDENCE OF HEREDITARY CHARACTER.

Concerning the frequency of occurrence of sidebone on the inside or outside of the foot, and as to which feet are more frequently affected, the following synopsis as regards the 275 sideboned horses is informative :—

Firstly, as to the number of feet affected—

	40	horses had sidebone	1 foot only
	214	,, ,,	2 feet only
	8	,, ,,	3 ,,
	13	,, ,,	4 feet
Total ..	275	affected with sidebone.	

Secondly, as to relative frequency in front and behind—

	254	horses had sidebones	in front only.
	2	,, ,,	behind only.
	19	,, ,,	both in front and behind

Total .. 275, of which 273 had sidebone in front and 21 had sidebones behind—a proportion of 13 horses affected in front to each 1 behind.

Thirdly, as to relative frequency of near side and off side affection—

Of the above-mentioned 254 horses having sidebone in front—

	197	horses had sidebones both fore	=	394	feet affected
	16	,, ,, near fore only	=	16	,, ,,
	41	,, ,, off fore only	=	41	,, ,,
Total ..	254	Total		451	,, ,,

Of these 451 affected feet, 213 were near fore and 238 off fore, viz.:—197 + 16 = 213 near fore, and 197 + 41 = 238 off fore.

Fourthly, as to the relative frequency of sidebone on the inside and outside of the foot—

Of the above-mentioned 254 horses having sidebone in front only—

147	had 4 sidebones	(588 individual sidebones)—	294 inside	and	249 outside
32	,, 3 ,,	(96 ,, ,,)	36 ,,	,,	60 ,,
46	,, 2 ,,	(92 ,, ,,)	24 ,,	,,	68 ,,
29	,, 1 ,,	(29 ,, ,,)	9 ,,	,,	20 ,,
254	horses sidebone in front	(805 ,, ,,	363 (45.1%)	,,	422 (54.9%) outside

(a proportion of 9 inside to 11 outside).

Of the 46 horses shown in this Table as having two sidebones in front, 28 were affected on one foot only; the remaining 18 had one sidebone on each foot, making 36 sidebones in all (18 × 8). Of these, 6 were inside and 30 outside. Therefore, the number of horses having sidebones on both feet was 197 (18 + 32 + 147). These 197 horses had 720 individual sidebones between them (588 + 96 + 36), distributed as follows:—

720 sidebones .. { 384 outside (53·3%). 336 inside (46·7%).

48 more sidebones on outside than inside—a proportion of 8 (outside) to 7 (inside).

The outstanding features of the above figures are—

(A) The great excess of sidebones in the fore foot as compared with the hind—proportion 13 to 1.

(B) The preponderance of cases in which both fore were affected as against one-foot affection—proportion 10 to 3.

(C) The approximation of the incidence of sidebone in the near and off foot—proportion 9 to 10.

(D) The approximation of the incidence of sidebone on the inside and outside of the foot respectively—proportion 9 to 11, inclusive of single-footed sidebones; 7 to 8 for pair foot sidebones only.

Concerning A, it is reasonable to regard the excess of sidebones in front as positive evidence of the part played by concussion and strain of body weight as exciting causes of sidebone. More weight is borne during rest and greater concussion is sustained during movement by the fore limbs and feet than the hind limbs and feet, for two reasons:—

Firstly, the incidence of body weight on the fore feet is greater than on the hind;

Secondly, the column of bones of the fore limbs, being practically perpendicular from the elbow down, is more rigid than that of the hind limb, in which the angle formed by the tibio-metatarsal bones tends to lessen jar.

The effect of concussion in the production of Splints might be adduced in support of the above conclusion. It is definitely recognised that the greatest exciting cause of "splints" in light horses is concussion. Their occurrence in the metacarpal region is, as compared with the metatarsal, in about the same proportion as recorded above concerning sidebones in the fore and hind feet respectively of draught horses. Incidentally, it may be mentioned that the form of hoof in which sidebone has been most frequently found, is that in which the wall—particularly at the sides—approaches the perpendicular. Such feet are also usually small, narrow and blocky. Sidebones are seldom associated with large and spreading or broad and flat feet.

As regards B, the fact of the sidebone occurring in both fore feet more than three times as frequently as in a single foot, indicates an intrinsic causation rather than causation by external violence, which would scarcely happen to both fore feet simultaneously.

Comment on C may be confined to the statement that the excess of sidebones found in the off feet, as compared with the near, is so slight (10 to 9) that it cannot be regarded as of any significance in the matter of determining the causation of sidebone. The observation, however, conflicts with the statement in Mollar and Dollar's *Veterinary Surgery*, that "the cartilage of the left foot suffers more frequently than that of the right."

Observation D is of considerable importance. The fact that the disparity between the incidence of sidebone on the outside and inside of the foot is so slight (only as 8 is to 7) would appear to indicate the falsity of a commonly held supposition, viz.:—that sidebone is regularly caused by an injury sustained through the dropping of the shafts on to the coronets when the horse is being unyoked from a dray, or from the coronets being trod on when working in a team. In the former case, it is obvious that only the outside coronets could sustain injury, but in neither case can such a cause be admitted as regards the horses under review. Being stud horses and many of them of high value, it may be asserted that not one in ten of the draught horses examined had even been yoked to a dray or harnessed in a team, or even worn a collar.

On this theory of injury as a cause of sidebone, it may be remarked that the number of occasions on which any evidence of external injury having been sustained, such as a scar, is practically negligible; on the other hand, some of the draught sires and many of the trotting sires examined have shown scars over the seat of sidebone but without any ossification of the cartilage having occurred. This was notably the case with the pony "D—— S——" whose near fore coronet outside had apparently at one time been literally cut to pieces, yet without even stiffening the cartilage. In cases of Quittor it frequently happens that the inflammatory process involves the lateral cartilage to the extent that suppurating sinuses may pierce it, and the cartilage still remains free from ossification. I doubt whether sidebone is ever caused by external violence *per se*, and I do not think that even deliberate bruising of the coronets of a light horse by severe hammering would result in ossification of the underlying cartilage. Amongst hundreds examined, I have never seen any specimen showing evidence of ossification having commenced at the summit or margins of the cartilage. It always commences at the base where the cartilage is joined to and rests on the wing of the pedal bone and gradually extends upwards throughout the substance of the cartilage to the summit and borders. Many specimens are in my possession showing all stages of growth of sidebone from the very commencement at the base of the cartilage, through gradations in size of the ossified portion to the fully formed sidebone involving the whole of the cartilage. I have never been able to find a specimen of bony formation at the top of the cartilage with normal cartilage in between the summit and base. I have one specimen in which the sidebone had become detached from the wing of the *os pedis* and formed a false joint, but the indications on the bones are that a fracture had occurred subsequent to the development of the sidebone, and not that the ossification had commenced high up in the cartilage and extended downwards with failure to unite with the basilar process of the wing of the *os pedis*.

It, doubtless, is the case that many draught horses when worked in pairs or in teams abreast are trodden on at the seat of the sidebone and that some of such horses may subsequently develop sidebones. Many so trodden on, however, do not develop sidebones and the logical inference is that when sidebones develop after actual or supposed injury, they develop despite the injury and not because of it. In such cases, sidebones would doubtless have formed whether injury had occurred or not; but where injury has occurred and sidebones have been noticed afterwards, the injury is credited with being the cause although the sidebone may have been present but unnoticed at the time the injury was sustained.

Since the attention of horse-owners has been so pointedly called to the subject of sidebones by the results of the Government examination of stallions, many of them have given me instances within their own experiences on their own farms which corroborate the conclusions above set out—cases in which certain horses on the farm related to one another have all developed sidebones, but the remaining horses on the farm, worked and treated in exactly similar fashion but unrelated to the sideboned horses, have remained sound. Mr. K—— C——, of Y——, has five descendants of one mare all bred on his farm and all sideboned, while seven other home-bred horses, unrelated to the mare in question but which have been reared and worked under the same conditions as her descendants, have remained sound.

Work versus Heredity in the Production of Sidebones.

The only set of figures bearing on the incidence of sidebone which I have come across in any veterinary text-book are those by Lungwitz, quoted in Mollar and Dollar's *Veterinary Surgery*. Lungwitz examined 1,251 horses, and furnished the following table of results :—

Description.	Number of Horses Examined.	Number affected with Sidebone.	Percentage.	Remarks.
Belgian Cart Horse ..	98	68	69·5	Working only on hard pavements
Danish Carriage Horse ..	120	25	31	.. .. ..
Heavy Riding Horse ..	388	36	9	Working on heavy ground and partly on hard pavements
Heavy Riding Horses ..	132	..	..	Working on light sandy soil
Light Riding Horse ..	133	8	6	Working on light ground
Riding Horses (various weights)	140	3	2	Working on light ground
Military Horses ..	200	1	0·5	Working on medium heavy ground
Officers' Horses (heavy) ..	40	3	7·5	Working on varied surfaces
	1,251	144	14·4	

The figures in this table relate to working horses only, not to stud horses, and do not throw any light on the question of hereditary influence in the occurrence of sidebone. They support the conclusion set out above as to sidebone being essentially an affection of draught horses, but one false inference may be drawn from the figures, viz. :—that the development of sidebone is consequential on the character of the work performed by the horse. Rather is it that the horses which are used for draught work on hard pavements and heavy ground are of the class that are hereditarily predisposed to the development of sidebones. In support of this latter view the fact must needs be mentioned that all the horses dealt with under the Victorian Government scheme were stud horses. Few of them had done any kind of work, and practically none had worked on pavement. The roads travelled by stallions when doing their season have an earth surface frequently cushioned with dust or grass; in the vicinity of the larger towns only are the country roads metalled or macadamized.

Another interesting fact as bearing on the falsity of the view that sidebones are caused by the use of calkin or high-heeled shoes, is that practically all the draught horses examined were shod without heels, the practice of shoeing stallions with flat shoes being general throughout this country.

EVIDENCE OF HEREDITARY CHARACTER OF OTHER UNSOUNDNESSES.

Table IV. shows the total number of rejections for ringbone, bone spavin, curb and bog spavin to have been respectively 60, 34, 29, and 25, as against 275 cases of sidebone. The difficulty, therefore, of revealing evidence of hereditary transmission of these other unsoundnesses as compared with sidebone is in ratio to the lesser numbers available for analysis in each case. There is only practically one-fifth of the number of the cases to work on in the case of ringbone, one-ninth in the case of bone spavin and curb, and one-eleventh in the case of bog spavin.

Nevertheless, relationship between a varying number of horses found to have these unsoundnesses respectively may be cited.

RINGBONE.—Of the 40 draught horses rejected for ringbone, five belong to one family and four to another.

The five comprise four sons (M—— B——, C——B——, U——C—— and Z——Q—— of B——) and one g.-g. son (C——K——) of the sire Q—— of B——. In the other family, the four rejects for ringbone are grandsons through their dams of the sire B——, viz., C—— K——, D—— W——, C—— K—— 3 and T—— K——.

BONE SPAVIN.—Relationship between the horses rejected for bone spavin has not, up to the present, been found to exist sufficiently close as to warrant the submission of any instances as evidence of hereditary influence as the causation of this particular unsoundness.

CURB.—In regard to curb, seven families have been encountered in which near relatives have been found affected. Particulars of these are—

Family 1.—Sire and one son examined both having curbs, thus—

Sire—X—— U—— (curb). Son—S—— D—— (curb).

Family 2.—Three sons (sire not examined) thus—

Sire—L—— (N.E.). Sons—L—— (curb);
R—— (curb);
I—— (curb).

Families 3, 4, 5, and 6.—Four families in which two sons (sires not examined in two cases) were found to have curbs, thus—

1. Sire—B——— (sound). Sons—H——— A——— (curb);
I——— (curb).

2. Sire—I——— A——— A——— (sound). Sons—I——— (curb);
G——— (curb).

3. Sire—E——— (N.E.). Sons—E——— Q——— N——— (curb);
E——— (curb).

4. Sire—T——— (N.E.). Sons—H——— (curb);
H——— (curb).

Family 7.—One son and one grandson (sire not examined), thus—

Sire—H——— (N.E.); Son—I——— E——— (curb);
Grandson—N———Q——— (curb).

BOG SPAVIN.—In one sense, the evidence of hereditary influence in the causation of bog spavin (including thoroughpin) is more pronounced than in respect of sidebone. There are no less than nine families in which a varying number of descendants have been found affected with bog spavin.*

In the case of one sire, five sons have had bog spavin, viz.:—

Family 1. Sire—P———. Sons—N———.
P———.
B———.
S——— D———.
Q———.

In two cases, three sons by the same sire had bog spavin, viz.:—

Family 2. Sire—G———. Sons—D———.
H——— C———.
G———.

Family 3. Sire—E——— I——— M———. Sons—B——— H———.
H——— U———.
S——— T———.

(Two other sons examined—sound.)

In one case, two sons and one grandson had bog spavin, viz.:—

Family 4. Sire—D——— S———. Sons—Z——— S———.
K——— C———.
Grandson—E———.

In three other cases, two sons of the same sire had bog spavin, viz.:—

Family 5. Sire—C———. Sons—C——— Q———.
D——— Q———.

Family 6. Sire—Q——— D———. Sons—U——— D———.
G——— A———.

Family 7. Sire—Q——— of B———. Sons—T——— S———.
B——— Q———.

In one case, a sire and son have been examined and rejected for bog spavin, viz.:—

Family 8. Sire—C———. Son—R——— C———.

In one case, a son and grandson of one sire have been rejected for bog spavin, viz.:—

Family 9. Sire—Z——— L———. Son—T——— B———.
Grandson—C——— U———.

* The horses referred to have not necessarily been rejected on account of this particular unsoundness—bog spavin.

MAIZE AND LUCERNE IN THE WESTERN DISTRICT.

A. W. Fisher, Dairy Supervisor.

In Western Victoria, throughout the Casterton district, there are thousands of acres of good dairying country that are at present given over to wool-growing and the fattening of stock for market. The high quality of this land may be gauged from the fact that fat stock from estates such as Muntham, Merino Downs, Henty, Tahara, Cammais, Dunrobin, and many others frequently bring top prices in our leading markets. Land that will grow good beef and mutton will usually prove to be equally adapted for dairying; and this country only awaits subdivision and closer settlement to become prominent in the production of dairy produce.

There has not in the past been much attention devoted to dairying, but the worry and losses sustained of late years with sheep through the worm trouble among the lambs, as against the large profits that are to be derived from dairying, will probably result in more attention being given to this latter line of business shortly.

At Sandford, in this district, Mr. Jackson has an estate of some 4,600 acres, which in regard to fertility is fairly typical of the surrounding estates. The greater portion of the estate is given over to sheep, but a number of fat cattle are turned off yearly also. The country is rather hilly and has some steep bluffs rising from the Wannon and Glenelg Rivers which form the boundary of the property on the northern and western sides. The soil is of a good depth, principally grey and black in colour, while some of the bluffs have a proportion of limestone showing through them. This estate was formerly owned by the late Mr. John Henty, one of the pioneers of Western Victoria, and is now managed by Mr. J. B. Jackson, the son of the present owner. From the accompanying photographs it will be seen that two of the principal dairy fodder crops can be successfully cultivated in the district.

The ground where the maize crop was sown is a grey loam with a fair amount of sand, extending to a depth of 2 to 3 feet overlying a light yellow clay. It has for years been devoted to mangold crops, but has lately become so over-run with hog weed, that last year Mr. Jackson decided to give it an extra working to try and eradicate this pest. The soil was ploughed 8 to 9 inches deep in April and harrowed down; ploughed again 4 inches deep in August; and again towards the end of October, when maize was ploughed in 4 inches deep and 3 feet between the rows, at the rate of ½ bushel to the acre. During the growth of the crop the land was scarified three times, keeping the ground loose on the surface between the rows and killing the weeds. Two varieties (Hickory King and Somerton White) made splendid growth and cobbed well, there being little difference between them; individual stalks measured up to

11 ft. 9 in., and the crop averaged well over 9 feet high. Alongside this plot is another of Boone County Special, which was not planted till late in November. This crop is just now (4th April) showing to advantage,

SAMPLE STOOLS OF MAIZE.
(Hickory King, Somerton White, and Boone County Special.)

being 8 feet high, and showing a mass of succulent leaves. It has also stooled well and is heavily cobbed, as many as five cobs being on one stem.

LUCERNE—FIFTH CUTTING FOR THE SEASON.

Single stools of Hickory King and Boone County Special weighed 12 lbs. each, and a section of the latter, cut and weighed, showed equal to 20 tons to the acre. Had it not been for bad germination in places, which Mr. Jackson attributed to the superphosphate which was applied to the drills at the rate of 2 cwt. to the acre, the crop would have been much heavier. The ground has been under cultivation for over 30 years and during the last five years the only other fertilizer it has had was a light top-dressing of manure gathered from the wool-shed and sheep-yards. The prolific crop of maize this year may be attributed to the thorough pulverising of the soil and inter-cultivation, for the rainfall was low, not more than 3 inches being registered from the time of planting until the heavy fall early in March.

The lucerne crop is on heavy black soil and was laid down eight or nine years ago. The sample illustrated was from the fifth cutting this season and another cutting will be secured before winter. Some eighteen months ago, Mr. Jackson put the scarifier into the ground, preparatory to ploughing it, as the lucerne was getting a bit thin. However, after the scarifying, it was left for a while, and it made such a vigorous growth that he decided to give it another chance, with the result that it is as thick now as ever it was. The plants were over 2 feet high at this cutting and grown without any water other than the season's rainfall. The land has never been manured.

ANSWERS TO CORRESPONDENTS.

Stomach Worms.—A.C.E. states that two of his draught mares (with foals at foot) are suffering from worms. He asks for a good remedy, and also whether the foals, nearly four months old, are too young to wean. The mares are in low condition.

Answer.—(1) Give night and morning in a damp feed the following powder:—Sulphate of iron 1 dram, sulphate of copper ½ dram, gentian 2 drams; continue for a week, then give a couple of bran mashes followed in the morning by a drench of linseed oil (raw) 1 pint, oil of turpentine ½ ounce. (2) They are too young to wean.

Impaction.—J.G.H. writes:—"Four of my weaners have died within the last ten days. On *post-mortem* examination, I found the stomach of the last full of dry grass, and the large intestine contained a quantity of large hard lumps of dry substance that the sheep had been unable to pass. The other organs seemed healthy. The sheep are in fair condition, and have plenty of dry grass and good water."

Answer.—The weaners evidently died from impaction of the colon or larger intestine, due to the indigestible nature of the food. To prevent it, either some succulent fodder such as silage, maize, or lucerne should be given, or if these are not available, then a little lucerne hay or bran and chaff twice daily. As treatment, a drench composed of 2 to 4 ozs. of Epsom salts with 1 oz. sulphur and ½ oz. ginger should be given. From the commencement of summer a liberal supply of salt should be available.

Delayed Parturition.—H.P. states that a sow of his has just farrowed her first litter. Two were farrowed on the Saturday and five on the following Tuesday, the latter being dead.

Answer.—Delayed parturition may be due to a variety of causes, but to no specific cause.

Shropshire-Merino Cross.—P.H. states that he has a small flock of plain-bodied merino ewes, and that a good Shropshire ram is running with them. He wishes to know whether it would be advisable for the ram to run with his own lambs next season.

Answer.—Yes, provided you are exceptionally careful to keep all weak-framed and inferior woolled ones away from him; this practice should not, however, be generally followed. Shropshire and merino rarely cross well, especially from a wool point of view. As a rule, at most only 50 to 60 per cent. of the ewe lambs will be found safe to go to him.

Death of Pine Trees.—M.McC. inquires as to cause of death of some large pine trees near his residence.

Answer.—The pines have probably reached the limit of their age. They live from 20 to 60 years, according to locality and situation. You might thin out occasional limbs, especially any that are going off. If the trees are in a particularly dry situation, soaking the subsoil would be of material benefit.

Mangolds.—H.P. intends putting in an acre crop of mangolds in virgin land. He requests information concerning variety and cultivation.

Answer.—Long red or yellow globe is recommended. Plant in August for early crop and for a succession in September and October. The seed should be drilled in very thinly, keeping the rows from 15 to 18 inches apart.

Planting Orchard.—(1) H.P. (Drouin district) asks for instructions as to preparation of land at present in its natural state. He also asks for best varieties of apples. (2) P.E. (Caniambo district) desires names of best varieties of apples, pears, and early peaches and cherries. (3) O.C. (Yarragon district) asks for a selection of apples, pears, and peaches, mostly for home use.

Answer.—(1) Clear all stumps and roots out of ground and thoroughly subsoil before planting. Plant the trees either 18 or 20 feet apart each way. For export, Jonathan is the best apple to grow. For home use, Jonathan, Rome Beauty, Five Crown, Emperor Alexander, Bismarck, and Yates are good.

(2) If a commercial orchard is being planted but few varieties of each fruit should be grown. A fair variety is required if the fruit is for home consumption. The following are recommended:—*Apples*—Jonathan, Rome Beauty, Munroe's Favourite. *Pears*—William's Bon Chrêtien, Broompark, Beurré de Capiaumont. *Peaches*—Brigg's Red May. *Cherries*—Early Purple Guigne, Bedford Prolific, St. Margaret's.

(3) *Apples*—Jonathan, Rome Beauty, Rokewood, Prince Alfred, Bismarck. *Pears*—Vicar of Winkfield, William's Bon Chrêtien, Winter Cole. *Peaches*—Brigg's Red May, Hale's Early, Lord Palmerston. The trees should be of the first season's working, young trees being preferred to old. The pears should be planted in the moist soil.

Nitrogen Free Extract.—W.S.B. asks for an explanation of the term "Nitrogen Free Extract."

Answer.—It is used to indicate principally the carbo-hydrates in a foodstuff. Carbo-hydrates, in turn, comprise chiefly the starches and sugars, which consist chemically of carbon, hydrogen and oxygen in different proportions. These, together with protein and fat, are the principal nutrient constituents in a food. In most foodstuffs, carbo-hydrates predominate in quantity, and they are considered to be correspondingly less valuable commercially. It is usually reckoned that a given quantity of protein is worth twice as much as the same quantity of carbo-hydrates, and that the fat is worth three times as much.

"Carman" Potatoes.—J.M. inquires as to difference between "Carman" potatoes, Nos. 1, 2, and 3.

Answer.—There is no potato known as Carman No. 2. The difference between Nos. 1 and 3 is:—The latter is a heavier yielder with larger tubers, the plants are larger and more vigorous, and are regarded as later maturing than No. 1, but there is very little difference in this respect.

Seaweed as a Fertilizer.—J.T. writes:—"I have 3 acres of sandy soil which was, until last year, covered with ti-tree. I have cleared it all, and have since carted 50 loads of seaweed on to it. Is the latter a good manure?"

Answer.—Seaweed may be used as a fertilizer on sandy soils. As it contains about 80 per cent. of water, it will not pay to remove it far from the coast. It decomposes rapidly and thus acts at once; but the percentage of plant food in seaweed is small, and it would, therefore, be advisable to continue the dressing yearly, if possible.

Paspalum.—J.M. asks what is the best kind of paspalum for the Cunninghame district.

Answer.—*Paspalum virgatum* is recommended. If seed is used it should be sown in seed bed, and when plants are strong enough they should be transplanted in check rows 3 feet apart, or at the rate of 4,840 plants to the acre. January to May is the best time to sow the seed. In your district planting roots is recommended—any time from April till October.

Water for Irrigation.—S.H.M. asks if brackish water is of any value for irrigation.

Answer.—Much depends upon the amount of minerals contained. This can only be ascertained by analyses extending over different periods of flow of stream. Certain soils will benefit by one or two applications of mineralised water, but will not stand repeated waterings. If only slightly affected, the water may be used provided efficient under drainage is provided.

Eradicating Thistles.—C.W.C. and M.E.M. inquire as to best method of eradicating thistles.

Answer.—(1) The Shore or Slender Thistle (*Carduus pycnocephalus*, L.) is an annual or biennial, the latter especially if cut or cropped, so that flowering is prevented during the first year. Hoeing to be most effective must be done while the seedlings are young and the cut should be low down below the knot where the first seed leaves are attached. Cutting above this point simply makes the plant branch more freely. The ripening and spread of seeds from plants which have escaped the previous treatment should be prevented by hoeing or pulling them out of the ground, piling and burning. Cutting down the plants may merely leave them to grow from the base and ripen seed next year. In all land which can be ploughed this thistle is easily destroyed by thorough and cleanly cultivation, stirring the soil as often as any fresh seedlings appear. Rough, rocky, hilly land which cannot be ploughed should be kept under timber, and will then not be liable to the incursion of weeds which it is not profitable to suppress on such land.

(2) Perennial or "Californian" Thistle (*Carduus arvensis*, L.).—Plough deeply in autumn and spring, raking out the rhizomes after harrowing and rolling to break the clods. Summer fallow, ploughing when necessary. Next season plant a potato or other root crop which allows working between the rows, after adding 10 to 15 tons of farmyard manure per acre. This should be followed by any crop (drilled-maize, cabbage, &c.,) which can be kept clean between the rows, then a grain crop, after which the land can be seeded down again in grass or clover or both mixed. After this, any thistles reappearing will be from seed blown in from adjoining land or from impure seed. Where there are only a few thick patches, these can be dug deeply and the rhizomes forked out, piled, and burnt, the thinner patches being hand pulled after rain or cut as often as possible. Only continuous and well-directed labour extending over two or three years can clean land of this thistle. Poisons and salts are useless for all plants with perennial underground parts. The cost is prohibitive, since doses are required which spoil the land for other use for some time.

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OF
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A. T. SHARP, Editor.

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LIMITING FACTORS IN AGRICULTURE.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist, and Professor of Botany in the Melbourne University.

Wherever and whenever the co-operation of several factors is necessary to produce a given result, the non-fulfilment of any one of them invalidates the remainder. For instance, to build a modern steam-ship, various kinds of skilled work are necessary, and the different workers are not interchangeable, so that the absence of any one set of workers may throw all the others idle and prevent them from working on, or from completing the ship. In the same way, the rate at which a house can be built primarily depends upon the rate at which the walls are constructed, and no number of painters, finishers or decorators can hasten the construction of the house, until the first factor, the building of the walls, is fulfilled.

In the case of plants, the factors essential to its life all act, for the most part, throughout their whole existence, instead of successively as to some extent they do in the instances quoted above. Hence, any essential factor or condition which is not fully satisfied, reduces the possible action of the others to the same level, or renders them useless if it is not fulfilled at all.

The factors essential for the growth of a green plant are—

1. A supply of water.
2. A certain temperature.
3. A supply of air, containing oxygen and a trace of carbon dioxide.
4. Exposure of its leaves to light.
5. A supply of mineral salts derived from the soil or elsewhere.

Under ordinary circumstances, particularly in the case of plants which start from large seeds, these factors are of importance in the order named. That this is so is shown by the following facts. A pea or bean, or indeed, any large seed, can be grown to a considerable size and will develop a root system, as well as a stem and leaves, if supplied with water and kept in moderately warm air. In this case, factors 1 and 2 are satisfied and factor 3 partly, in so far as the air contains oxygen, but the presence or absence of carbon dioxide, is immaterial so long as factor 4, exposure of the leaves to light, is not fulfilled.

If the first four factors are satisfied, that is to say, if the seed is kept warm, provided with water, air and carbon dioxide, and if the leaves of the seedling are exposed to light, then the seedling will be found to increase considerably in weight. This is the case when its roots are grown in distilled water and it may then even carry its development as far as the production of flowers. In this case, the fifth factor is unsatisfied so far as the supply of mineral salts derived from the soil is concerned. Growth is then only possible at the expense of and by virtue of the mineral salts that were stored up in the seed during ripening. In this respect, all plants show considerable powers of accommodation, since the smallest amount of a particular essential salt necessary to permit a plant developing, is very much smaller than the amount it would like to have. To put it into plain English, we might say that the plant is like a boy who prefers to have a pound of chocolates a day but could get on with an ounce. In the case of the plant, however, its power of accommodation is partly due to the fact that it is able to go on absorbing and accumulating an essential salt which is only present in the soil in extremely small amount. For this to be possible, a large root system and a good supply of water are necessary. For instance, very many plants can obtain all the salts they require from ordinary tap water, if the roots are grown in it and it is frequently changed, although in such water, certain essential elements such as potassium, magnesium and phosphorus may occur in the merest traces, almost incapable of estimation by analysis.

Water is the plant's most important requirement, hence, under ordinary cultivation conditions, the physics of the soil, including its aeration and its power of storing and supplying water, is far more important than its chemistry. Plants can adapt themselves to minimal amounts of salts, without undergoing agricultural deterioration, far more readily than they can to minimal amounts of water.

The essential elements which an ordinary plant obtains from the soil through its roots are calcium, potassium, magnesium, sulphur, phosphorus, and nitrogen. A trace of iron is also necessary, but all ordinary soils contain this element in greater amount than the plant requires it. These essential elements are usually absorbed by the plant in the form of salts, such as phosphorus in the form of phosphates, sulphur in the form of sulphates, nitrogen in the form of nitrates, while the calcium, magnesium and potassium are absorbed as salts of these acids or of others. Hence, three salts such as calcium nitrate, magnesium sulphate, and potassium phosphate will provide the plant with these six essential elements, and any ordinary plant can be grown to full adult size, if provided with nothing but these salts and distilled water, and exposed to light and air.

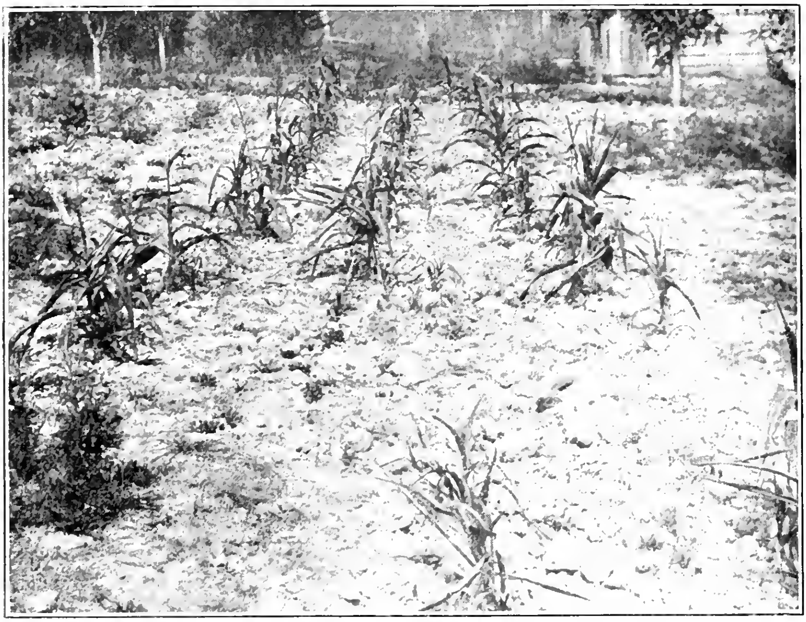
A point of great importance is that, to some extent, an essential element can be replaced by another which is not essential. For instance, a limited substitution of strontium for calcium is possible, that is to say, if strontium is present in the soil, the plant can grow with a less supply of calcium than it otherwise needs. As strontium is, however, rarer and more costly than calcium, this is a fact of theoretical importance alone. The same applies to the fact that calcium may be partly replaced by magnesium. In the case of cereals, however, it has been found that the presence of soluble silica, or of silicates in the soil, enables the plant to get along with a less quantity of phosphoric acid than it would otherwise need. Now silica or sand is the commonest constituent of all soils. Traces of it are brought slowly into solution by the decompositions which are continually in progress in a "live" soil and by the presence of water containing carbon dioxide in solution. Hence, in a well aerated soil, rich in humus, these solvent actions would be especially prominent and a less quantity of phosphoric acid should be necessary than on a dead, inert, or badly aerated soil.

It is hardly necessary to say that different crops have different ash requirements. Grain crops have especially high ash requirements, particularly as regards phosphoric acid. Hence, the use of mineral manures is especially important for all crops where the part removed from the soil and from the farm is the seed. In the case of leafy or root crops, the ash requirements are not so great relatively to the weight of the crop and the element which is apt to be reduced by such crops to an unduly low ebb, is potassium. Naturally, however, a statement such as this is a general one and will not apply to every soil and every crop.

In any case, sufficient has been said to show that the chemistry of the soil, so far as these ash constituents are concerned which the plant uses as food, is less important than the physics of the soil. Chemical deficiencies in the soil may be made good naturally by substitution, and by the power of selection the plant possesses, or they may be made good artificially, by the selection of suitable crops or crop rotations, and by the use of chemical manures. Nothing can, however, make good a deficiency of water, a low temperature or a deficient aeration in the soil, and these three factors are all capable of considerable amelioration by suitable working of the soil.

One of the most important factors in the development of crops is entirely beyond our control, that is, the percentage of carbon dioxide present in the air. As this forms the source of the whole of the carbon in the plant, and as carbon is the most important element and forms the greater part of the dry weight of all ordinary crops, this is a fact to be regretted. It has been found that small increases in the percentage of carbon dioxide present in the air, increase the amount of food assimilated, and hence also the amount of growth in a given time. The limit is soon reached, however, at ordinary temperatures. In the same way, increases in the intensity of the light make the plant feed and grow more and more rapidly. The limit is reached in the case of plants growing in the open when the light has about the intensity of ordinary bright diffused daylight. Beyond this, no further increase in the rate of feeding is shown. If, however, the temperature is raised and the amount of carbon dioxide increased at the same time, the amount of food assimilated goes on increasing as the light increases in intensity, up to, or even beyond that of strong, direct sunlight. Evidently, the temperature and the amount of carbon dioxide are *limiting factors* to the effects produced by increases of light. An analogy with this is afforded by a locomotive which is stoked up with the steam only partly turned on. No amount of stoking can increase the speed beyond a certain limit, but as soon as the steam-cock is turned fully on, the train may attain its maximum speed. Naturally, if there is no water in the boiler or not enough, stoking is useless just as it is in the plant.

The following simple experiments with maize illustrate these facts and show that it is no use attending to a minor factor (mineral constituents in soil) in plant nutrition until the more important major factors, (water,

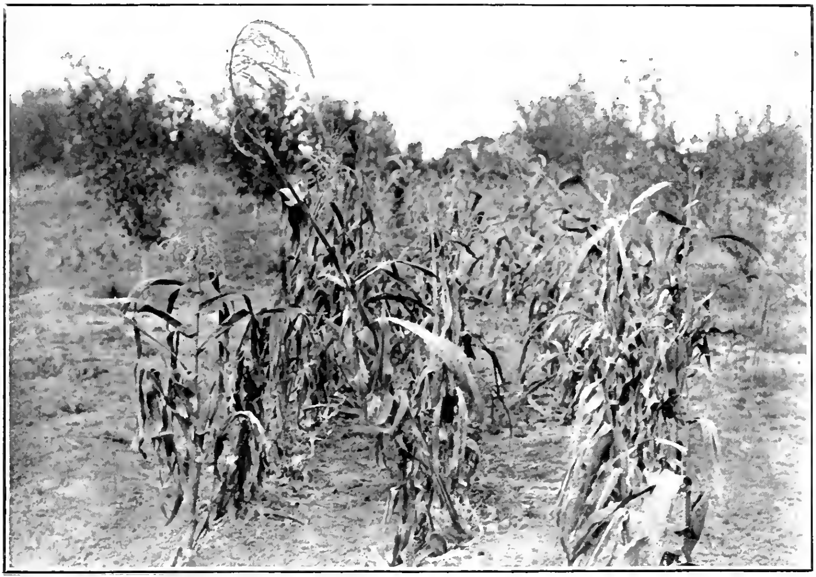


MAIZE (SIBLEY) WITH SUPERPHOSPHATE IN BADLY WORKED SOIL.

aeration of soil, &c.) are adequately fulfilled. The maize shown in the first photograph was planted in poor soil which had been ploughed once,

MAIZE (SIBLEY) IN BETTER WORKED SOIL WITHOUT MANURE.

disced twice, and manured with one hundred-weight of superphosphate per acre. It was grown at Box Hill on a soil consisting of a fine, dust-like sand, with a clayey subsoil. The latter has the peculiarity of baking very hard in dry weather, and the former of setting after rain and also baking very hard after dry weather if not worked. Hence, as can be seen in the photograph, the soil remained full of clods. It did not retain its moisture well, and the subsoil dried hard, preventing the roots penetrating deeply, and giving a stunted growth of the crop. The land for the maize in the second photograph was similarly prepared, but in addition, the clods were partly broken and it was hoed thrice instead of once. No manure at all was applied, but it was easy to see the superior effect of the physical treatment on the crop as contrasted with the effect of a mineral manure. In addition, the subsoil remained softer than in the previous case, the soil itself was moister a few inches in, and the root system was larger and penetrated more deeply.



MAIZE (SIBLEY) IN WELL WORKED SOIL WITHOUT MANURE.

In the case of the maize shown in the third photograph, these differences were still more marked and were simply and solely the result of continually working the soil so as to keep it open and well aerated, at the same time maintaining a fine dust-like soil mulch on the surface. As in the second plot, neither manure nor water was given to the maize grown in this plot.

The results speak for themselves. In fact, in the case of all crops, the working of the soil to enable it to retain moisture and to maintain its aeration, so encouraging the formation of a large root system, is vastly more important as a prime factor in plant development than is any amount of manuring with chemical manures. Indeed, where the supply of water is scanty, the use of a soluble chemical manure may even be injurious, since it may cause a saline concentration in the soil sufficient to injure the roots, retard their development, and make it more difficult for them to absorb water. Such actions are most shown in sandy soils, and less so in the presence of humus, which is, in fact, one of the best correctives a soil may possess, not only against actions of this kind, but also against the presence of poisonous or injurious organic or inorganic substances in the soil.

To conclude, the facts mentioned above may be summarized as follows: —

1. In most soils, and particularly in virgin soils, the proper working of the soil is usually far more important than is its manuring.

2. Water is the plant's most important requirement and it cannot be replaced in the slightest degree by any other factor, whereas a deficient mineral food element may in part be covered or replaced by a surplus of another substance of which the plant does not need so much as is present, or which it does not use at all under ordinary circumstances.

3. Each essential factor can set a limit to the growth of the crop however well all the others may be satisfied. Hence, to add mineral manures to a soil where the stunted growth is due to a deficiency of water is more likely to retard growth than to increase it.

4. The limiting factors to growth need to be separately determined in each case and the answer will depend upon the crop, upon the soil, upon the climate and upon the rainfall.

5. It is when the failure of a crop is due to the deficiency of a single factor that its satisfaction by irrigation, by soil treatment, or by manuring, as the case may be, will produce the most striking and profitable results.

TESTING POTATO VARIETIES FOR IRISH BLIGHT.

D. McAlpine, Vegetable Pathologist.

It is a wise provision of the Federal *Quarantine Act* that potatoes are not admitted to the Commonwealth from any country where the Irish Blight is known to exist, and this might seem at first sight to shut out any promising new varieties which it might be found desirable to introduce for experimental purposes. But, from the knowledge we now possess of this disease, it is quite possible to test under strict quarantine conditions any new variety, so as to determine whether there is any risk of introducing the blight with it.

It is an established fact that the only known means of importing this disease from countries separated from us by a wide expanse of ocean, is in the potato itself. The spawn or mycelium of the fungus causing this disease must be dormant in the tubers before there is any possibility of its development, and fortunately we are able, not only to detect its presence, but to destroy it even when concealed in the tissues of the potato. The destructive agent is dry heat and this is applied in such a way that the sprouting of the potato is not interfered with; in fact, it is rather stimulated than otherwise as numerous experiments have shown. By growing potatoes submitted to this treatment in a quarantine area for at least two years there would be a complete safeguard against any possible contamination from this source.

The method has already been tested on the Continent of Europe by Jensen, who used freshly dug diseased tubers and found that the fungus was destroyed in the treated potatoes, while those untreated developed a rich crop of the fungus. I have also carried out similar experiments and obtained similar results. Diseased potatoes were placed in an incubator for four hours, kept at a constant temperature of 120 deg.

F., and subsequently kept moist in a bell-jar to see if the fungus developed. While there was no trace of the disease in the treated lot, those untreated developed the fungus freely. Not only so, but the treated tubers sprouted more readily and better than the untreated, when kept in store and some of them were planted in pots and invariably produced a healthy crop. At a dry heat of 120 deg. to 122 deg. F. the mycelium of the fungus is destroyed inside the tissues of the potato, and there is no development of the disease, unless infection occurs from outside sources.

A supply of seed potatoes of special sorts was obtained from Sutton and Sons' agent in New Zealand, having been grown there from seed sent out by the firm in England. They were forwarded to me in a strong box and carefully examined before being planted in pots in my laboratory. In one of the varieties (British Queen) the disease was detected and this shows the necessity for treating with suspicion even the best guaranteed samples. There were nine selected varieties altogether, viz., Sutton's Abundance, Sutton's Superlative, British Queen, Windsor Castle, Ninety Fold, S. S. Seedling, Early Regent, Supreme, and Discovery; and specimens of each were planted on 10th November, 1909.

Sutton's Abundance, Sutton's Superlative, and British Queen, were subjected to a dry heat of 120 deg. F. for four hours, and the rest were planted without any treatment.

The results were taken on 31st March, and under the limitations in which they were grown, the tubers produced were mostly small. The growth was closely watched. In twelve days Sutton's Abundance and Supreme were above ground and in fifteen days all had appeared. The two varieties which sprouted first took the lead from the start, and in 31 days, Sutton's Abundance was the best looking of the lot and Supreme nearly as good. By the end of March the tops had all withered naturally, and the results are shown in following table:—

Pot.	Variety.	Treatment.	Diseases.	Produce of Plant.
1	Sutton's Abundance	Dry heat	Rhizoctonia, a little ...	12, all small
2	Sutton's Superlative	"	Rhizoctonia	7, only one medium
3	British Queen ..	"	Quite clean	10, only two medium
4	Windsor Castle ...	Untreated	Rhizoctonia and Dry Rot	9, all small
5	Ninety Fold ...	"	Rhizoctonia	13, only one medium
6	S.S. Seedling ...	"	Rhizoctonia, very bad ...	4, only one medium
7	Early Regent ..	"	Rhizoctonia, bad ...	15, all small
8	Supreme	"	Rhizoctonia	21, all small
9	Discovery ...	"	Rhizoctonia	5, all small, absolutely the poorest of the lot

Owing to the restriction imposed by Western Australia that potatoes will not be accepted when grown within 50 miles of an infected area, I was unable to carry out experiments on a larger scale and in the open field, but the fact remains that potatoes can be submitted to a dry heat of 120 deg. F. for four hours and still grow luxuriantly, and that potatoes so treated did not develop the Irish Blight. Some of the varieties, such as British Queen, in which the fungus of the Irish Blight was found, did not develop the disease after treatment.

Small quantities of potatoes can easily be submitted to dry heat and kept at a constant temperature in the incubator, but arrangements could be made for the treatment of large quantities, so as to insure the destruction of the spawn of the fungus if it existed in the tuber.

EXPERIMENTS WITH POTATO DISEASES, 1909-10.

George Seymour, Potato Expert.

During the last two seasons much loss has been sustained by potato-growers through the disease known as "Scab." In some instances, one-third of the crop has been rejected by the inspectors, while in others the crop was so bad that it had to be sold for cow feed.

Much discussion has taken place on the matter, opinions differing widely as to the nature and cause of the trouble. The term "scab" in its widest sense is used to cover a disordered condition of the tuber, and is used as such in these experiments. It is applied by the ordinary grower to half-a-dozen different forms which may at certain stages resemble each other, but are produced by different causes. Some maintain that it has been always present in the potato crops, because they found tubers of a scabby appearance where fires had been made when clearing the land. This is a totally different form, and it does not injure the cooking quality, providing the land is dry. It has also been ascribed to an excess of lime in the soil; if such were the case it would not be found on soils of an acid nature, but it is common to every soil.

1. NEW GROWTH OF TUBER ATTACKED BY EEL-WORM.

The diseased tubers are said to be as good for culinary purposes as sound ones; in fact, at the conference, some growers said they were better. However, if a diseased tuber be cooked and served up beside a sound one, the difference in appearance is most striking. All the outside of the diseased one must be cut away before it can be used. They are also said to be "Just as good" for seed as clean tubers, but evidence is rapidly accumulating which goes to prove that the disease is spreading and that soon there will not be a clean district in the State.

With reference to the wart-like excrescences or galls on the tubers, it is believed by growers that they are due to rain, after a long dry period, which causes the formation of blisters. This may be partly true, but nevertheless the appearance is the result of the presence of the Potato Eel-worm, which lies in a desiccated state in the dry soil, and only becomes active after a fall of rain.

The accompanying illustration of an affected tuber will show what takes place under the influence of abundant soil moisture due to a fall of rain. The field from which it was taken was carefully inspected on 26th January. The tubers then showed no sign of eel-worm, but on 6th March and following days upwards of 2 inches of rain fell. The plot was visited again on 31st March, when it was found that many of the tubers had made a second growth and many entirely new tubers had been formed. In every instance these, as well as the new growth on the old tuber, had been attacked. The left hand or clean portion shows the stem end on oldest part of tuber, the right hand the new. If the weather conditions had not favoured the development of the worms before the tubers had become firm in the skin, the crop would have escaped the attack.

A.—Eel-worm.

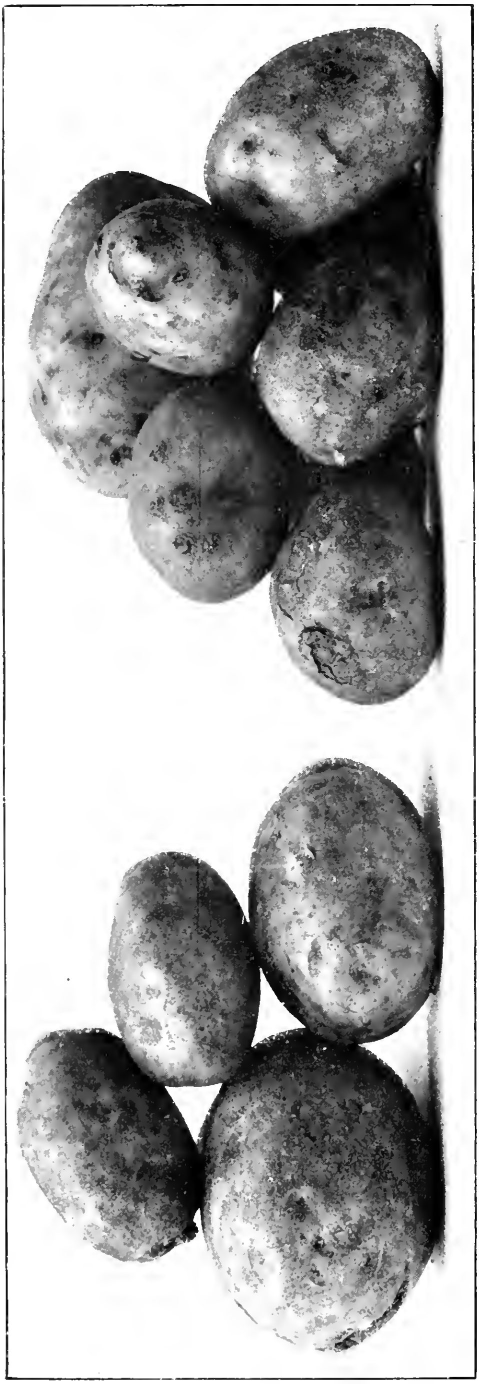
In this experiment, two pots containing sterilized soil were used. In No. 1 a clean Carman tuber which had been dipped in formalin solution (1 lb. to 30 gallons of water) for two hours was planted, whilst in pot No. 2 another Carman tuber, treated in a similar manner, was planted. To the second pot was added a further tuber of the same variety, from which all the eyes were removed to prevent it growing. This was covered with eel-worm galls.

When harvested on 2nd March, no galls had been formed on any of the tubers produced by the plants in either pots, and both appeared clean; but on examination Mr. Laidlaw, Micro-Biologist, reported that he had found worms in the abrasions of the skin of the tuber and also in the soil of pot No. 2, whilst both the soil and tubers of No. 1 were clean.

As the weather had been very dry up to the time of harvesting, there is little doubt but that the worms had not developed before the tubers became firm in the skins.

B.—Treatment of Seed Tubers with Formalin.

This experiment was designed to test the effect of dipping scabby seed in formalin. Two very scabby tubers (Carman) were cut into two sections, each making four sets. One section from each tuber was dipped in formalin (1 lb. to 40 gallons of water) for two hours. It was thought the dipping might possibly injure the cut sets, but such was not the case. Careful notes were taken and the only difference observed was that the germination of the dipped sets was retarded. They did not come through the ground for more than a week after the untreated, and the growth was slow for nearly six weeks; then they overtook the others, and as



2. Clean Tubers from Scabby Seed Treated. 3. Scabby Tubers from Scabby Seed Untreated.

evidence that the crop did not suffer, some of the finest tubers were produced by these plants.

The sets were planted on 26th November in an ordinary garden plot heavily manured two seasons before with farm-yard manure, from which a crop of green peas had been taken the previous season. The plants were lifted on 21st March last. Many of the tubers were in a very immature state, showing that the rain which fell on 5th March and following days had exercised a marked influence on the growth of the crop.

All these plants were carefully examined on 4th March, when the tubers were apparently sound, showing that the disease attacked them immediately after the fall of rain; whether the disease was caused by fungus or eel-worm, the weather conditions would be favourable to either. On lifting the plants it was found that the produce of the plants from the treated sets gave clean tubers, and those from the untreated were all scabby; those under plant No. 2 were very bad, and those under No. 1 but slightly affected.

C.—Planting "Scabby" Seed in a Clean Soil.

This experiment was carried out in the following manner. A quantity of soil was prepared and then sterilized, after which it was placed in pots numbered 1, 2, 3, and 4.

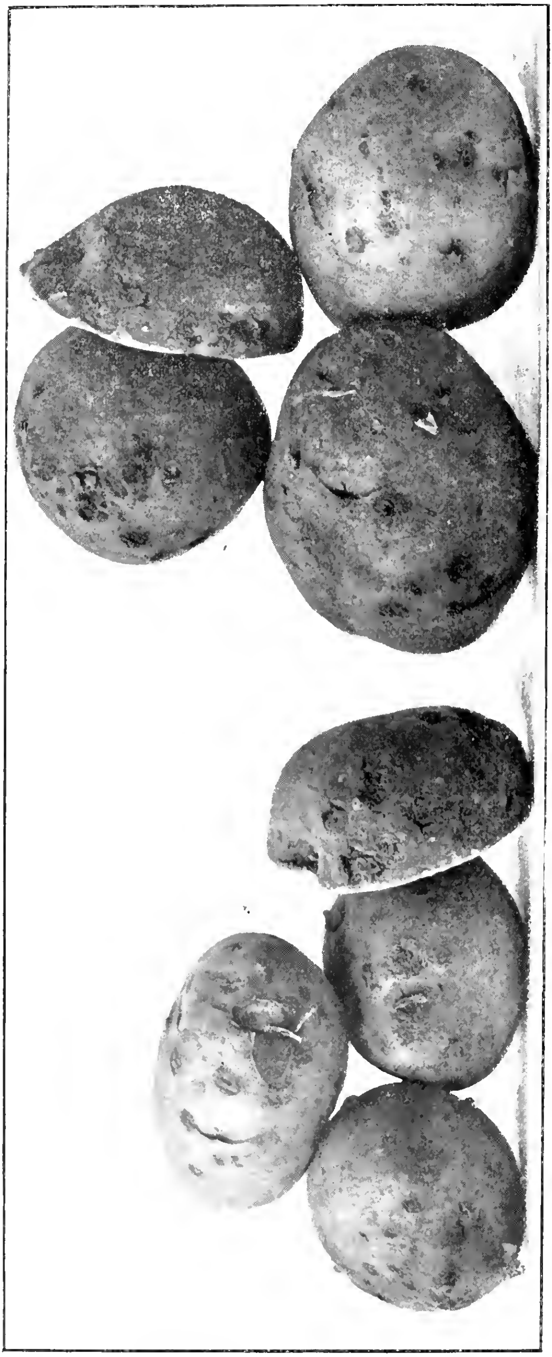
No. 1 pot was used for a control for experiments A and B. In this a clean Carman which had been treated with formalin was planted.

Pot No. 2 had a similar tuber treated in the same way as No. 1. To this was added a half section of a diseased New Zealand Pink-eye taken from the first truck of the new crop condemned on account of scab at Melbourne by the inspectors. From this diseased tuber all the eyes were removed to prevent it growing.

Pot No. 3 was an exact duplicate of No. 2 and contained the corresponding half section of the diseased New Zealand Pink-eye.

Pot No. 4 had a very badly diseased New Zealand Pink-eye tuber of the winter crop, also taken from a condemned parcel. This was planted without any treatment.

4. CLEAN TUBERS FROM CLEAN SEED GROWN IN STERILIZED SOIL, POT NO. 1. 5. SCABBY TUBERS FROM SCABBY SEED UNTREATED GROWN IN STERILIZED SOIL, POT 4.



6 AND 7. SCABBY TUBERS WITH DISEASED SECTIONS—GROWN IN STERILIZED SOIL. POTS 2 AND 3.

All of the pots were examined carefully every week after the tubers began to form. The first indication of disease was noticed on 13th February, when slightly brown patches made their appearance, and by the 20th these had broken into well-defined blotches. It was noticed that the tubers most affected were those that formed near to, or touched, the blind sections, whilst those furthest away were but little diseased. In the case of pot No. 4, the produce of this set was all diseased—the plant did not produce a single clean tuber.

* * * * *

Experiments carried out during one season cannot be considered conclusive, and no more is claimed for them than an attempt to throw some light on this vexed question. They are submitted without any expression of opinion as to whether the disease is caused by a fungus or a worm.

STERILIZATION OF SOILS.

W. Laidlaw, B.Sc., Micro-Biologist; and C. A. Price, Microscopist.

Our experiments in connexion with the sterilization of eel-worm affected soils, led to some curious results on plant growth, and was the means of inducing us to undertake some further experiments and research into the cause of the increased productiveness of soils sterilized by steam or partially sterilized by chemical treatment. The effect of heat on the soil was discovered incidentally about 25 years ago, and the action of carbon bisulphide was first noted some years later by a vine grower when using it for the purpose of combating the ravages of phylloxera.

In both instances it was noted that the soil which had undergone treatment became more productive and yielded larger crops. Many theories have been advanced as to the cause of this increased productiveness, and the subject has been studied by several investigators, notably Koch, Hiltner, Stormer, Russell, and Darbishire. In a paper recently published by the two last named it is shown that this increased productiveness after sterilization is a property of all soils and for all plants, excepting those of the *Leguminosæ* (Pea family). They showed that soil heated to 95 deg. C. (203 F.) had its productiveness increased two, three, and sometimes four times, whilst treatment with volatile antiseptics led to an increase in crop varying between 20 and 50 per cent, this increase taking place in both fertile and exhausted soils.

Theories as to the Cause of Increased Productiveness.

Where volatile antiseptics were used it was supposed that a chemical reaction took place between the antiseptic and the soil whereby plant food was rendered more available. This theory was soon discarded but Pickering revived it recently (*Journal of Agricultural Science*, Vol. iii.).

Koch suggested that the action was physiological, the antiseptic being supposed to stimulate the plant roots to greater activity; this may have happened in Koch's experiments where the antiseptic was left in the soil. Drs. Russell and Darbishire, however, got the increased results after the removal of the antiseptic from the soil. In our experiments also, the chemicals were allowed to volatalize before sowing the seed.

Hiltner and Stormer ascribed the increase in productiveness to the changed bacterial flora, and showed that the first effect of antiseptic treatment was to reduce the organisms, but when the conditions again become favourable they multiplied with extraordinary rapidity and brought about a more intense production of nitrogenous plant food in the soil.

Some observers say that increased nitrogen fixation is the main cause of the increased productiveness. Koch, however, maintains that nitrogen fixation is decreased by partial sterilization.

Stormer considers the increased production of ammonia is due to the decomposition of the larger organisms by the surviving bacteria.

The dark green colour of plants grown in partially sterilized soils has generally been regarded as an indication that the nitrogenous food stuff in the soil is in some way increased by the treatment.

Russell and Hutchinson used heat to 98 deg. C.: Toluene (4 per cent.) was used and at the end of three days it was allowed to evaporate by spreading out the soil in a thin layer. They found that the difference between toluene evaporated and heated (98 deg. C.) soils was only one of degree. The evidence of the formation of ammonia becomes evident earlier in the toluened than in the heated soil but does not last so long; by the ninth day the heated soil contains more ammonia, a superiority which persists throughout. They conclude that the ammonia is mainly the work of micro-organisms.

Stoklasa determined that the bacteria in common field soils produce daily per hectare ($2\frac{1}{2}$ acres nearly) to a depth of 40 c.m. (about 16 inches) 75 kilos. of CO_2 (nearly 2,649 cubic feet) while an equal area of wheat produces only 60 kilos. This carbonic acid before it escapes into the atmosphere will help to disintegrate the rocky particles of the soil, dissolving carbonates and phosphates of lime and magnesia for the needs of the plant, but, on the other hand, the healthy respiration of the root will probably be interfered with. From this point of view, it follows that the disinfection of a soil overcharged with microbes must have a very beneficial effect on the healthy respiration of the roots, and consequently on the well being of the entire plant, since after the microbes have been killed they no longer use up the oxygen and manure. This continuous struggle for air and food between the roots on the one side, and microbes on the other, is thus interrupted in favour of the plant.

At 125 deg. C. all organisms are killed.

Partial sterilization causes two significant changes (1) An increase in the amount of ammonia (2) Cessation of the nitrifying process.

Bacteria reach far higher numbers in partially sterilized than in untreated soils.

Untreated soil contains a factor, not bacterial, limiting the development of bacteria, this factor being put out of action by partial sterilization (Russell and Hutchinson). The limiting factor is not a toxin but is in all probability biological. Infusória, amœbæ, and ciliata, are killed by the treatment, and these are all severe competitors with the bacteria by reason of their large size (about 1,000 times that of the soil bacteria).

As our experiments are far from being complete we can only make the suggestion that the increased fertility is due to—

(1) The new bacterial flora, being more active decomposing agents than the original ones, cause an increased production of ammonia.

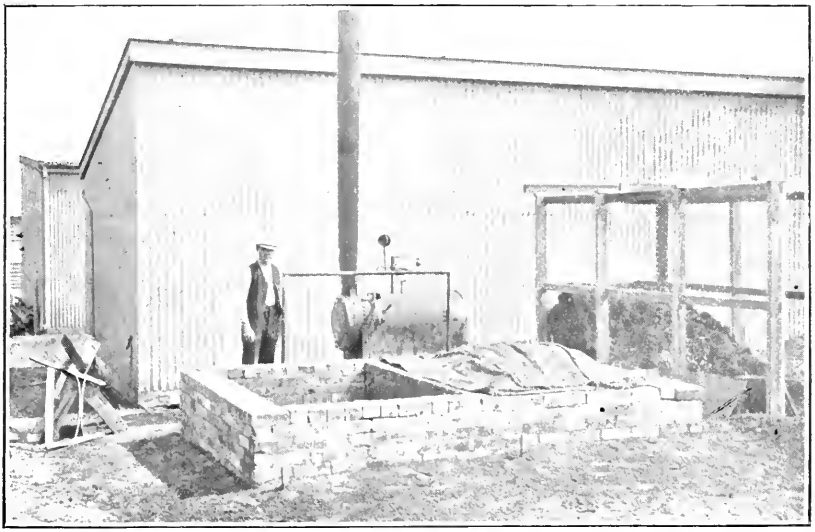
(2) The large organisms (Protozoa) being killed off by the treatment, serve as food for the new bacterial flora. Their decomposition also provides food for the new plant in the shape of ammonia, and as some of these large organisms are known to devour bacteria (*e.g.*, *Colpoda cucullus* and *amœba nitrophilia*), their destruction allows a rapid development of the new bacterial growth to take place.

The bacteria being found in greater abundance after a time in partially sterilized soils, Stoklasa's theory that the production of CO_2 by too great a number of bacteria being present in the soil and interfering with the respiration of the roots does not seem to hold good, though of course the killing of the large organisms will greatly lessen the consumption of oxygen and the production of carbonic acid.

A Soil Sterilizer.

A very effective plant for the sterilization of soil for the purpose of securing a pure seed bed is at present in use at the nurseries of Mr. R. Cheeseman at North Brighton. As will be seen from the accompanying illustration, it consists of a shallow pit, 18 inches in depth, floored with bricks. The walls are formed of 9-inch brickwork, and divided into twc compartments by a single-brick partition. Each of these compartments has a capacity of two tons, only one being used at a time, so that whilst one lot of soil is being sterilized the other one is being filled.

The method adopted for the production of the necessary heat is a simple one. Steam is supplied by means of a small portable boiler worked at a pressure of between 25-30 lbs.; ¾-inch piping is led from the boiler to the floor of each pit, where it is joined to a T-piece, and from the T-piece in each of the pits six pipes are let into spaces between the brick-work on the floor, somewhat resembling the prongs of a large fork. The pipes in the spaces of the brickwork are lightly covered with sand. They are 8 inches apart, are plugged at the ends furthest from the boiler, have a fall of 1 inch, and are perforated along one side by 3-16ths inch holes 3 inches apart. To carry off the condensed steam a drain is provided of ordinary tiles. It runs along the whole length of the pits close to the plugged ends of the steam pipes, is buried in cinders an inch below the surface, and has a fall of two or three inches. Two valve taps enable the operator to turn the steam into the desired compartment.



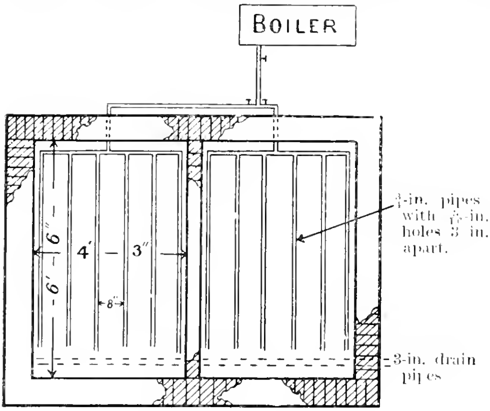
SOIL STERILIZATION BY STEAM.

The soil or other substance to be sterilized is placed in one of the pits. It is then covered with sacking and the steam turned on for a period of about two hours. The sacking prevents the too rapid escape of the steam from the surface and raises the whole mass to a higher temperature and in a shorter time than it would otherwise attain were it left uncovered. When the upper layers reach a temperature of 212 deg. F. it is allowed to steam for 30 minutes, the whole operation occupying a period of two and a half hours. The second compartment having been prepared during the sterilization of the first one, the steam is cut off from the latter and turned on to No. 2, and in this manner the sterilization of the soil proceeds without interruption.

As soon as the soil taken from the sterilizer is sufficiently cool it is ready as a seed bed. When it is necessary to sterilize cow or stable manure for the purpose of killing weeds, &c., it is treated in like manner, but on removal from the pit it is desirable to spread it out in a layer of 4 inches to dry it somewhat.

When once a sterilizing plant of this description has been fixed in position, the operation can be carried out at little more than the cost of the labour, for it is a convenient method of disposing of the accumulations of leaves, pieces of wood, and other refuse.

A steam sterilizer similar to the one described has been found indispensable by florists, nurserymen, and others engaged in intense culture. We have been informed that without its use it would be quite impossible to place certain annuals on the market, except at prices quite beyond the reach of the general public. For the sterilization of soil and manure not only destroys all the forms of life injurious to plants in the shape of insects, worms, fungi, &c., but it also kills the seeds of all weeds present in the soil, rendering the tedious and expensive operation of weeding unnecessary.



PLAN OF STERILIZER.

Professor Stone, of Massachusetts, has estimated that the cost of sterilizing 1,000 cubic feet of soil with an apparatus of this kind would amount to 8s. approximately. Steam has an advantage over dry heat in two ways; it leaves the soil in a good condition for immediate use and noxious weeds and pests of all kinds are killed more quickly. Professor Stone found that it was possible to kill eel-worm in the soil by heating it to a temperature of 140 deg. F. This is in contradiction to assertions made by some practical growers to the effect that it is necessary to employ a temperature of 212 deg. F. It seems to be a question of thoroughness of application; a temperature of 170 deg. F. will certainly kill all eelworms of their ova and it only remains to apply steam to the infested soil so that every portion reaches this or a higher temperature.

THE REARING OF QUEEN BEES.

R. Beuhne, President, Victorian Apiarists' Association.

The selection of a queen from which to breed for the purpose of superseding old or inferior queens, or the queens of colonies showing a predisposition to disease, viciousness or some other undesirable trait, is not only of the greatest importance but also a most difficult problem.

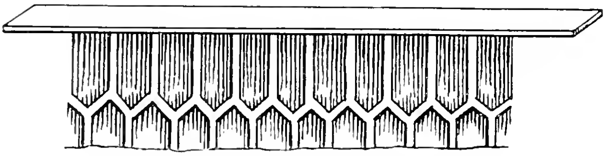
It is upon the prolificacy of the queen and the longevity and vigour of her worker progeny that the larger or smaller amount of surplus honey depends; but the most prolific queen is not necessarily the best to breed from. Experience has shown that the queen progeny of an exceedingly prolific queen rarely equal their mother; when they do, they produce workers which are constitutionally delicate, and these never yield the amount of surplus which one should expect from the great number of bees raised. A prolific queen producing vigorous long-lived workers is very soon restricted in egg production by the relatively large number of old field bees, the honey gatherers filling much of the comb with honey once the colony has attained normal strength. In the case of a colony having a queen producing short-lived workers the position is reversed. Many of the bees in such a colony die soon after reaching field bee age; therefore the young, the nurse bees, predominate. It is the work of the young bees to feed larvæ, prepare cells for egg-laying, and attend the queen. As the number of field bees bringing in honey is little more than sufficient to supply what is needed for immediate consumption, the colony will show a very large amount of brood in all stages right through the season but will store less honey for the apiarist than colonies which, with a smaller amount of brood, have far more old field bees.

As a breeder, I prefer the queen of a colony which has the maximum number of bees from a moderate amount of brood during a season. This results naturally in a good yield of honey, and indicates longevity of the bees. There are, however, other desirable characteristics, such as purity of race, gentleness, and absence of excessive swarming, which are needed. The number of queens which conform to all these requirements is, even in a large apiary, usually rather limited.

Important as the selection of the queen mother is, the raising of the young queens by the best possible method, and under the most favourable conditions, is not less so. Poor queens may result when queens are raised under unfavourable conditions, no matter how suitable the mother queen is. There are many different methods of raising queens and good queens may be obtained by any one of them if everything is just right. The difficulty is, that many bee-keepers fail to observe when conditions are suitable and when not. A prosperous condition of colonies, an income of pollen and honey, and a warm moist atmosphere, are essential. A heavy honey flow is not the best time for queen rearing, particularly when it occurs during hot dry weather. There may be both pollen and honey coming in, and yet the right conditions may not exist, even though atmospheric conditions appear favourable. This is probably owing to some deficiency in quality of the stores gathered. It may, however, be taken as an indication that conditions are favourable when the young larvæ are surrounded by a plentiful supply of pure white food. The colony selected for raising cells from the eggs or larvæ of the chosen breeding queen should be strong, particularly in nurse bees.

The "Doolittle" method of transferring young larvæ to artificial cell cups and getting the cells raised, either in a queenless colony or over the queen-excluding honeyboard in the super of a strong colony, has the advantage of enabling one to know exactly when the queen cells will hatch. The same advantage can be obtained by the "Alley" method without disturbing the young larvæ. Queenless bees are compelled to raise queen cells under the impulse of self-preservation, whether the conditions are suitable or not. Often they appear to raise them rather hurriedly. There is no doubt that good queen cells are produced by bees bent on swarming (in the proper season). They are raised deliberately, and only when conditions as to food supply and strength in bees are suitable. But the bees of queens from swarm-cells inherit the swarming impulse, which the best apiarists of all countries are trying to eliminate, and such queens are therefore not desirable in any numbers.

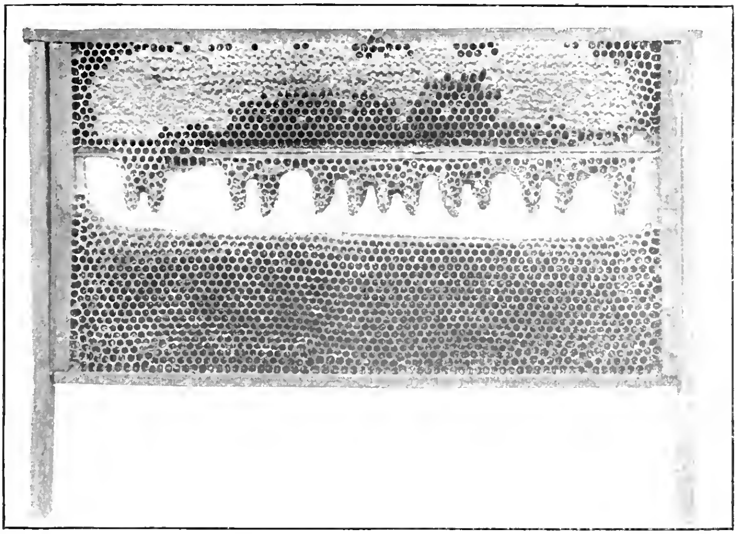
There is yet another impulse under which bees will raise good cells: the superseding impulse. When a queen is in her third season, and long before the apiarist can notice any decline in her prolificacy, the bees usually prepare to supersede her by raising one or more queen-cells. They do this at a time when the conditions are most favourable; they are usually better judges of this than their owner, excepting in the case of a queen suddenly failing from disease or accident. If the bees are inclined to swarm there may be a swarm issuing before or after the cell or first cell hatches. Where the bees are less inclined, the virgin queen on emerging from her cell will destroy all other cells but will take no notice of the remaining old queen, her mother.



1. COMB CUT FOR QUEEN RAISING.

The number of cells raised under the superseding impulse is not large —from one to three usually; but they are invariably fine large cells producing splendid queens. For a number of years I have obtained some of my best queens in this way, but as the number is limited I could not get sufficient, till I made use of the superseding impulse for raising them from larvæ supplied repeatedly to the superseding colonies from selected breeding queens. For this purpose it is necessary to know the ages of all queens. Colonies having queens in their third year are examined periodically when conditions are favourable. If there are indications of superseding, the cells are removed and larvæ from the breeding queen, over which cell cups have previously been started by temporarily queenless bees, are given in place of those removed. The colony should naturally be populous and thriving enough to raise good cells. If the queens which are not up to standard are replaced every year irrespective of age, these three-year-olds are those which passed all the musters and there will be no lack of the necessary condition. Should none of the superseding colonies be of sufficient strength other strong ones may be made by exchanging queens between colonies with old queens and strong colonies with younger ones.

To have all the queen-cells mature at the same time, so as to be able to leave them where they are raised till the day before they hatch, it is necessary for the young larvæ from which the queens are to be raised to be all of the same age. This is not a difficult matter for any one knowing from experience the size of the grubs at different ages. At eighteen hours old, they are of about the size of the small c of ordinary type and will hatch on the twelfth day. For the purpose of obtaining larvæ of the right age in sufficient numbers, I do not find it necessary to insert an empty comb into the brood chamber of the colony with the selected queen, because, at a time suitable for queen rearing, sufficient larvæ for the purpose should be in every hive. To obtain the larvæ I cut a piece, four to six inches long and the width of three rows of cells, out of a comb in a suitable place. By cutting it again through the middle row of cells two single rows are obtained. These are fastened with liquid wax cell end on, to a thin strip of wood. The open row of cells is then cut down to half the depth (Fig. 1) by means of twirling a wooden match head first into the surplus larvæ. Those of the wrong age and any eggs which may be present are removed, leaving as far as possible one larva of the right age in every third cell. These strips of comb are then fixed in gaps cut into a comb and given to queenless bees for 6 to 12 hours to mould queen-cups round the larvæ. They are then fitted into an outside brood comb of the superseding colonies.



2. QUEEN CELLS GROUPED IN COMB.

When the cells are sealed the strips may be removed and grouped into a comb, as shown in Fig. 2. This is placed into the super of a strong colony over a queen excluder where they may remain till distributed in cell protectors to nuclei about the tenth or eleventh day after they are started. Started queen-cells may again be given to the colonies which raised the cells as soon as the sealed cells are removed but the brood combs should be examined occasionally for a cell they may be raising on their own account. Three to six cells are all I raise in a superseding colony at a time. When greater numbers are raised they are not so perfect. The thirteen cells in Fig. 2 are on three strips, each from a different superseding colony.

The great advantage of this method of queen-rearing is that, having a laying queen in the hive, the bees will not raise the cells given, unless conditions are as they should be. No inferior queens will therefore result.

CLOSER SETTLEMENT STUDIES.

1.—Nine Acres carrying Twelve Head of Stock.

J. M. B. Connor, Agricultural Superintendent.

In every business, two questions which often need to be considered are:—"Is it worth while?" and "What will it cost?" These two serious considerations presented themselves to Mr. George Hyde when, some seven years ago, he decided to purchase the farm of 9 acres, under review, situated in Bell-street, Coburg. At that time he was without means, but a friend advanced him the sum of £25 to pay the first instalment of purchase money. How to manage this farm, so that there should be no waste, and that its products should realize satisfactory prices, has been successfully solved by the owner, through his knowledge and adoption of scientific and practical principles in the culture of fodder crops grown for his dairy herd.

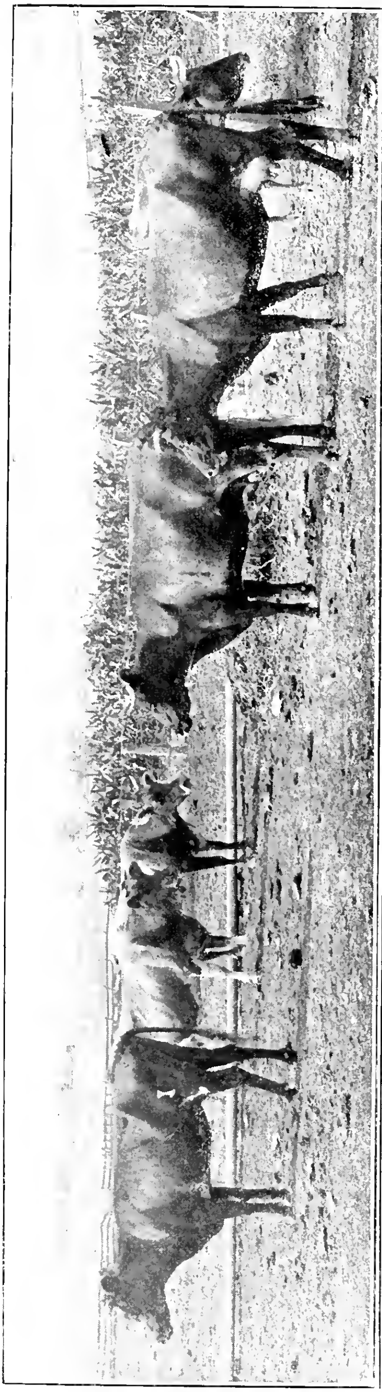
To the question—"Is it worth while?" the owner emphatically answers "Yes," and adds that the farm is now practically paid off. The dairy cows number eight, yielding 56 quarts of milk daily, which is sold retail and wholesale around the farm, returning an average profit of £3 per week. The cows, which are of good dairy type, are of the Jersey and Ayrshire cross, and some of them milk up to 20 quarts of milk daily when freshly calved; the test for the herd averaging at the present time 5.6 per cent. butter fat. The farm also carries one draught horse, one pony and foal, one heifer, and one bull. At the time of my visit, no concentrated foodstuffs were being purchased, the produce of the farm being ample.

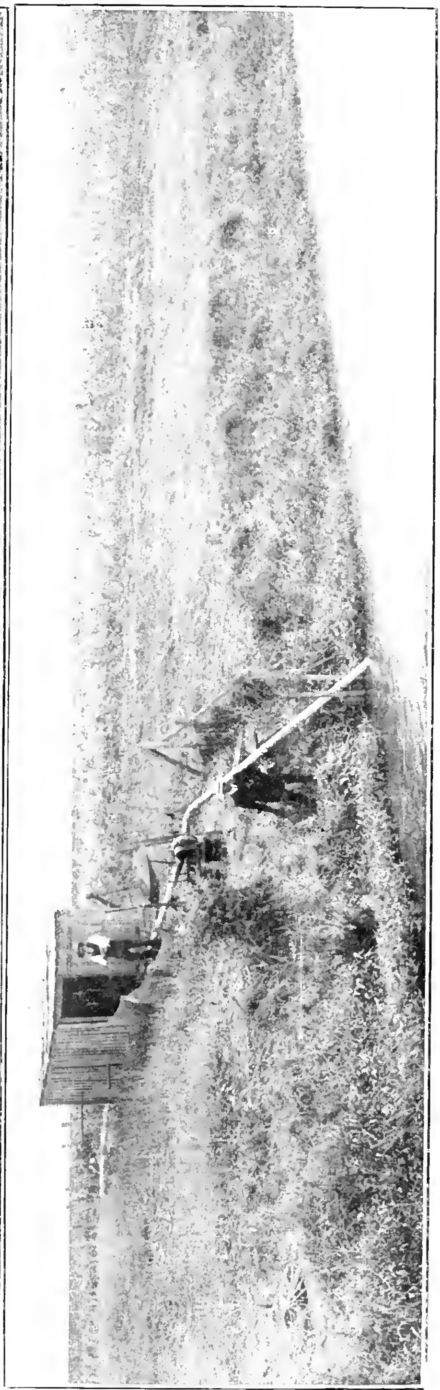
The land has a frontage to the Merri Creek, and is sub-divided into six paddocks, ranging from a ¼ of an acre to 3 acres. Two acres of the hill portion of the farm are thickly dotted with bluestone boulders. At present this paddock can only be used for grazing purposes. The stones are, however, being taken out gradually and the land levelled.

At time of writing (23rd February) various crops were growing or were being fed green to the dairy herd. First, there was a quarter of an acre of Hungarian, French Provence, and Hunter River lucerne. This paddock was trenched 2 feet deep and terraced, the sowing being done during the months of April, May, and June, 1909. The owner states that he has already cut the lucerne seven times to date. During the warm weather it has been irrigated once every fortnight. Of the 5½ acres of flat land running along the creek, 2½ acres are carrying a heavy crop of the following varieties of maize, viz.:—Hickory King, Yellow Moruya, Ninety Day and Eclipse. The maize crop has been watered once a month and is being fed with the lucerne to the cows. For green feed, 2¼ acres are sown with Algerian oats. Crops of French beans, broad beans, and potatoes, planted last November, have done remarkably well.

Mr. Hyde has installed a 7½ h.-p. motor engine, with a 4-in. centrifugal pump capable of lifting 1,800 gallons per hour. This is used to irrigate the fodder crops. As the crest of the hill, where the lucerne is growing, is situated 500 feet from the creek, and 36 feet above its level, the resources of the pump are well tried. Mr. Hyde has the low lying portion of the farm ploughed in lands 60 feet wide by 132 feet long and by this means he can give any of them a good soaking in half-an-hour.

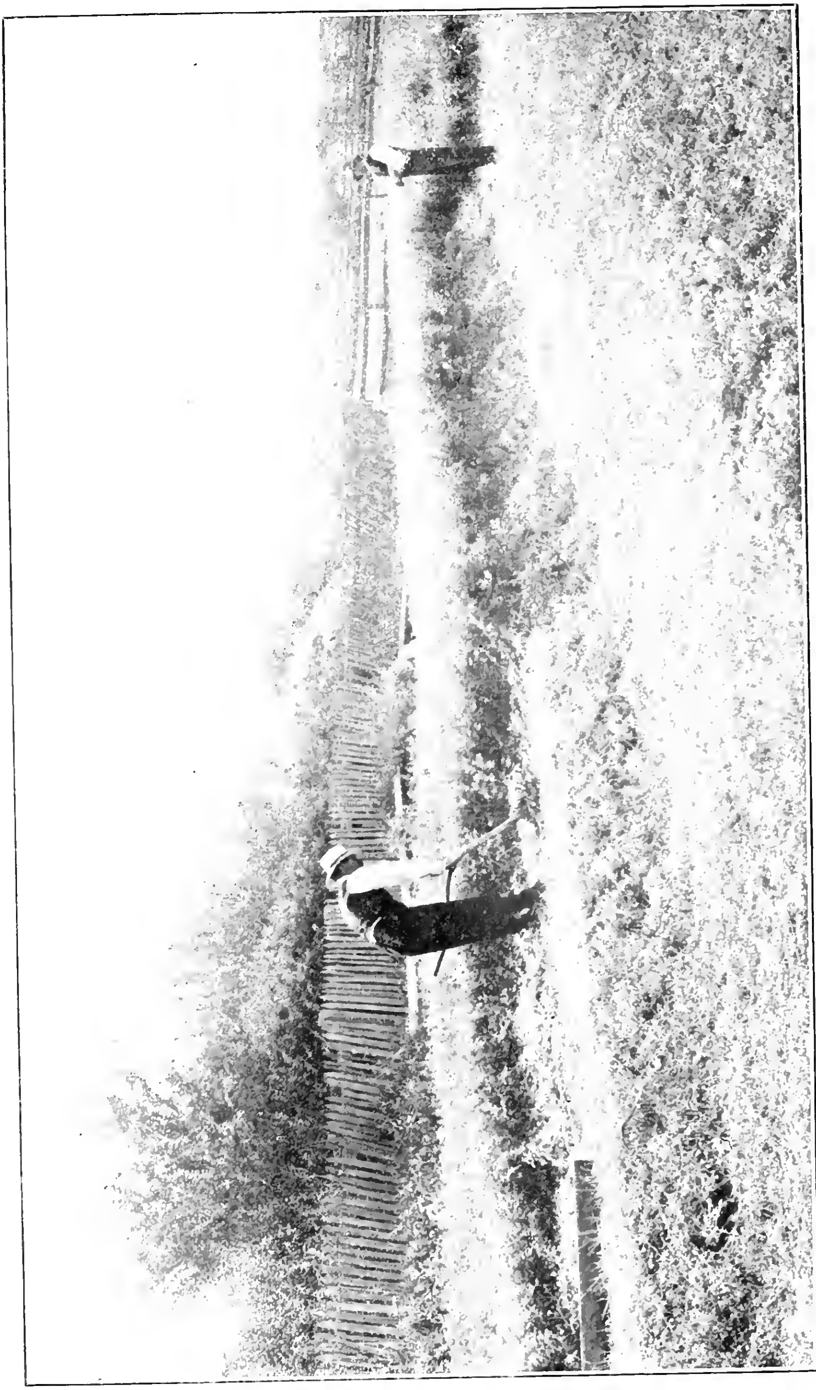
The milking shed and barn, built by the owner, cost £60. The former contains five bails whilst the barn has a capacity of 30 tons. There





SOME MEMBERS OF THE DAIRY HERD.

THE PUMPING PLANT.



LUCERNE TERRACES. SEVENTH CUTTING IN NINE MONTHS.

is a good reserve of oaten hay from last season, and when the motor engine is not in use pumping water the owner removes it into the barn and cuts a supply of chaff. Although the work required to keep this small area in good order takes up most of the owner's time, he also receives a little income from other sources.

CROP OF HICKORY KING MAIZE.

As evidence of what has been accomplished through intelligent and practical hard work during the past seven years, it is sufficient to state that Mr. Hyde is to-day the owner of the undermentioned property. (The values are those supplied by Mr. Hyde):—

9 acres of land	£425	0	0
8 cows	80	0	0
1 heifer	3	0	0
1 Jersey bull	5	0	0
1 draught horse	45	0	0
1 pony and foal	12	0	0
1 $7\frac{1}{2}$ h.p. electric motor engine and 600 ft. piping ...	120	0	0
1 dray and harness	26	0	0
1 American waggon and harness	12	0	0
1 chaffcutter	12	0	0
1 plough, harrows and harness	6	0	0
1 separator and dairying utensils	30	0	0
Furniture and sundries	160	0	0
	£936	0	0

THE CORK INDUSTRY IN PORTUGAL.

F. de Castella, Government Viticulturist.

Attention has repeatedly been drawn to the suitability of the climate and soil of the greater part of Victoria for the growth of the cork oak. Its cultivation has been recommended by the late Baron von Mueller and by witnesses before the Royal Commission on Vegetable Products. Practically nothing has yet been done, however, by our land-owners, towards the establishment of the industry. Our Forestry Department has distributed within the past thirty years a good many trees in order that they might be practically tested in different parts of the State. Many of these have done remarkably well, and prove conclusively the possibilities there are for cork production in Victoria.

Australians, as a rule, think twice before undertaking any culture which entails a wait of several years before profits are obtainable. This impatience has prevented the utilization of many plants which have proved sources of wealth in the warmer or sub-tropical countries of Europe, where the climate is in many respects similar to our own.

Many of these are shrubs or trees which, although taking some years to come into bearing, are, owing to their deep roots, well able to withstand, without the aid of irrigation, the long dry summers of Northern Victoria.

The Olive, the Chestnut and the Carob are among the principal trees one meets with so frequently in the Peninsula, but which are almost unknown to us, in spite of our very similar climate. The Cork Oak is even slower than the olive in becoming productive, hence it is, no doubt, that it has received even less attention from us than the latter tree.

Cork plantations, methodically worked, are capable of yielding a return of about £2 per acre per annum, in addition to the value of the acorns they bear for pig feed; and this without any expenditure in the way of cultivation; for the industry belongs to the domain of forestry, rather than to that of agriculture or horticulture. This productiveness may be considered almost indefinite, since the life of the tree, in spite of regular removals of cork, is generally set down at over a couple of hundred years. Nor does there appear to be any danger of over production; the world's consumption of cork is increasing more rapidly than the supply, and good cork is becoming steadily scarcer. As a means of turning poor soils to profitable account, and at the same time providing an excellent evergreen shelter tree, few others can compete with it.

It is hoped that the following notes of what I saw of the cork industry in Portugal may cause attention to be once more turned to this valuable but neglected tree.

It was in Portugal that the work of my mission brought me most in contact with the cork industry, and that I was best able to collect information concerning it. The cork oak is even more largely grown in Spain, and also to a considerable extent in Southern France. The first extensive plantations I saw were on the train trip from Oporto to Lisbon. In Northern Portugal, the climate is colder and the profits to be realized scarcely high enough for it to be suited to the economical conditions of the region, which is essentially one of small holdings and intense culture. Further south, where the rainfall is small and the climate warmer, the properties are larger and much of the land of poor quality from an ordinary agricultural stand-point. Here, the cork oak asserts itself and becomes a feature in the landscape. North of Oporto, the tree is seldom seen; shortly after leaving this town for the south, vineyards are much in evidence, as well as mixed farming. Among the prevailing trees, one frequently sees Eucalypts and Blackwoods (*Acacia melanoxylon*, which is known locally as "Australia"). These native trees of ours appear to be quite at home, and afford reassuring evidence as to the suitability of Australian conditions for the cork oak. It is after passing Coimbra, and when one enters upon undulating country with poor sandstone ridges, in many places planted with *Pinus Maritima*, that the first cork plantations are seen. Further south, at Entroncamento Junction (and thence on to Lisbon, wherever the soil is poor enough), plantations or cork are seen from the train, some of them in regular lines with cultivated strips between (cereals, &c.), as is often the case in the orchards of the country. They are more often irregularly planted, as is usual with forest trees.

These plantations are, in appearance, very striking to the visitor, chiefly by their many coloured trunks. The natural colour of this is the silver or ashen grey of the twisted and gnarled surface of weathered cork. After stripping great changes take place. Immediately after this operation, which consists in the complete removal of the bark, right round the trunk, this is of a vivid orange colour. On exposure, and as the new layers of bark form, it becomes darker, passing through different shades of brown to an almost inky black, which is reached in a few months after stripping. This in turn gradually gives place to the natural ashy grey tint. Being worked on a regular system, which provides for the stripping of a certain area of a plantation each year, it follows that, in every plantation, different coloured trunks are to be seen, all of which contrast strangely with the dense, handsome, evergreen foliage above.

Within the next few days, in the neighbourhood of Lisbon, I frequently came in contact with cork, either growing or harvested. The plantations usually occupy land too poor for ordinary agriculture, and even too poor for vines. Truck loads of cork are everywhere to be seen on the railways, sometimes in the curled up state it assumes on its removal from the tree, but at others straightened out, by steam treatment, into the flat sheets known to the trade as "cork wood," and made up into bales. On barges in the river, as well as on the railways, these are so much in evidence that the visitor cannot fail to be impressed with the great value of this industry to the country.

IMPORTANCE OF THE INDUSTRY IN PORTUGAL.

The Portuguese are very proud of their cork industry. They claim that, both as regards quality and quantity, they occupy first place in the world, Spain alone being able to compete with them. It is universally admitted, however, that the highest class champagne corks come from Cataluña (Spain).

In 1900,* Portugal possessed 525,000 acres devoted to the culture of the cork oak. This is an approximate estimate, as allowance has to be made for another evergreen oak, *Quercus Ilex*, with which it is often mixed, and of which more presently. It is estimated that the annual production amounts to 50,000 tons of dry cork, of a value of 3,671,736,000 reis, equivalent, at par, to £813,290 of our money. In other words, the cork forests of Portugal yield, *on an average*, over 30s. per acre per

* *Le Portugal au Point de vue Agricole* by Don Luiz de Castro and Sr. Cincinnato da Costa.

annum; and these figures are exclusive of the value of the acorns (for pig feed), an important item, as will be seen later. Naturally, the best situated and best cared for forests yield considerably more than the above sum. which is nevertheless a very fair return for a form of forestry requiring the use of practically no labour beyond that of removal.

It is south of the Tagus that the great majority of the cork forests are situated. They are distributed as follows:—

	Acres.
District of Faro	47,500
District of Beja	147,500
District of Evora	190,000
District of Portalegre	36,000
Remainder of Portugal, chiefly Lisbon, Santarem, and Castello Branco	50,000
	525,000

Of the 50,000 tons produced annually, it is estimated that 11,000 tons are consumed in the country and 39,000 tons exported, under the following headings:—

	Kilogrammes.
Cork wood	27,662,844
Waste cork	7,919,004
Cut corks	2,817,666
Virgin cork	426,016
Cut squares	278,230
Raw cork, as removed from tree	124,610
Cork dust	114,119
Sundries	1,611
	39,344,100

The metric ton of 1,000 kilogrammes being only $34\frac{1}{2}$ lbs. lighter than our ton, the above figures divided by 1,000 give very nearly the quantities in English tons.

Endeavours are made to retain the working of this raw material for Portuguese artisans, by restriction on the export of unworked cork, on which export duties are imposed. These are as follows:—

Cork wood, 100 reis (1s. 4d.) per 15 kilos (33 lbs).
Undressed cork, as removed from tree, 30 reis ($5\frac{1}{2}$d.) per 15 kilos (33 lbs).
Cut corks, (free).

These fiscal restrictions do not appear, however, to have been very successful in establishing the cork-cutting industry in the country. The question is one which has given rise to much discussion, the cork cutters asking for even higher protection, which is opposed by growers, as well as by the officers of the Agricultural Department, as an unfair tax on one of the leading industries of the country, and one which defeats its object by causing foreign buyers to look to other sources for their supplies.

THE CORK OAK.

Botanically known as *Quercus Suber*, it is a handsome evergreen tree, very long lived and growing to considerable size. In a general way, it may, as regards size, be compared to our Goulburn Valley grey box (*Eucalyptus hemiphloia*), which it somewhat resembles also in habit of growth, our photograph showing a group of cork oaks at Rio Frio near Pinhal Novo, will give some idea of their general appearance. Two very large trees are mentioned by Don Luiz de Castro,* one at Torre, near Azeitão, 54 feet high, with a trunk 30 feet in circumference, its branches covering an area 65 feet in diameter; the other, at Pereira, near Extremoz,

* *Le Portugal au Point de vue Agricole.*

yielded 1 ton 16 cwt. of bark at a stripping, which gave work to 20 men. These are of course exceptional trees of great age.

In addition to *Q. Suber*, *Q. Pseudosuber* and *Q. Occidentalis*, are mentioned as yielding cork, the latter being the better of the two†. *Q. Suber* appears to be the only species grown in Portugal. Their botanists distinguish three varieties, viz., *Brevisquama*, *Genuina* and *Subcrinata*. Practical growers divide them according to the time of ripening of the acorns into early, medium and late, known respectively in Portuguese as *Bastão*, *Lande* and *Landisco* or *Jancrinha*. The mid-season one is preferred.

CORK OAKS AT RIO FRIO (PORTUGAL).

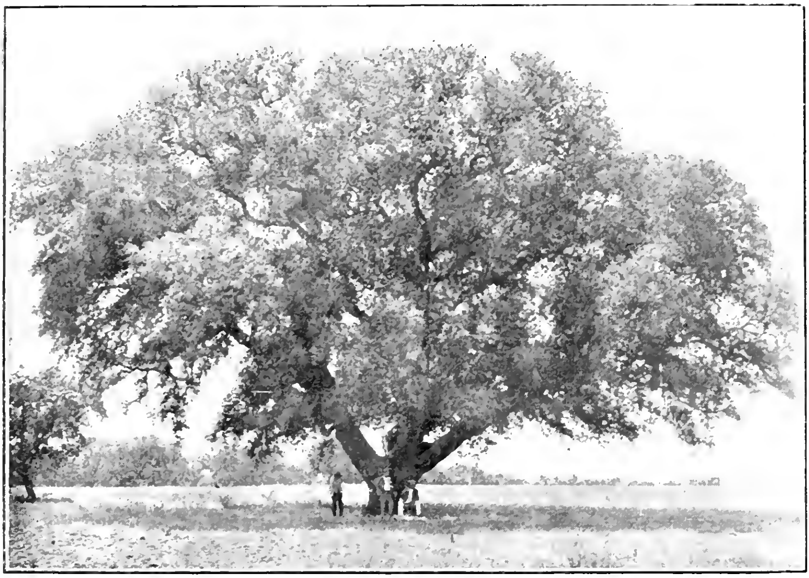
The cork oak prefers schistose and feldspathic soils, a feature which renders it essentially suitable for many parts of Victoria, especially the auriferous country so largely represented in the poorer lands of this State; wherever this type of soil is sufficiently penetrable for the roots, this tree will thrive. In limestone soils, it does not grow so quickly, nor is the cork produced of the same quality. It is in poor soil that the best quality cork is produced. On richer soils, growth is more rapid and the yield heavier, but the grain or texture of the cork suffers. The timber of this tree is not without value; it is said to be good for coachbuilding (primitive wooden carts), and ploughs. It is also an excellent firewood. If not more largely used for these purposes, it is because the trees are so long lived and regularly productive that they are never cut down, only dead wood and rubbish, which is cut out occasionally, being available.

The growth of the cork oak is slow, especially after a while. It is rare for young plantations to have given their first crops of cork at twenty-three years old. This is in addition to the crop of virgin cork removed some eight or ten years earlier.

† Von Mueller, *Select Extra-tropical Plants*.

QUERCUS ILEX.

This closely allied tree, although it yields no cork, cannot be passed over without mention, for it is usually found associated with the cork oak in the forests of Southern Portugal, where it is grown for timber and for its acorns, which are of great value as pig feed. Our photograph shows a very large specimen of *Q. Ilex* at Tisnada (Alemtejo). The *Q. Ilex* differs somewhat from *Q. Suber*, doing better than it in limey soils; nevertheless, the two are largely found together. Between them, they occupy a greater area of the forests of the country than any other tree. Being so often mixed, exact figures are difficult to get, but it has been estimated officially that *Q. Ilex* occupied 625,000 acres and *Q. Ilex* 525,000 acres in 1900. These areas have not greatly altered since. There are several varieties of the former species. *Q. Ilex* var. *Belòtta*, known popularly as *Azinho*, is the one



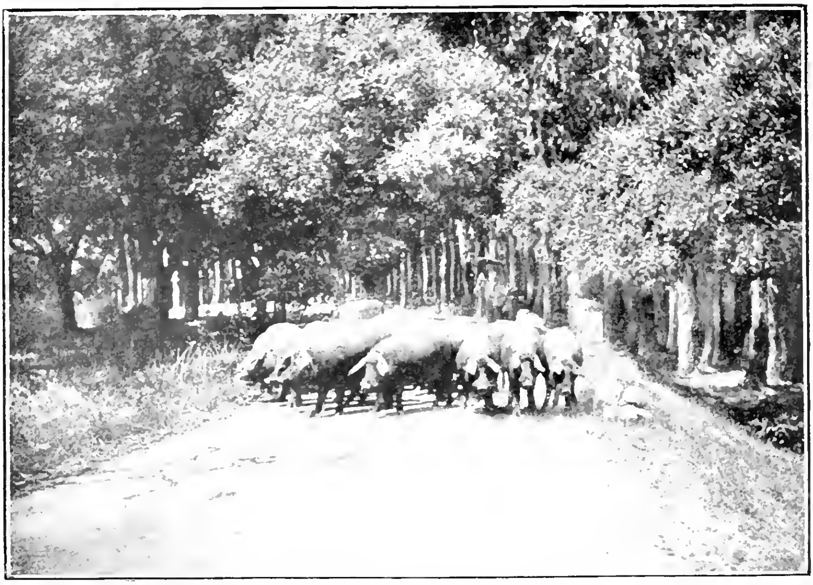
VERY LARGE EVERGREEN OAK (QUERCUS ILEX VAR. BELOTTA) AT TISNADA.

which produces the sweet acorn. This tree is to be met with right through the Peninsula, where the sweet acorns it yields are not only looked upon as a most valuable food for pigs, but enter largely into human consumption. Though *Q. Suber* produces acorns in even greater quantity, they are not of nearly equal quality. They are, nevertheless, also excellent pig feed, though not fit for human consumption. Owing to the better quality of its acorns the *Q. Ilex* was the more popular of the two half-a-century ago. The increasing demand for cork has, however, led to its being largely displaced by *Q. Suber*.

ACORNS AS PIG FEED

It is estimated that the two above-mentioned trees yield between them annually in Portugal no less than 163,000 tons of acorns, a quantity sufficient to fatten 300,000 pigs. On an average, 1,000,000 pigs are raised annually in the country; it thus follows that one-third of these pigs are fed on acorns.

Many land-owners graze their own pigs in their cork forests; in other cases the grazing is leased to pig-owners, who are prepared to pay a high price for the right. A curious way of adjusting the amount of payment has long been in existence. Instead of paying so much per acre, as is usual in other transactions of the kind, the price is fixed at so much per pig for the season, skilled adjusters being called in to decide what number of pigs should be allowed to graze in a given forest area. It often happens that pig-owners are prepared to pay as much as 30s. per pig for the season's grazing. The pigs fed in this manner are large dark-red ones with big ears and much coarse hair, reminding a good deal of the Tamworth. This breed is said to have come originally from Naples; it is now many years since it was first introduced. Large herds of these red pigs are to be seen about the country in the acorn season, as shown in the photograph. They fatten rapidly, being said to increase in weight by as much as $4\frac{1}{2}$ lbs. per



PIGS IN A PORTUGUESE OAK WOOD.

day. According to these figures, the value of the acorn crop to the country would be approximately one-half of that of the cork produced.

ESTABLISHMENT OF A PLANTATION AND SUBSEQUENT TREATMENT.

The great majority of existing plantations have established themselves spontaneously. As with our Australian gums, it is only necessary to fence off an area, thus protecting it from grazing, and within a couple of years a young forest will have sprung up. By cutting out all other growth, one obtains a forest of cork oak or of this tree mixed with *Q. Ilex*, as the case may be. It is true that, of recent years, a good many plantations have been artificially established. This presents the advantage of rendering artificial selection possible, acorns being only taken from trees which produce the best cork. The Lande (mid-season ripening variety), is preferred.

The seed is sown in spring, either on land which has been completely or partially ploughed. In the latter case, strips 6 feet wide are ploughed at a distance of 25 feet from each other; in the centre of these the acorns are sown in drills. Germination takes place in due course, and no other culture or shelter is given to the young plants.

Occasionally, young trees raised in a nursery are planted. This course is more used for filling up misses—sowing the acorns where they are to grow is more usual. The distance apart varies a good deal, about 25 feet x 25 feet, or 70 trees per acre, is a usual number. It is rare that the trees are arranged in regular order; they are much more often planted promiscuously.

Sometimes, especially in regions where cereals are produced, the trees are planted very much further apart, the land between them being ploughed and crops grown on it. The trees benefit by the cultivation and grow more luxuriantly, but this is not so great an advantage as might be expected, as the quality of the cork suffers. Its grain is not so good; slower growth on poorer soil produces better cork.

In the great majority of forests, the land is not cultivated, though the ground is kept clear of scrub and rubbish. In addition to promoting better growth, this is necessary to guard against bush fires which in cork forests are capable of doing very considerable damage. Suckers are usually removed, and a certain amount of pruning is practised, to let in air and promote the formation of acorns. Of all forest trees grown in Portugal, this is the one which is best looked after and which yields the most handsome returns.

The cork forests of Portugal are nearly all private property, either worked by the owners or leased for a period of 20 to 40 years. The conditions of these leases vary a good deal; sometimes cultivation is required, more often not. The obligation to remove virgin cork from young trees and to cut out dead wood, &c., from old ones, is often provided for, and in nearly all, the need for careful stripping so as not to injure the liber or cork-producing layer is insisted on.

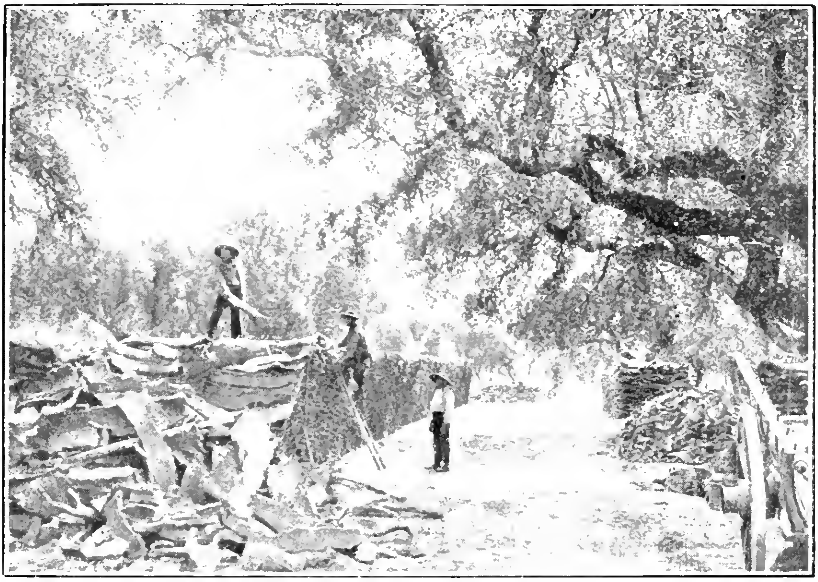
STRIPPING.

The first operation, termed in French *Demasclage*, consists in the removal of what is known as virgin cork (*Cortica virgem* in Portuguese). This is necessary in order to allow for the rapidly increasing calibre of the trunk and larger branches. The age at which it is performed varies a good deal. If growth has been exceptionally good, it may be executed as early as ten years after planting, but this is rare; it more usually takes place between the fifteenth and twentieth year. Sometimes, a small crop of bark for tanning purposes is removed when the trees are about four years old.

The first real stripping is known in Portugal as *Secundario*. It takes place some eight or ten years later than the removal of the virgin cork. After this, the tree may be looked upon as thoroughly established; it continues, almost indefinitely, to yield its regular crop of cork at intervals of nine or ten years. No fixed period can be laid down; the interval depends on the rapidity of growth and the thickness of cork required—sometimes it is eight years, at others twelve years. Once in production, the trees are worked on a methodical system, one-ninth or one-tenth of the plantation being stripped each year; a regular and uniform annual production is thus assured.

The stripping season is from 1st June to 30th August (1st December and 28th February in Australia); sometimes, but rarely, it commences as early as 15th May (15th November). The best strippers come from the Algarve district, in the extreme south. Skill and great care are required in order to avoid damaging the tree. Although, to outward appearances, stripping seems to be executed in much the same way as a sheet of bark is removed from a gum tree (see *Journal* for January, 1910), the operation is a far more delicate one. The whole of the tree is not usually stripped at one time; this might give too great a shock, and besides, the cork takes a different time to form on the trunk and on the branches. Nevertheless, it is removed from right around the trunk at one operation.

Circular incisions are made above and below, care being taken that they do not penetrate quite as far as the cambrium layer. These are joined by a longitudinal cut of same depth (two are made if the trunk be a very large one). By smartly tapping the edges of the incisions with the axe, the bark is detached sufficiently from the liber to permit the introduction of the chisel-shaped end of the axe handle. The sheet of bark is thus removed without damaging the *Mãe*, as the liber is known in Portuguese. The removal of its bark does not appear to injure the tree in any way—it immediately proceeds to grow itself a new layer of bark, the outer surface passing through the colour variations already described.



STACK OF STRIPPED CORK.

As soon as it is stripped, the cork is roughly graded and provisionally stacked in the forest. From these stacks, one of which is shown in the photograph, it is very often sold, the unit on which transactions are based being the *Arroba*, of 15 kg. (33 lbs.). From the stack, it is taken to the factory, where it is converted into the flat state in which we know it as cork wood. In the factories, it is further graded, and the rubbish and portions damaged by insects (the cork oak has many enemies), are removed. After boiling in special boilers, to render it elastic, the outer woody layer is scraped off. It is finally graded according to its thickness:—

		mm.		Inches.
10 lines ...	...	22·6	...	·9
10 to 15 lines	...	22·6 to 33·8	...	·9 to 1·3
15 to 20 lines	...	33.8 to 45·1	...	1·3 to 1·7

It is then placed in cases 1m.50 x .72 x .60 (4ft. 11in. x 2ft. 4in. x 2ft.), compressed, and made into bales of from 60 to 70 kilos (132 to 154 lbs.). In this form it is shipped to all parts of the world, and known to the trade as cork wood.

* * * * * *

As showing the suitability of even the cooler parts of Victoria for the growth of this tree, photographs are reproduced of a cork oak growing in the suburbs of Melbourne—in the garden of Mr. Theyre A'B. Weigall, Alma-road, East St. Kilda. This tree must be about thirty years old. Its main stem was accidentally broken off 25 years ago, causing it to fork at a lower level than is usual. The photograph taken at closest range shows the characteristic appearance of virgin cork, for this tree has never been barked. Had it been thus treated some ten years back, a smoother surface would now be presented, and the layer of cork would be more even in thickness. It is fully two inches thick in places. The white disc, representing a half-crown, will give some idea of the scale.

A MELBOURNE CORK OAK.

I am informed that a very fine specimen of *Quercus Suber* is growing near Beechworth.

THE SMUTS OF AUSTRALIA.

The attention of readers of the *Journal* is drawn to the notice on the back cover regarding Mr. D. McAlpine's latest work, "*The Smuts of Australia: Their Structure, Life History, Treatment and Classification.*"

MAIZE FOR FODDER—LAST SEASON'S RESULTS.

I.—IN THE BALLARAT DISTRICT.

A. J. Ross, Dairy Supervisor.

The crop of maize shown in photograph was planted on the 23rd day of December, 1909, under my supervision. It is on Mrs. J. Hartley's dairy farm, Ballarat. The land was a mixture of grey soil and quartz gravel, which was ploughed the full depth to the subsoil, about 6 inches, early in the spring and worked up to a very fine tilth. The previous crop had been barley, rye, and tares mixed. The plot was liberally supplied with cow-yard manure, this being supplemented by superphosphate at the rate of 1 cwt. per acre, which was sown in the plough furrow with the seed 3 inches deep in every third furrow and 30 inches apart.

1 TO RIGHT, HICKORY KING ; 1 TO 2, ECLIPSE ; AND 2 TO 3, YELLOW DENT.

The seed was sown at the rate of half a bushel per acre. When we finished sowing the land was well harrowed and worked down to a fine tilth to conserve the moisture in the soil. The seed germinated quickly and when about 3 inches overground was hand hoed, and at different stages of its growth the intertillage was attended to with the hand hoe till a height of 4 feet was reached.

The photograph was taken on the 26th March, 93 days from date of planting. The average height of the different varieties were :—Hickory

King (from No. 1 to the right in illustration). 10 ft. 6 in.; Eclipse (1 to 2). 9 ft.; Yellow Dent (2 to 3). 8 ft. 6 in.

Hickory King shows a very prolific growth of green succulent foliage with three and four stools from each seed and two and three cobs on each stalk. A patch of this strip was weighed and calculated to give a return of 33 tons of green fodder per acre. Eclipse stooled out three and four stalks to the seed and a heavy profusion of green succulent foliage and thick heavy stalks, well cobbed. This crop worked out at 28 tons per acre. Yellow Dent grew to a height of 8 ft. 6 in. with plenty of green leaf and a heavy stalk. It stooled out fairly well and had two and three stalks, with large full cobs, to the majority of seeds. Estimated weight of this variety, 25 tons per acre.

HICKORY KING, 8 FEET HIGH, AT THE BALLARAT HOSPITAL FOR THE INSANE.

The maize crop is being chaffed and fed to the cows, the balanced ration being made up of bran and good hay chaff. Mr. Green, the manager, informs me that he can always increase the supply of milk by a liberal supply of green maize. Besides, the herd are in better health, and it minimizes the risk of impaction when the pastures are dry.

A crop of barley, rye, and tares, and a strip of Chou Moellier, were sown directly some of the maize had been cut out

By intense culture of her small area of land the owner has a fairly constant supply of green succulent fodder for feeding the dairy herd. Mr. Green is very pleased with our combined efforts, and intends in future to cultivate the land and sow the crop under similar conditions.

The following dairymen, in the Ballarat district, have grown maize successfully in the past season, viz., P. Rettallack, E. Whiteley, A. Kenny,

T. Mason, G. Shearer, T. Clemence, R. Isbel, J. E. Jones, J. S. Douglas, Thomas Bros., J. Hill, J. Woods, C. Reeves, P. Fisher, R. Hanrahan. On these farms, the maize was sown in drills, the majority about 2 ft. 3 in. apart. Where horse or hand hoe tillage was carried on between the rows, the crops were far superior in height and weight of fodder per acre to some of the crops sown broadcast or with seed drill when every coulter was used. These were, on an average, only 2 ft. 6 in. high, which compares badly with those sown a distance apart and horse- or hand-hoed.

Varieties which seem to do best in the Ballarat district are:—

Hickory King—A very hardy and frost-resisting variety. Stands frost better than most other varieties;

Red or Early Hogan—Grows well, not too coarse in the stalk, and stools out well;

Sydney Flat Red—A similar variety; grows high and produces a heavy crop of green fodder;

Eclipse—Grows well and produces a heavy crop of succulent fodder and a large heavy stalk. An ideal maize for making silage.

GENERAL VIEW OF THE CROP AT THE BALLARAT HOSPITAL FOR THE INSANE.

Mr. J. J. O'Meara, farm bailiff, has furnished the following particulars relative to the crops grown at the Ballarat Hospital for the Insane—

"The crop illustrated was drilled in about the middle of November, 1909, Hickory King at the rate of 1 bushel per acre being the variety sown. Upwards of 100 loads of stable manure were carted on to the land —5 acres of poor ironstone-gravel country. Three waterings were given.

At the time of cutting the crop for silage it averaged 8 feet high, and yielded about 25 tons to the acre. It was badly damaged by a hailstorm on the 3rd January but made a good recovery.

The same land is now growing a very nice crop of black oats, rye, vetches and barley. This will be cut during June, and then manuring and ploughing for the spring crops will be carried out instead of allowing the weeds to spring up."

II.—IN THE LILYDALE DISTRICT.

J. S. McFadzean, Dairy Supervisor.

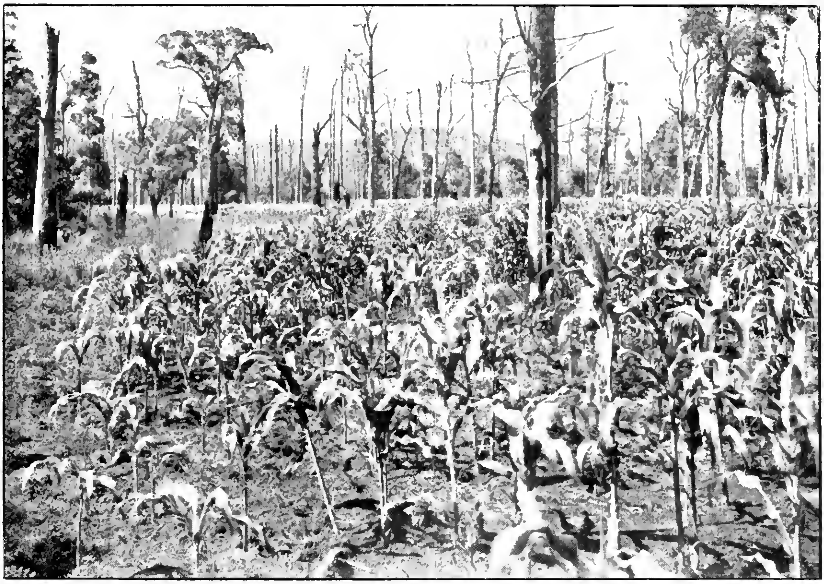
Some interesting photographs in connexion with maize cultivation are here presented. In some parts of the State the past season has not been

YELLOW MORUYA IN MESSRS. NEWMAN AND SPAVEN'S EXPERIMENTAL PLOT.

at all favourable for the growth of this fodder, for at planting time several weeks of dry weather intervened; and in several places the germination of the seed was uneven from this cause. However, those who practise the principles of dry farming in connexion with their summer sowings have got fair crops, and in some cases very good ones.

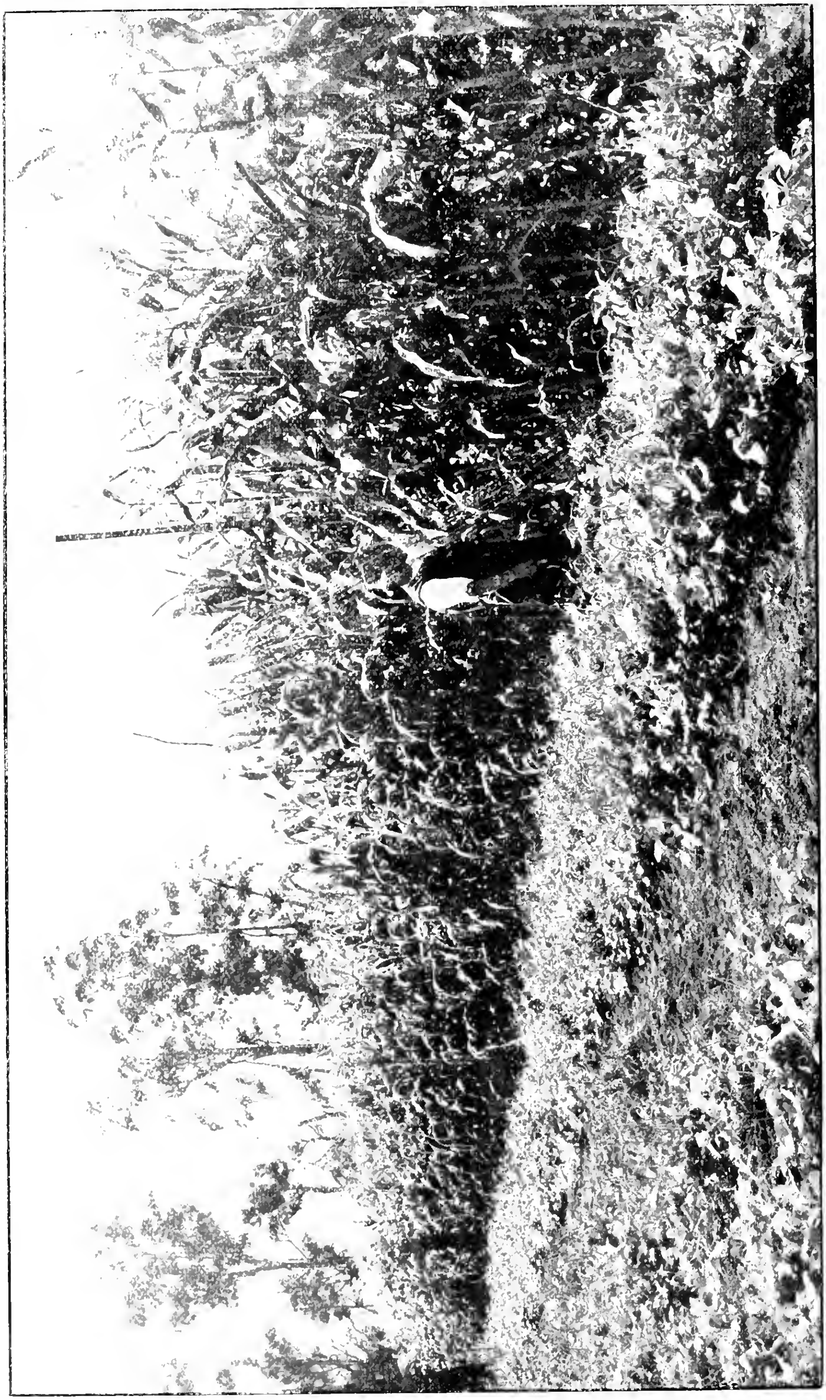
Messrs. Newman and Spaven had a very fine crop on their farm at West Warburton. This property, "Yarra Lea," contains 100 acres, and is situated within half-a-mile of the railway station. Being on rich friable river-flat land, with a fine frontage to the Yarra, it is exceptionally suitable for dairy farming; for at very little cost the water from the river could be made available for irrigation.

Since purchasing this farm early last year, the owners have made good progress in improving it. The cultivation area has been largely increased, new ground has been cleared and broken up, an overground silo has been erected, and nineteen cows are now in profit.



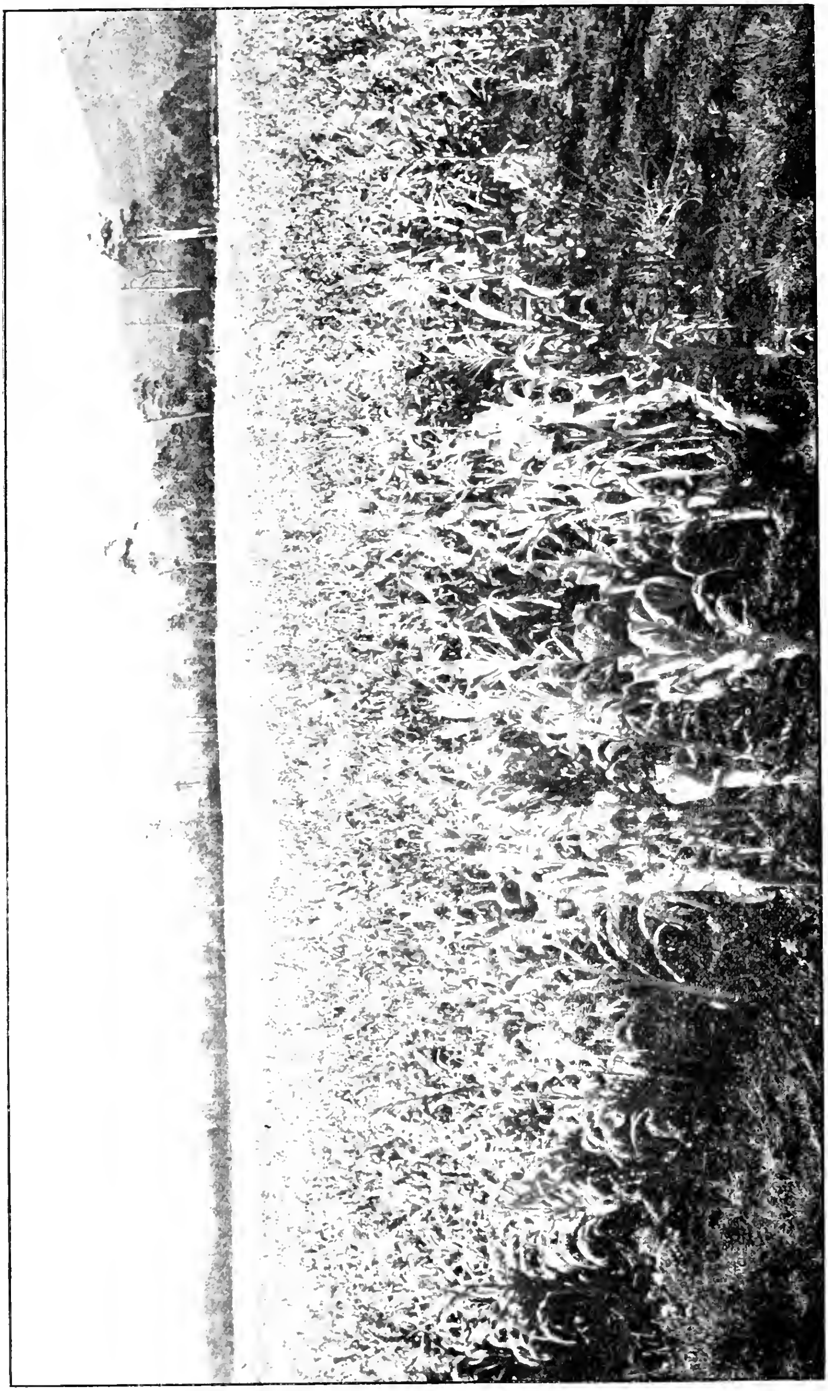
BROADCAST SOWING ON NEWLY CLEARED LAND.

This season eight acres were sown with four varieties of maize, viz., Flat Red, Hickory King, Yellow Moruya, and Sunshine. About half of this area was sown in drills from 2½ feet to 3 feet apart; and on the rest of the land the seed was sown broadcast and ploughed in; the latter sowing was on the newly cleared land. When clearing, some of the heavier timber was left standing, to be dealt with later on when it would burn more easily. In the meantime, the intervening ground was broken up and sown. This serves to check the growth of scrub, bracken, and burr; and at the same time a fair return is obtained. Potatoes may be frequently seen planted under such conditions, and at times almost as much bracken as potato-haulm will cover the ground on this first breaking up; but the harvesting of the crop considerably reduces the vitality of the fern. The accompanying photograph shows a first sowing of maize on newly broken



YELLOW MORUYA AT WEST WARBURTON—COW PEAS IN FOREGROUND.

A TRIAL PLOT OF COW PEAS. RUNNERS, $4\frac{1}{2}$ FT. LONG; PODS, 8 TO 9 INS.



HICKORY KING MAIZE FOR SEED AT MRS. BUCHANAN'S, LAUNCHING PLACE.

ground without manuring; and the poorest patch of the sowing.

The drilled crop was also sown without manure in the beginning of November, the seed germinating well and the plants making good headway. Average sections of the Hickory King and Yellow Moruya sowings were cut and weighed on 29th March. The former was then about 10 feet high, and weighed equal to 27 tons $13\frac{3}{4}$ cwt. of green fodder per acre. The Yellow Moruya was over 12 feet high, and very heavy in stalk, as shown on pages 388 and 390; and it gave an estimated yield of 55 tons $15\frac{1}{2}$ cwt. per acre.

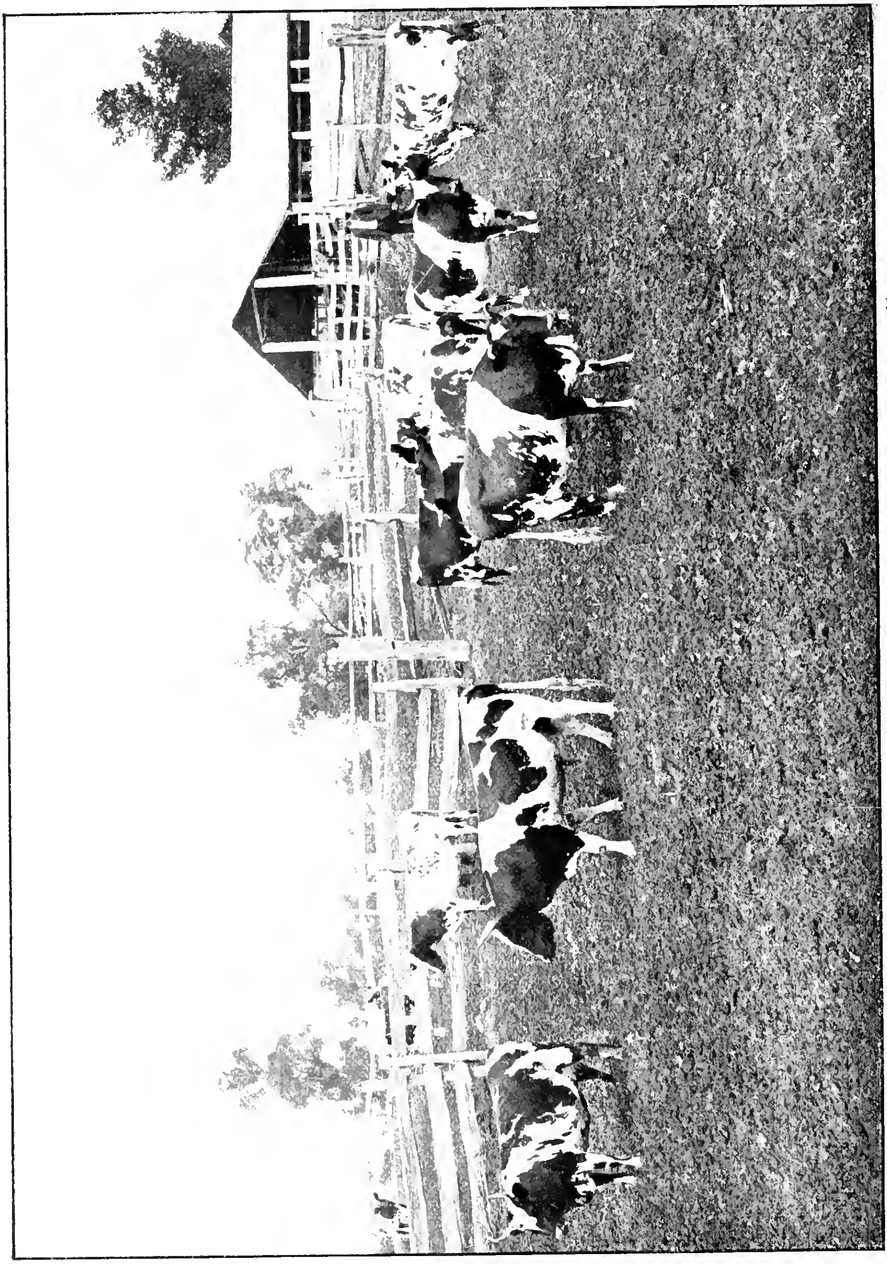
The Sunshine and Flat Red sowings were sampled on 9th April; the former at 8 feet high weighed at the rate of 16 tons 4 cwt. per acre; and the Flat Red at over 12 feet high yielded equal to 41 tons $8\frac{3}{4}$ cwt. per acre. All cobbed well; but the Sunshine made a very poor showing beside the others for fodder purposes.

A crop of potatoes near the maize gave promise of digging about $8\frac{1}{2}$ tons to the acre. A small sowing of cow-peas was also made here. They came up well, but were fancied by rabbits, which destroyed many of the young plants, checked the growth of others, and also very materially reduced the number of pods on the plants that reached maturity.

(2) Mrs. Buchanan's crop, illustrated on page 392, is at Launching Place. This crop is being grown for grain, and when seen it was about 8 feet high and well cobbed. After it had made a good stalk it was top-dressed with mixed fertilizer in order to increase the grain.

FROM TUSSOCKS AND THISTLES TO DRILLED MAIZE—2 YEARS' WORK AT "DEVON PARK."

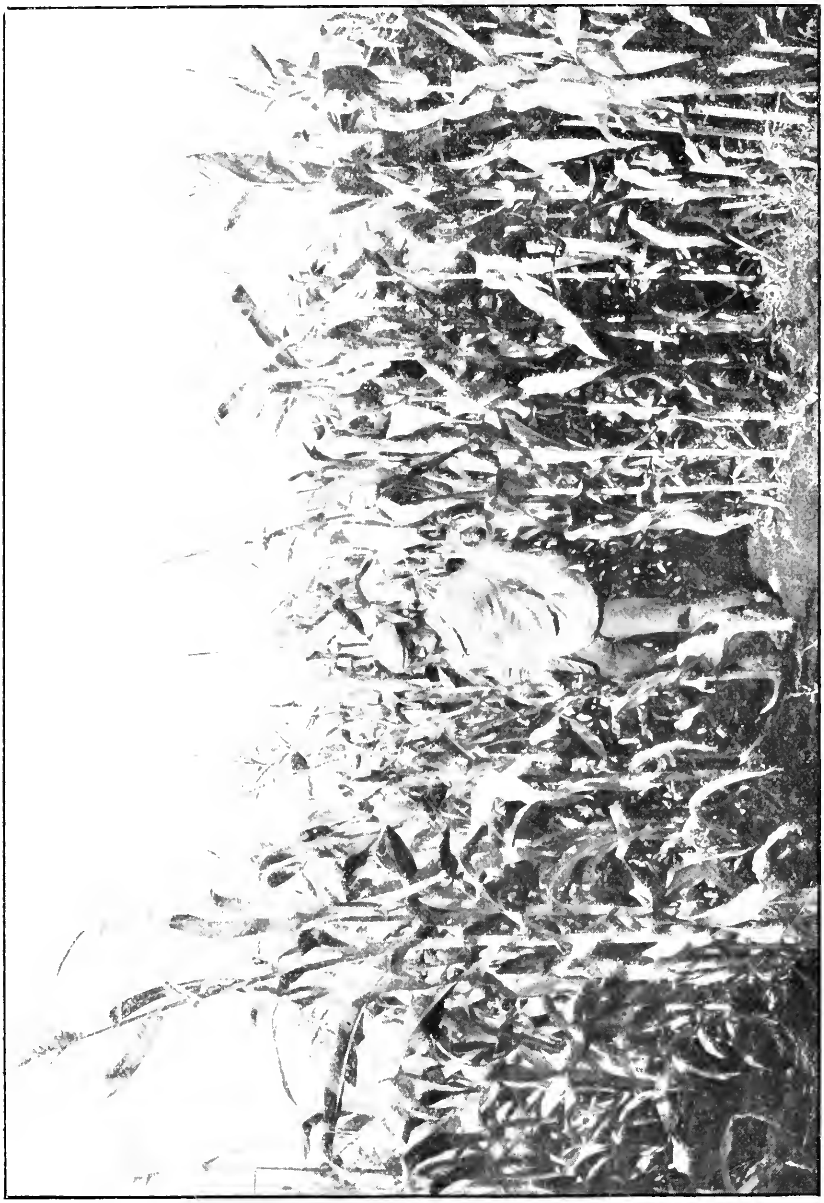
On this farm some seven acres of peas and French beans are also growing, and the produce from these, as well as the butter from about 20 cows, is sent to the Melbourne market.



QUALITY IN MILKING STOCK—MR. W. TOWT'S "DEVON PARK" HERD.

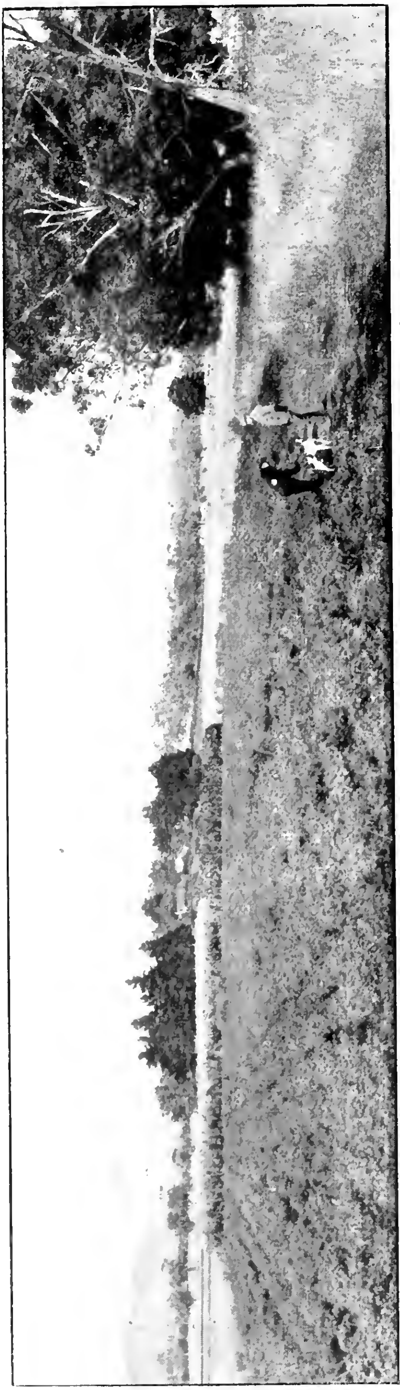
(3) On page 393 is a photograph of a fine crop of maize grown on "Devon Park," the dairy farm of Mr. Wm. Towt, at Coldstream. This

sowing was of Hickory King in rows 28 inches apart; and from a sample cut it was estimated to yield 27 tons $12\frac{1}{2}$ cwt. per acre. It ran from 11 feet to 12 feet high, and is the second sowing on new ground without manure.



A TYPICAL CROP OF HICKORY KING.

In the foreground is shown a dense mass of thistles and tussocks, such as occupied the maize land prior to its cultivation; and it is intended to break this part up during the coming year.



POTATOES AND MAIZE ON THE OLINDA CREEK FLATS—MR. F. B. LITHGOW'S FARM.

A good portion of the maize land was sown on the broadcast system, and on the lower-lying places it made very rank growth, running to 12 feet high, and weighing up to nearly 31 tons per acre. On other parts, however, the yield would not be more than half this and in places it was very short. It was sown at the rate of about $2\frac{1}{2}$ bushels to the acre, and the stalks were consequently too close wherever there had been even fair germination. Where the growth was heaviest the stalks were very fine, and sparsely cobbed, weighing only about $\frac{2}{3}$ lbs. each on the average. In the drilled sowings, on the other hand, the stalks were very well cobbed, and averaged about $2\frac{3}{8}$ lbs. each.

From Warburton to here, the Yarra flows for some 25 miles or more through first class river flat land that is capable of being made very productive by cultivation; but so far very little of it has been broken up. Here and there may be seen a few acres sown with a broadcast crop of maize, which gives a good bulk of fodder if there is a favourable rainfall, and very little otherwise. It is quite a rarity to see a good even crop, such as results from a proper system of sowing and cultivation. Hundreds of acres of these flats are within a few chains of a first class water supply that could be used for irrigation, yet they lie there unimproved, covered with scrub and tussocks, harbouring snakes, rabbits, and foxes, and keeping a comparatively small number of cows in milk for six or seven months of the year. Very few owners indeed are making any effort towards bringing this valuable land under cultivation. Many are doing absolutely nothing. Unquestionably, it must be good country where dairy-farming can be made so profitable that the advantages of possessing good cultivatable and irrigable land can be so completely ignored.

(4) On pages 395 and 396 are shown photographs of maize and potato

crops grown on "Flowerfield," the dairy-farm of Mr. F. B. Lithgow, which is also at Coldstream, but nearer to the station. This farm is on the rich black flats of the Olinda Creek; and these, too, are possible of being irrigated by gravitation. Excepting that in an exceptionally dry summer the grazing paddocks on these flats may be flooded, very little use is made of the water supply. The crops shown in the photograph have had neither water nor manure applied to them.

Flat Red and Hickory King maize were sown at the end of November. Both varieties made good growth, for, when weighed at the end of March, the former showed equal to 21 tons $12\frac{3}{4}$ cwt. per acre, and the latter, to 24 tons $6\frac{1}{4}$ cwt. per acre. When the photographs were taken neither crop was nearly matured, and there still was a lot of growth in the Flat Red when it was weighed.

Mr. Lithgow keeps a very good class of Yorkshire pigs, with which he has taken numerous prizes; and a few acres of his flats are usually planted with peas and potatoes for their use.

Both Mr. Lithgow and Mr. Towt make a specialty of pure Ayrshire cattle, and a photograph of some of Mr. Towt's stock is shown on page 394.

III.—IN THE YARRA GLEN DISTRICT.

W. Younger, Dairy Supervisor.

There has been a decided improvement in the methods adopted in the cultivation of maize throughout the Yarra Glen district during the past two seasons. In order to encourage dairy farmers to adopt the inter-cultivation of this fodder the Dairy Supervision Branch of the Department of Agriculture in 1908 distributed several varieties of seed maize to dairymen, gratis, on condition they were drilled in 3 feet apart and cultivated at intervals as required during the growing period. In some cases artificial manure was also distributed free of cost. In that year only three dairymen in this district (Messrs. Hunter, Boyd, and Downer) accepted this offer, and their crops turned out highly satisfactory. On adjoining farms, crops sown on the old-fashioned broadcast system were practically failures in almost every instance.

This season, at least half the dairymen here drill-sowed their maize, and although in many instances the work of inter-cultivation has not been carried out as regularly as desirable, still the results all go to prove the advantages of up-to-date methods. On those farms where thorough inter-cultivation has been practised excellent crops have been obtained. The best crops are those of Messrs. A. M. Boyd, "Tralee," Yarra Glen, and Mr. P. Downer, Steel's Creek.

Mr. Boyd has 5 acres of maize of different varieties, including Hickory King, Yellow Dent, Victorian Flat Red, and Yellow Moruya. These were sown in drills 3 feet apart in November and December, and cultivated at intervals of two and three weeks—until the plants had reached a height of 4 feet. No manure was used. The several varieties have now reached a height varying from 6 to $10\frac{1}{2}$ feet, and the whole are thick-stemmed and well cobbed, making an excellent crop. Fifty pounds of this green maize per cow have been fed daily during the past six weeks to the milking herd of 15 cows, and after filling his 50-ton silo Mr. Boyd estimates he will have from five to six weeks' green fodder still to use before commencing on his silage.

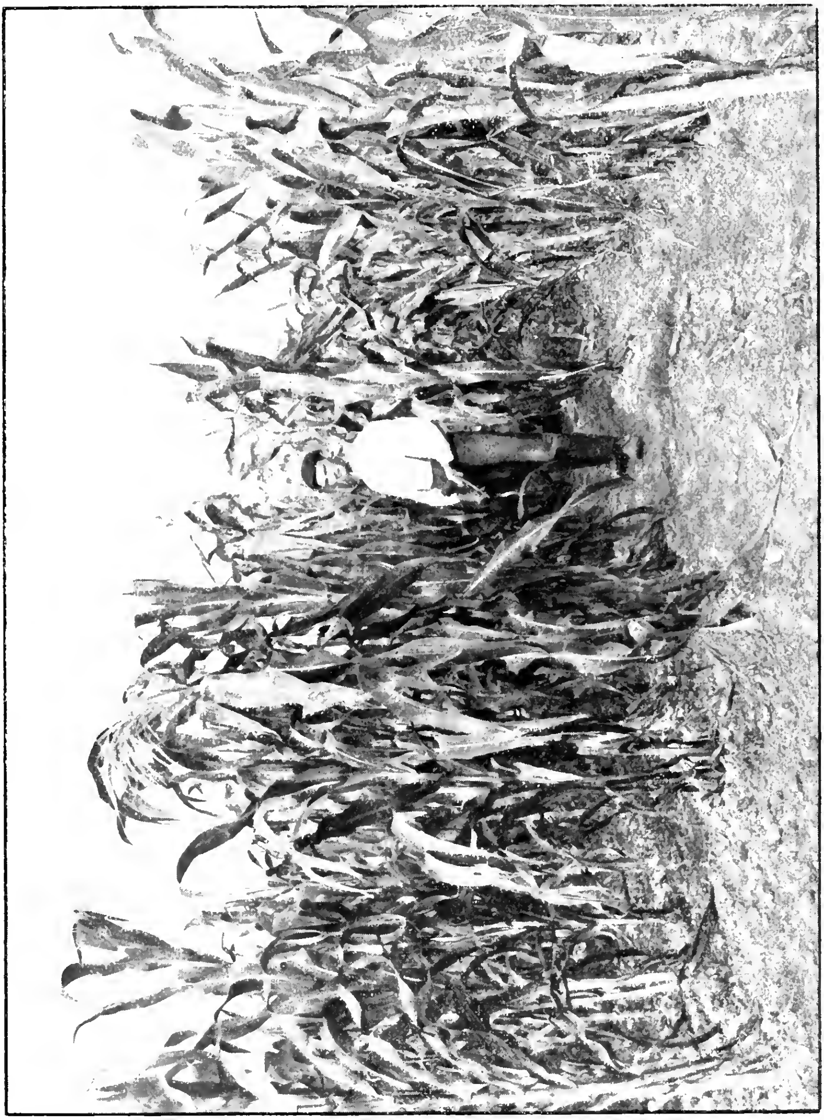
Mr. Downer has five acres of Yellow Dent and Hickory King varieties that were sown in November in drills 3 feet apart. Two cwt. of superphosphate and bone manure to the acre were put in with the maize, which was sown at the rate of 20 lbs. to the acre; the ground was inter-cultivated at intervals of ten days, and the crop is now from 6 to 10 feet high. The stems of these maize are particularly thick and heavy, weighing up to $3\frac{1}{2}$ lbs. each.

HICKORY KING AT "TRALEE."
Height, $10\frac{1}{2}$ ft.—4 months' growth.

The success of this crop may be claimed to be wholly due to Mr. Downer's systematic method of cultivation, as the land on which it is growing is comparatively poor. In the same locality, maize crops sown broadcast are almost without exception so poor as to be practically worthless. Satisfactory results have also been obtained from drilled maize grown on high land on which in previous years under the old broadcast system failures were the rule. Mr. B. Sadlier and Mr. N. White each had two acres of Hickory King sown with 1 cwt. superphosphate to the acre in drills 30 inches apart and cultivated twice in December. These reached a height varying from 6 to $8\frac{1}{2}$ feet, which is considered very satisfactory.

Messrs. Fletcher, J. Scott, Hubbard, Ellis and others have also adopted this system of maize sowing, and recognise it to be the only sure means of obtaining a crop.

The accompanying photographs show the crops of Messrs. Downer and Boyd, which have just been referred to. Less than two years ago Mr. Downer was a resident of Melbourne, and was engaged in one of the city banks. Finding this occupation was in his case not satisfactory from a



MR. DOWNER'S CROP OF YELLOW DENT MAIZE. HEIGHT, 10 FT. 14 WEEKS' GROWTH.

health point of view he purchased his present farm of 97 acres at Steel's Creek, which is about 6 miles from Yarra Glen station. Dairy farm work was new to him, and he was of anything but a robust physique; but he had the will for his work, and he set about it in as methodical a manner as he could. Aided by such knowledge as he could gather by reading and by timely advice from the Dairy Supervisor of that district, he is now making very satisfactory progress in his work. He has a small herd of cows that are well cared for, and the place is kept in neat order. Mr. Boyd and his family, until recently, were also residents of the city, and were professionally engaged with brush and pallette. Under the united hands of the family, however, the farm they have owned for the last two and a half years is now coming gradually into proper and profitable condition, and the work has proved congenial. By this, it is not to be supposed that any and every one who may find that city life does not suit them should turn to dairy farming, but rather that any whose fancy does tempt them to take up country life should not be deterred by lack of experience. Many a city business man makes an exceptionally good farmer for he has not only no faulty teachings to hinder him, but, by following the advice freely given by the Department of Agriculture, he can make best use of whatever advantages are presented in his surroundings.

RARE PROFITS FROM SOWS.

J. S. McFadzean, Dairy Supervisor.

Prolificacy of production is a most desirable quality in all utility stock, and as this trait is largely hereditary it is from highly productive stock that breeding animals should be chosen. As an instance of this principle of hereditary fecundity in pigs, the following facts are related:—

Mr. J. Williams, Warburton-road, Seville, has a breeding sow, a grade Berkshire, which farrowed 101 pigs within four years and reared 91 of them. A young sow was purchased from him by Mr. John Smith, Avon, East Warburton. This sow had her first litter of eight pigs on 10th September, 1908. These, when fit, were sold as baconers for £20 0s. 1d. Concentrated food, such as bran, pollard, and biscuit refuse, was purchased for them to the value of £6 6s. 9d., and on this was also fattened a 260-lb. pig that was killed and cured on the farm. A second litter of ten was farrowed on 25th April, 1909. Nine of these were sold for £18 9s. 6d., and one weighing 121 lbs. was killed for home use. Feed to the further cost of £6 0s. was used in growing these. The sow had a third litter of fifteen on 28th August. Of these ten were well grown when seen on 3rd February, 1910, and two had been sold for £3 9s. 2d. This sow, therefore, farrowed 30 strong pigs within twelve months, seventeen of which were sold at a profit of £23 9s. 2d. Besides this, she paid for the raising of the household supply of 380 lbs. of pork and bacon, and her second year's work begins with twelve young ones to sell against eight of the previous year. With such breeding stock as this, and reasonable care, pigs can be made a very profitable side issue on the dairy farm.

VICTORIAN REGISTER OF VETERINARY SURGEONS FOR 1910.

Abbreviations.

		Nos.
R.V.S.	Registered Veterinary Surgeon	41
G.M.V.C.	Graduate Melbourne Veterinary College	60
M.R.C.V.S.	Member Royal College Veterinary Surgeons (Great Britain)	14
F.R.C.V.S.	Fellow Royal College Veterinary Surgeons (Great Britain)	1
D.V.Sc.	Doctor of Veterinary Science	3

Date of Registration.	Name.	Address.	Qualifications.
21 Jan., 1889	Adams, William Julian	Templeton-street, Maldon	R.V.S.
17 Dec., 1902	Adeney, Alexander William	Cotham-road, Kew	G.M.V.C.
19 June, 1907	Allen, Robert Parker	Benalla	G.M.V.C.
18 Dec., 1901	Anderson, John Reginald	Tower Hill, Illowa	G.M.V.C.
19 June, 1889	Baird, Robert Fairlie	Little Malop-street, Geelong	R.V.S.
19 June, 1907	Barbeta, Augustus J.	Terang	G.M.V.C.
20 Dec., 1899	Barbeta, Estevan	Hamilton	G.M.V.C.
15 May, 1889	Barnes, James	Minyip	R.V.S.
21 Dec., 1904	Barnes, James, jun.	Horsham	G.M.V.C.
9 Nov., 1909	Beaumont, Joseph Henry	Yarrawonga	G.M.V.C.
21 Jan., 1889	Beckwith, William	East Malvern	R.V.S.
21 Jan., 1889	Bodey, Matthew	316 Doveton-street, Ballarat	R.V.S.
4 July, 1902	Bordeaux, Edward Francis Joseph	Mt. Alexander-road, Moonee Ponds	G.M.V.C.
19 Dec., 1900	Bruton, William Henry	Cheltenham	R.V.S.
19 May, 1909	Burns, Jerome Lawrence	Stock Department, Perth, W.A.	G.M.V.C.
7 Dec., 1898	Burrage, Thomas Allen	St. Arnaud	G.M.V.C.
21 Dec., 1892	Callow, Andrew Edward	23 Doveton-street, Ballarat	G.M.V.C.
17 June, 1908	Callow, Charles Napier	Colac	G.M.V.C.
15 May, 1889	Cameron, Samuel Sherwen	Department of Agriculture, Melbourne	M.R.C.V.S. *et* D.V.Sc., Melb.
17 Oct., 1894	Campbell, William	138 Camberwell-road, Hawthorn	R.V.S.
30 Mar., 1889	Chatto, Thomas	Bridge-road, Richmond	R.V.S.
16 Mar., 1898	Cherry, Charles Cummings	Hawthorn	G.M.V.C.
24 Nov., 1897	Christensen, Charles Joseph Peter	305 High-street, Prahran	G.M.V.C.
9 May, 1907	Colebatch, Walter John	Department of Agriculture, Adelaide, S.A.	M.R.C.V.S.
19 June, 1895	Corrigan, James	North Brighton	R.V.S.
18 Dec., 1891	Cother, William John	Department of Agriculture, Melbourne	G.M.V.C.
17 May, 1905	Cristfield, John	Corowa, N.S.W.	R.V.S.
1 Dec., 1888	Desmond, John	Government Veterinary Surgeon, Adelaide, S.A.	G.M.V.C.
18 Dec., 1891	Edwards, Henry H.	Western Australia	G.M.V.C.
20 Nov., 1895	Fletcher, Stanley	Beechworth	G.M.V.C.
19 June, 1907	Fyans, Harold Napier	Kyneton	G.M.V.C.
20 Dec., 1905	Geddes, George Grant	Majorca	R.V.S.
3 May, 1909	Gilruth, John Anderson	University, Melbourne	M.R.C.V.S. *et* D.V.Sc., Melb.
17 July, 1889	Goule, Arthur	South Africa	M.R.C.V.S.
19 Nov., 1890	Gray, Achilles	Wedderburn	R.V.S.
16 Mar., 1908	Green, William Bertram Lloyd	Moonee Ponds	G.M.V.C.
18 Dec., 1889	Harrison, William Asquith	Bendigo	R.V.S.
19 Mar., 1902	Hay, Adam	Wangaratta	M.R.C.V.S.

Victorian Register of Veterinary Surgeons for 1910—*continued.*

Date of Registration.	Name.	Address.	Qualifications.
19 June, 1889	Haygarth, George Montgomery	Inverleigh	R.V.S.
21 Jan., 1889	Hepburn, Thomas John ..	Echuca	R.V.S.
15 April, 1891	Hill, William H. ..	Stawell	R.V.S.
18 Dec., 1891	Hollingham, Edward Arthur	South Africa	M.R.C.V.S.
16 Mar., 1908	Holt, Henry James ..	Government Abattoirs, Hobart, Tas.	G.M.V.C.
21 Dec., 1904	Humm, Charles	Warrnambool	G.M.V.C.
15 Aug., 1889	Hunter, William ..	Camberwell-road, Hawthorn	R.V.S.
18 Dec., 1901	Jones, David T.	Warragul	G.M.V.C.
18 Sept., 1889	Keene, Joseph Horatio Nelson	Tasmania	R.V.S.
16 June, 1897	Kendall, Ernest Arthur ..	Department of Agriculture, Melbourne	G.M.V.C.
25 Dec., 1908	Kendall, Hector	Brunswick-street, Fitzroy ..	G.M.V.C.
17 Dec., 1902	Kendall, John	Shepparton	G.M.V.C.
20 Nov., 1899	Kendall, William Augustus	323 High-street, Prahran ..	G.M.V.C.
14 Nov., 1888	Kendall, William Tyson ..	Brunswick-street, Fitzroy ..	M.R.C.V.S. *et* D.V.Sc., Melb.
24 Nov., 1897	Kerr, David John McConnell	Auburn-road, Auburn ..	G.M.V.C.
21 Jan., 1889	Kings, Richard Taplin ..	Lilydale	R.V.S.
20 Nov., 1895	Kyle, Herbert Seton Stewart	Christchurch, N.Z. ..	G.M.V.C.
18 Dec., 1891	Leitch, John Black ..	Geelong	G.M.V.C.
16 Mar., 1908	Lerew, William Margrave ..	Hamilton	G.M.V.C.
20 Nov., 1895	Le Souef, Ernest A. ..	Perth, W.A.	G.M.V.C.
24 Nov., 1895	Le Souef, Sherbie Albert ..	Sydney, N.S.W.	G.M.V.C.
18 Dec., 1901	Loel, Bertram Benjamin ..	Sydney, N.S.W.	G.M.V.C.
16 Dec., 1903	Looney, Henry Michael ..	Sunbury	G.M.V.C.
17 June, 1901	Loxton, Charles Arthur ..	Department of Agriculture, Adelaide, S.A.	G.M.V.C.
30 Mar., 1889	Mansergh, Fredk. John ..	122 Chetwynd-street, North Melbourne	R.V.S.
18 Dec., 1891	Melhuish, Frank Whiddon	Sydney, N.S.W.	M.R.C.V.S.
15 May, 1889	Miller, Robert Charles ..	Casterton	R.V.S.
7 Dec., 1898	Mitchell, Ernest Wilfred ..	Bendigo	G.M.V.C.
21 Dec., 1904	Morgan, William S. L. ..	Ballarat	G.M.V.C.
17 July, 1889	Moore, John	Maldon	R.V.S.
16 Mar., 1892	Morris, Patrick Francis ..	90 Hope street, South Yarra	R.V.S.
21 Dec., 1892	McCure, Alfred	Colac	R.V.S.
20 July, 1904	MacDonald, Norman ..	Casterton	G.M.V.C.
16 July, 1890	Nicholls, Robert	Rushworth	R.V.S.
21 Aug., 1889	Ogburn, Joseph	Charlton	R.V.S.
20 Dec., 1905	Page, George Charles ..	Bairnsdale	G.M.V.C.
21 Jan., 1889	Parker, Edward	Bendigo	R.V.S.
20 Dec., 1905	Paterson, Lawrence Lindley	Numurkah	G.M.V.C.
20 Dec., 1905	Phelan, Denis	Werribee	R.V.S.
17 Sept., 1889	Phillips, John	Easy-street, Collingwood ..	R.V.S.
21 Nov., 1906	Reid, Belle	Whitehorse-road, Balwyn ..	G.M.V.C.
21 Feb., 1889	Rivett, Ernest	New South Wales ..	M.R.C.V.S.
17 July, 1889	Robertson, Stewart ..	Argyle-street, St. Kilda ..	R.V.S.
7 Dec., 1898	Robertson, William Apperley Norton	Department of Agriculture, Melbourne	G.M.V.C.
3 Jan., 1889	Rogerson, William Dunk ..	Middle Park	M.R.C.V.S.
20 Dec., 1899	Runting, Hector George James	Moreland	G.M.V.C.
18 Feb., 1891	Russell, James T. ..	Upper Hawthorn	R.V.S.
5 Dec., 1894	Rudduck, Harold Sugden	London, England	G.M.V.C.

VICTORIAN REGISTER OF VETERINARY SURGEONS FOR 1910—*continued.*

Date of Registration.	Name.	Address.	Qualifications.
18 Dec., 1897	Ryan, Joseph	Berrigan, N.S.W.	R.V.S.
17 July, 1889	Rye, Harry	Elizabeth-street, Melbourne	R.V.S.
21 Feb., 1906	Schiller, Charles	Waanyarra	R.V.S.
21 Jan. 1889	Shaw, Charles William ..	Riddell's Creek	R.V.S.
19 July, 1899	Sherlock, Samuel ..	Frankston	R.V.S.
25 Nov., 1908	Shew, William Dunbar ..	Camperdown	G.M.V.C.
16 Dec., 1903	Smith, Adam William ..	"The Meadows," Alberton..	G.M.V.C.
22 Nov., 1888	Snowball, William Dempster	Dunedin, N.Z.	M.R.C.V.S.
18 Dec., 1901	Scott, Cathcart	141 Auburn-road, Auburn ..	G.M.V.C.
16 Mar., 1898	Strong, Charles Denniston	Department of Agriculture, Victoria	G.M.V.C.
5 Dec., 1900	Symonds, Stanley L. ..	Malay States	G.M.V.C.
30 Mar., 1889	Thompson, Joseph C. ..	England	M.R.C.V.S.
12 July, 1905	Thwaites, Alexander ..	Tallangatta	G.M.V.C.
19 June, 1907	Tomlin, Ernest John ..	Leongatha	G.M.V.C.
17 July, 1895	Tuck, Arthur W. K. ..	Warrnambool	G.M.V.C.
15 May, 1895	Utber, Robert Ashwell ..	Auburn	R.V.S.
17 April, 1889	Vyner, Charles James ..	Health Department, N.S.W.	M.R.C.V.S.
17 May, 1905	Wagstaff, Rufus	Maryborough	R.V.S.
19 Oct., 1892	Wallace-Dunlop, John Anthony	Glen Wallace, Poowong ..	R.V.S.
21 Nov., 1888	Weir, Robert E.	Stock Department, Perth, W.A.	M.R.C.V.S.
5 Dec., 1900	Weston, Edward Alexander	Launceston, Tas.	G.M.V.C.
21 Dec., 1904	White, Augustus ..	Kyabram	G.M.V.C.
21 Aug., 1889	White, Henry Innell ..	Princes-street, Prahran ..	R.V.S.
12 July, 1905	Whitfield, Leslie Charles ..	Tasmania	G.M.V.C.
27 April, 1892	Willmot, Robert ..	Hobart, Tas.	F.R.C.V.S. *et* M.D.
19 Mar., 1902	Wilson, Albert Charles ..	Williams-street, Brighton ..	G.M.V.C.
20 July, 1904	Wood, Ernest Nonus ..	Caulfield	G.M.V.C.
20 Nov., 1895	Wood, Samuel Octavius ..	Caulfield	G.M.V.C.
19 June, 1907	Worthington, Harry ..	Echuca	G.M.V.C.
17 Aug, 1892	Younghusband, Thomas ..	Brownsville, Newtown ..	R.V.S.

JAMES C. HATTON,
Registrar.

Melbourne, 1st May, 1910.

DWARF FRUIT TREES FOR SMALL GARDENS.

A. S. Neilson, Orchardist, School of Horticulture, Burnley.

Not only in the metropolis and its suburbs, but in the cities and large towns in the country, there are many people who are often heard to exclaim "If I only had a larger plot of ground, I should like to grow a few trees, from which I could pick fruit as fresh as I wanted it." Yet, doubtless, such people are unaware that for small gardens, there are trees obtainable that are suitable for their wants; viz., those that are worked on the dwarf system in order to produce small trees.

Apples.—With apples this is done by first grafting the Doucin or French Paradise on to the Northern Spy, so as to give the tree a sound blight-proof root system, and then working the particular variety desired on to the Paradise.

Pears.—The quince is used as a root stock for pears. On to that is worked any of the following pears as an intermediate stock; viz., Beurré d'Amanalis, Louise Bonne of Jersey, or Jargonelle; and then on to the intermediate stock is worked the particular variety desired.

Cherries.—In the case of cherries, the Mahaleb stock is used, as it is of a dwarf nature in itself. The varieties selected are grafted or budded straight on to it.

Plums.—By a judicious system of root pruning, plums can be kept down and thus dwarfed to a certain extent.

This treatment should also be applied to the other fruits mentioned. The plan laid down for such treatment is to dig a spade-wide trench about 18 ins. from the stem of the tree all round, and to the depth of about 18 to 24 ins. Chisel in under the tree so that the ball of earth containing it will swing as if on a pivot; thus cutting all the roots and checking the growth for the purpose required. The soil should then be replaced and well trodden in; the addition of a handful of bonedust or superphosphate will be an advantage. This procedure should be followed every second or third year, according to the growth the tree makes.

The trees can be planted at a distance of 6 to 8 feet apart, thus allowing a great number of trees to be placed on a small space. Thus, in a garden plot containing one-eighth of an acre it is easily possible to grow 85 trees at a distance of 8 feet apart or 155 trees at 6 feet apart. Other advantages in these dwarf trees are that they are easy to prune, and to spray. To gather the fruit no ladders or steps are required, and, if birds are troublesome, the trees are easily netted over.

Enthusiasts in Pomology with only limited space at their command, can thus have pleasure and profit during their spare time; a few trees so planted and looked after will well repay the grower. For those who may contemplate trying a few trees and are not sufficiently well versed in the names of varieties, the following lists are furnished. The particular varieties mentioned are those that have succeeded well in the Royal Horticultural Gardens, Burnley, where the writer has had many years of experience with them:—

Apples.

Red Astrachan, early dessert.
Gravenstein, early dessert.
Ecklinville Seedling, early cooking.
Lord Suffield, early cooking.
Jonathan, medium dessert.
Pomme de Neige, medium dessert.
London Pippin, medium cooking.
Prince Bismarck, medium cooking.
Buncombe, late dessert.
Rome Beauty, late dessert.
Stone Pippin, late cooking.
Rokewood, late cooking.

Cherries.

Early Purple Guigne, early.
Belle d'Orleans, early.
Bigarreau, Twyford, early.
Bedford Prolific, medium.
Black Tartarian, medium.
Bigarreau Reverchon, medium.
Bigarreau Napoleon, late.
Bigarreau de Hollande, late.
Florence, late.
St. Margarets, late.

Pears.

Williams' Bon Chrêtien, early.
Howell, early.
Beurré Capiaumont, medium.
Calabasse Grosse, medium.
Louise Bonne of Jersey, medium.
L'Inconnue, late.
Winter Nelis, late.
Keiffer's Hybrid, late.
Black Achan, cooking.
Vicar of Winkfield, cooking.

Plums.

The Czar, early.
Evans' Early, early.
McLoughlin's, early.
Washington, medium.
Large Black Imperial, medium.
Kirk's, medium.
Grand Duke, late.
Belle de Septembre, late.
Reine Claude de Bavay, late.
Wright's Early, early Japanese.
Wickson, late Japanese.
Satsuma, or Japanese Blood.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

Planting

The long delayed rains having come early in May, all ploughing will now be completed. June is the month usually favoured for the planting of all deciduous orchard trees, and this work should now be carried out. The ground should have been previously ploughed, subsoiled and drained, in anticipation of the planting of the young trees. The young trees should be planted to the same depth as they were growing in the nursery beds; and the holes for their reception should not be any deeper than is necessary to contain the roots. A deeper hole only provides soakage room for the soil moisture, and the hair roots are rotted as soon as they are formed. In order to keep the tree holes at an even depth, a plough furrow may be run along the whole length of the row; and each tree could then be planted to the depth of the furrow, and no deeper. By this means, any soil moisture, or an excess of moisture, is evenly distributed, and is not likely to settle around the growing roots.

Before planting, the roots of the young tree should be well pruned, cutting them hard back, leaving a very small root system; generally only about one-third of the original roots being left.

It is rarely necessary to manure newly planted trees when they are being planted. If manure is required, it should either have been well worked through the soil previously, or else it should be used as a surface mulch some considerable time after planting.

As soon as the soil has settled firmly around the newly planted tree, it is the general practice to cut the top hard back to two or three buds, so as to restore the balance between the roots and the top. This method is being criticised by a number of English fruitgrowers, who claim as a result of some years experimenting, that more vigorous trees may be produced by allowing the tops to remain unpruned until a year after planting. The first theory is that the elaborated sap may be working and distributing into the buds after the foliage has fallen, and to cut off any portion of the tree containing the elaborated sap, is to disturb the work of distribution. The pertinent questions asked are, "Why prune the shoots to restore the balance?" "Would it not be better for the tree to restore its own balance?" It is claimed that the tree will do this more effectively if *all* the shoots are left unpruned for the first season; as the tree will give a greater number of leaves, and leaf sap earlier in the season. Thus a greater amount of sap elaboration takes place, and more roots and a more vigorous tree are the result. In the experiments a number of plum stocks were planted, some being left uncut, the others being pruned. Afterwards, average trees were selected from each class the pruned tree carried 240 leaves, and the unpruned tree had 792 leaves. The growths of the trees under review during the second year showed that the trees pruned the year after planting were far superior to the earlier pruned trees. This is a matter for local experiments, and the results should prove very interesting and valuable to the experimenter.

Varieties.

In planting, growers will do well to study such varieties as are valuable as export fruit, in apples and pears; and other classes are generally profitable if planted for a succession. A great deal of attention is paid to new varieties; and it is to be regretted, that, in the search for newer varieties, which are so often a failure, the older, and more valuable varieties may be lost sight of altogether. Among these are many that have been proved for many years to be valuable acquisitions to the fruit-grower. A few may be mentioned.

Pears.—St. Michael Archangel is a pear grown in but few districts in Victoria. It is a fairly large sized pear, well coloured, and possessing a fine juicy flesh with an excellent first-class flavour. As its time of blossoming generally synchronises with that of Kieffer's Hybrid, it is valuable for cross fertilization purposes.

Bakehouse's Bergamot is a Tasmanian seedling, of medium size, a good cropping tree, and possessing one of the finest flavours to be found in any pear.

Embassy is a seedling raised by the late Mr. Charles Draper. The tree is a heavy bearer, and the fruit is of a beautiful ruby-red colour. It is called by some a red Beurré Capiaumont. The flesh and flavour are first class.

Twyford's Monarch is another excellent pear, juicy, medium size, and of a most rich and delicate flavour.

Triomphe de Jodoigne is a very large coarse looking pear, but possessing no coarseness whatever. The flesh is firm and juicy, and of more than first-class flavour.

Apples.—Calville Blanche d'Hiver is a very fine apple, valuable as being a very late variety, culinary in winter, and a dessert variety in early spring.

Granny Smith, and Trivett's Seedling are worthy of a place in every garden, and are becoming more popular in Victoria every year.

SPRAYING.

All the winter pests will now come in for attention and trees should be freed as far as possible from all classes of scale insects, bryobia mite, woolly aphis, &c. The red oil or crude petroleum emulsion is most suitable for the eradication of these pests.

Spraying before pruning is not the general rule; and yet it seems to be the safest, especially where scales or woolly aphis are prevalent. Certainly, a much larger amount of spray material will be required; but much better work will be done. There will be no danger whatever from future contamination from any of these pests on the undestroyed prunings; or from any small clippings that may be lying ungathered around the tree. Another point in favour of this is that, if by any means, whether by careless spraying or by the use of bad materials, any part of the tree is left, so that the pest is not destroyed, and so continues to increase, then a second spraying can be given while the tree is still dormant.

DRAINAGE.

In old established orchards, a thorough scheme of drainage does more to invigorate and resuscitate the trees than any amount of surface cultivation or manuring. This work is easier done in June and July; and where necessary, it should be started at once. Drainage pipes are more generally used, but stones, logs, waste timber, brushwood, and charcoal are all valuable as drainage mediums. The benefits of soil drainage have been so frequently urged, that it is hardly necessary to repeat them again.

PRUNING.

Pruning will now be largely occupying the attention of fruit-growers, and a start may now be made with this all important work. The requirements of each tree will need to be carefully studied, and the work carried out accordingly. Generally speaking, a tree should be kept fairly open, with its leaders and limbs evenly balanced, and worked outwards at a good angle, more approaching the angle of 45 degrees. Straight, and consequently strong upright, growths should always be suppressed; and the laterals and spurs should always be encouraged in the lower and middle regions of the tree. The most useful type of tree is one that will allow all operations, such as spraying, thinning and picking the fruit, to be carried out with as great ease as possible, and with little use of ladders.

Vegetable Garden.

The principal work in this section during June is the preparation of beds for the main crop of vegetables. Most vegetables require, and thrive best in, a thoroughly well worked soil, the soil being as friable as possible. The beds should be deeply worked; all manures should be well rotted, and evenly distributed throughout the soil.

One point to be emphasized is a good system of rotation whereby a continual succession of the different classes of vegetables is grown in the beds. This is not only valuable as a method of soil restoration and improvement, but it helps to reduce and weaken any insect or fungus disease that may have been present.

Asparagus beds may now be renovated, and new beds planted according to directions given in the April number of the *Journal*. Onions and any other seedlings that are sufficiently far advanced may now be planted out; and succession crops of spinach, radish, peas, broad beans, leek, lettuce, carrot, &c., should be planted.

The planting of rhubarb beds should now be completed.

Flower Garden.

June is generally considered the month of drudgery in the flower garden; although to enthusiasts, there is no such season.

Such work as digging, top dressing with manures, cutting back shrubs, cleaning up the beds, planting out deciduous trees and shrubs, notably roses, will all be carried out this month.

Leaves, light prunings, and vegetable matter of all descriptions should either be dug into the beds, or placed in some corner to form a compost heap. This heap is greatly enhanced by the addition of wood ashes. As a soil corrective and as manure, there is no waste material more valuable than wood ashes: and, mixed with vegetable humus in the compost heap, the result forms a valuable addition to the garden soil.

This is the month for planting out roses. Some of the newer roses are of beautiful form and colour. The average gardener does not test the newer and expensive varieties as they come out, preferring to leave that work to the rose enthusiast, and to profit by his successes—and failures. Among old roses, a garden is incomplete without La France, the two Cochets, Belle Siebrecht, Georges Schwartz, Frau Karl Druschki, Madame Abel Chatenay, Mildred Grant, and many others. Some of the later varieties are very worthy of notice, and among these are George C. Waud, Rhea Reid, Madame Maurice de Luze, Mrs. A. R. Waddell, Laurent Carle, Lyon Rose, Warrior, Yvonne Vacherot, and Souv. of Stella Gray.

In planting roses, the roots should be thinned out, all bruised and broken parts cut out, and the balance well laid out in the hole. The bed should be thoroughly and deeply dug, to a depth of two or three feet. The presence of clay in the soil is an absolute essential to successful rose culture. The accepted method of soil preparation amongst rosarians is to dig out the soil and clay to a depth of from two to three feet, and replace clay and well rotted stable manure in alternate layers of a few inches each, finally planting the rose in the top soil. It is certainly productive of excellent results to bury in the soil of the rose bed all kinds of animal refuse, such as bones, hair, hoofs, tan-yard refuse, &c., and these, mixed with wood ashes, form a valuable part of rose producing soil.

Rose cuttings should now be planted, and also cuttings of hard-wooded shrubs.

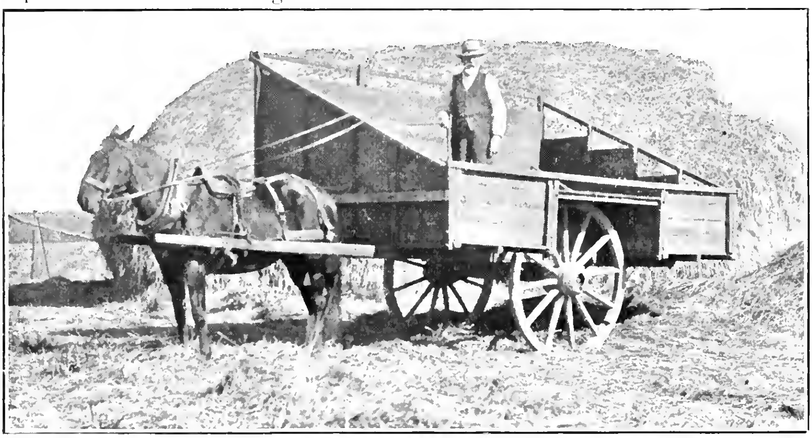
Sweet pea seeds may still be sown for a succession of blooms.

LUCERNE HAY CART.

E. A. Ryland, Dairy Supervisor.

The accompanying illustration is that of a lucerne hay cart, built by Mr. J. Pratt on his farm at Swan Hill.

The chief advantage in using a vehicle of this description is that it saves labour; it can be easily loaded by one man from the ground, and the load does not require to be built or tied. The cart will hold upwards of a ton of loose lucerne hay, and can also be used for removing other fodder crops, such as maize, sorghum, and millet.



MR. PRATT'S LUCERNE HAY CART.

Although while the cart was being built, the neighbours were very sceptical as to its utility, it has been in great request since they have seen it in use.

The dimensions are:—Length, 12 ft.; width, 8 ft.; height (high side), 5 ft. 6 in., (low side), 2 ft. As the wheels are higher than the floor they are boxed inside. The cart is floored with 1-in. packing-case boards and the sides consist of lining boards (6 in. x $\frac{1}{2}$ in.) bolted to hardwood uprights. The cart is light in draught, and has an "outrigger" attachment for another horse.

LIST OF FRUIT TREES, ETC.,

GROWN AT

THE ROYAL HORTICULTURAL GARDENS AND SCHOOL OF HORTICULTURE, BURNLEY.

E. E. Pescott, Principal.

This list comprises the total number of fruit trees, vines, &c., in cultivation at the Burnley orchards at the end of December, 1909. It is intended to annually increase the collection with both old and new varieties of fruits, and a supplemental list will be published each year.

Buds and scions may be obtained in limited quantities, if available, by the general public, of such varieties that are not obtainable from nurserymen.

Nurserymen may obtain the buds and scions in exchange for similar wood, or for young trees.

Varieties of trees that have proved generally useful and fruitful are prefixed by an asterisk.

The following are the numbers of the various kinds of fruits:—

Almonds, 10 varieties	Figs, 24 varieties	Plums, 209 varieties
Apples, 633 varieties	Nectarines, 18 varieties	Quinces, 13 varieties
Apricots, 37 varieties	Peaches, 16 varieties	Vines, 194 varieties
Cherries, 20 varieties	Pears, 342 varieties	Miscellaneous, 38 varieties.

The orthography and nomenclature of Hogg (1884) and Thomas (1903) have been strictly adhered to throughout the list.

Almonds.

*Brande's Jordan
Early Jordan
Hawthorn Seedling
*I.X.L.
Languedoc
Large Soft Shelled
Lewelling's Prolific
*Nonpareil
*Paper Shell
*Sultana

Apples.

Abram
*Adam's Pearmain
Albion
*Alfriston (true)
Allsop's Beauty
Allsop's Early
*Allan Bank Seedling
Allen's Everlasting
Allington Pippin
Amatia
Amère de Berthcourt
American Beauty
*American Golden Russet
*American Golden Pippin
*American Mother
American Nonpareil
*Annie Elisabeth
Api
Apollo Bay Seedling
Aporta
Arabaskoe
Argile Gris
*Aromatic Carolina
*Aromatic Cornish
Aromatic Quatford
Ashmead's Kernel
*Astrachan Red
*Astrachan White
*Autumn Pearmain
Autumn Tart
Balchin Pearmain
*Baldwin
Baltimore
Banks Exhibition
Barcelona Pearmain
Barnack Beauty
*Baron Ward
Bars
Bascombe Mystery
*Battalion
*Baxter's Pearmain
Beachemwell
Beatrice
Beau Apple
Beauty of Bath
Beauty of Kent
Beauty of the West
Bedan
Bedford
Bedfordshire Foundling
Belle de Boskoop
Belle de Magny
*Belmore Pippin
*Ben Davis
Ben Lomond
Bentley's Sweet
Benwell's Large
Bethlehemite
Birchgrove
Bizell's
Black Ben Davis
Blackshear
*Blenheim Pippin
*Blue Pearmain
Blüt Apple
*Bonum
Borrowdale
Borsdorffer
Borsdorffer Strié de Bohème
*Boston Russet
Boutteville Jaune
*Brabant Bellefluer
Bramtot
Brickley's Seedling
Britchel
Bromley's Seedling
*Brown's Pippin
*Brownlee's Russet
Bruce's Summer
*Buckingham (Equinetely)
Bunce
*Buncombe

Burwood
Byford Wonder
*Calville Blanche d'Été
*Calville Blanche d'Hiver
*Calville Rouge
Cambusnethan Pippin
Cammack's Sweet
Cannonade
*Cannon Pearmain
*Capper's Pearmain
Cardinal
Carolina
Carolina Red June
Carter
Castle Major
Cat's Head
*Cellini
Chalk's Ton
*Chamberlain's Late Scarlet
Champion
Chapman's
Charles Ross
Chattahoochie Greening
Chelmsford Wonder
Cheoce
Chestatee
*Chestoa
Chicago
*Cheltenham Pippin
Chemise de Soie Rouge
*Chenango Strawberry
Chronical
Cimetière de Pays
*Claygate Pearmain
Clayton
Claudius Früber Herbst
*Cleopatra
*Cobham
Cobrico
Cockle Pippin
Colourette
*Commerce
*Compton
Condom
*Constantinople
*Cooper's Market
*Cornish Gilliflower
Coronation
Count Orloff
*Court of Wick
Court Pendu
*Cox's Orange Pippin
Cox's Red Leaf Russet
Creasey's Seedling
Crémière
*Cullasaga
*Cullawhee
Daniel
De Boutteville
Defiance
Deitzer's Golden Reinette
*Delicious
Dennis' Seedling
*Devonshire Quarrenden
*Dillington Beauty
Disharoon
*Dr. Hogg
Dr. Livingstone
Dominie
*Donaldson's Seedling
Doonside
Doux Amer Gris
Downton Pippin
Drap d'Or
*Duchess d'Oldenberg
*Duckett
Duke of Devonshire
*Dumelow's Seedling
*Dundonald
*Dutch Mignonne
Eagle's Seedling
*Early Almond
Early Green Hayes
*Early Harvest
*Early Red Margaret
Early Richmond
*Early Strawberry
East End
*Ecklinville Seedling
*Eddy's Favourite
*Edgar's Red Streak
Edward Lippiatt
Edwin
Egg or White Paradise
Elarkee
Elgin
*Emperor Alexander
Emperor Napoleon
Epp's Favourite
*Esopsus Spitzenberg
Etowah
Fair Ellen
Fairleigh's Pippin
Fairy
*Fall Pippin
Fall Wine
Fanny
Fearn's Pippin
Filby Seedling
*Fillbasket (Kentish)
*Five Crown or London Pippin
Flanders Pippin
Fletcher's Crimson
Flower of Herts
*Forfar Pippin
*Forge
Forth's Gippslander
Foster
Frampton
French Codlin
*French Crab
Frequin Audivere
Frequin Audivere Rouge Amer
*Frogmore Nonpareil
*Galloway Pippin
*Garden Royale
*Garibaldi (Chapman's)
Gascoigne's Scarlet
*George Neilson (Draper's)
*Gipsy
*Gladney's Red
Glenmaggie
Glory of England
Glory of the West
*Golden Ball
Golden Harvey
*Golden Noble
Golden Pippin (English)
Golden Pippin (Whatmough's)
Golden Queen
*Golden Reinette
Golden Russet
*Gooseberry Pippin
Gordon's Seedling
*Governor Glade's Red Streak
*Grand Duke Constantine
Grand Richard
Grand Sultan
*Granny Smith
*Gravenstein
Green Tom Putt
Greeve's Pippin
*Grenadier
Grey Leadington
*Grosse Casseler Reinette
*Grüner Fürstein Apple
Hall Door
*Hamilton
*Harcourt Pippin
Hanzen's Golden Pippin
Harmond's Seedling
Hartford Sweet
*Harvey's Seedling
Harvey's Wiltshire Defiance
Haskell Sweet
*Hawthornden (Murray's)
*Hawthornden, New French
Hawthornden, Red
*Herefordshire Beefing
*Herefordshire Pearmain
*Hoary Morning of the Colony
*Hoary Morning (English)
Hocking's Greening
Hockett's Sweet
Holding
*Hollandbury
Holland Pippin
Holly
*Hoover
*Horn
Horse
*Hubbardston's Nonsuch
Hulbert
Hunter's Choice
Huntingdon Codlin
*Huon Mystery
*Huon Pearmain
Italian Red
*Jackson's Seedling
Jacques Lebel
James Greive
Jefferson
Jewett's Best
*John Toon
*Jonathan
Jubilee (Brimmer's)

Julian
*Kansas Queen
Karabowka
Keddleston Pippin
Kentish Codlin
*Kentish Fillbasket of the Colony
*Kentucky
*Keswick Codlin
*Kew Pippin
*King David
*King of the Pippins
*Kingston Nonpareil
Kirk's Golden Pippin
Kittageskee
Ladies' Sweet
*Lady Daly
Lady Henniker
*Lady Hopetoun
Lady Sandwich
Lady Sudely
*Lamb Abbey Pearmain
Lancashire Lass
*Lane's Prince Albert
*Lang's Best
Langley Pearmain
*Lapsley Pearmain
Large Hunthouse
Larra
*La Trobe
*Late Aromatic
Late Nonsuch
*Late Wine
Late Winter (Cole's)
*Lemon Pippin
Leo the Tenth
Lewis' Incomparable
Lincoln Pippin
Liveland Raspberry
*Lodgemore Nonpareil
Loddington
Longville's Kernel
*Lord Burleigh
*Lord Clyde
*Lord Grosvenor
*Lord Lennox
*Lord Suffield
*Lord Wolseley
Loy
Mabbott's Pearmain
*McAfie's Nonsuch
*Magg's Seedling
Magnolia
*Maid of Hawthorn
Malakoona
Mann
*Manx Codlin
*Marjel
*Marshall's Red
McIntosh's Red
McLean's Favourite
McLellan
*Majetin
*Mamma
*Mannington Pearmain
Maverick's Sweet
*Mela Carla
*Mellon's Seedling
Melrose
*Melville Red Streak
*Ménagère
Mercer
*Merritt's Royal Pearmain
Meuller's Spitz Apfel
Michelon
*Missouri Pippin
*Mr. Gladstone
*Monmouth Pippin
*Moore's Extra
*Morgan's Seedling
Moultries or Indian Winter
*Munroe's Favourite
Nantahallee
Napolitaine
Nelson Codlin
Neverfail
New England Pigeon
*Newman's Seedling
*New Rock Pippin
*Newton Wonder
*Newtown Pippin, Green
*Newtown Pippin, Yellow
*Nickajack
Nicolayer
Niton House
Noir de Vitry
Nonpareil, Early
*Nonpariel, Old or White
*Nonpareil, Scarlet
*Nonsuch
Norfolk Beefing
Norfolk Storing
*Northern Spy
*Northern Spy Seedling
Oakhill
Occident
Oconee Greening
Ohinimaru
Ohio Nonpareil
Orange Nonpareil
Ord's
Oregon Mammoth Black
*Ortley (Imported)
Paradise, Cole's Blight Proof
Paradise, French
*Parker's Glory
Parry's Pippin
Peach Apple
*Peck's Pleasant
Pegg's Seedling
Penny Loaf
*Perfection (Shepherd's)
*Peter the Great
Petite de la Santa
Pewaukee
Pickard's Reserve
*Pigeonette
Pile's Russet
Pine Apple Russet
*Pioneer
Pitmaston Golden Pippin
Pitmaston Pine Apple
Pomme Amère
*Pomme de Neige
Pomme Grise
Pomme Grise Ménagère
Pomme Joseph
Pomme Royale
*Porter
Potts' Seedling
Pound Royale
*Prince Alfred
Prince Arthur
*Prince Bismarck
Prince Rudolphe d'Autriche
Prinz Apfel
*Prior's Red
*Prother's Winter
Pumpkin, Sweet
*Purity
Pymble's Seedling
Queen Caroline
Queen of the Pippins
Rambo
Red Betigheimer
Red Caldwell
*Red Canada
*Red Jacket
Red Normanby
Reinette à feuilles d'Acuba
*Reinette Baumann
Reinette Blanche d'Espagne
*Reinette de Canada
Reinette de Caux
Reinette de Cuzi
*Reinette Franche
*Reinette Jaune Musquée
*Reinette Kroone
Reinette Musquée
Reinette Oberdeich
Reinette Perle
*Rhode Island Greening
Rhodes' Orange
Ridgway's Red
Rinahowski
*Ringer
*Rival
Rodney (Kialla)
*Rokewood
*Romanite
*Rome Beauty
Ronald's Bess Pool
Rosehill
*Rosemary Russet
Rouge Brugère
Rouge de Trèves
Roundaway Magnum Bonum
Royal Jubilee
Royal Oak
Royal Russet
*Royal Sovereign
Ruby Pearmain
Rushock Pearmain
*Russet par Excellence
*Rymer
St. Alban's Pippin
St. Martin
St. Sauveur
Sam Young
Sandringham
Santa

*Scarlet Pearmain
*Scarlet Queen
Scarlet Tom Putt
*Schell
*Schroeder's Apfel
*Schroeder's Seedling
*Scott's Seedling
Seaton House
Seedless (Imported)
*Selector
*Senator
September Beauty
Serinka
*Shannon
Sharp's Early
Shiawasse Beauty
Shorland Eclipse
*Shorland Pearmain
Shorland Reinette
*Simmons' Winter
*Sing's Seedling
Sir Henry Parkes
Small's Admirable
*Smith's Cider
*Smith's Early Red
Smith's Midseason
Somerset Lasting
South Carolina Greening
*Speckled Pearmain
Spice Apple of Burntisland
Spring Grove Codlin
*Spring Ribston
Stanley's Seedling
*Stayman's Winesap
Stark
Staten
*Statesman
*Stewart's Seedling
*Stirling Castle
*Stone Pippin
*Stone's Harcourt Favourite
*Striped Beefing
*Stubbard
*Sturmer Pippin
*Sugar Loaf Pippin
Summer Box
Summer Golden Pippin
Summer King
Summer Rose
*Sutton Beauty
Sutton's Seedling
Sweet Bough
Sweet June
*Sweet Lading
*Sykehouse Russet
Taccocee
*Talkapuna Russet
*Taunton
Taupaki
Tetofsky
*The Queen
Thompson's Long Keeper
Thorle Pippin
Tomber Mogden
Tom Thumb (Whatmough's)
*Tower of Glamis
*Transparent (Cole's)
*Trivett's Seedling
Tufts' Baldwin
Tupp's Surprise
*Tuscaloosa Seedling
*Twyford Beauty
Tyler's Kernel
*Ulleuner's Golden Reinette
*Vandevere
Verité
Victoria Nonpareil
*Von Moltke
*Wagener
Waltham Abbey Seedling
*Wandiligong Favourite
*Warner's King
*Washington
Watson's Carolina
*Watson's Dumpling
Weatherall's Pippin
*Wealthy
*Werder's Golden Reinette
Wells' Sweet
Whatmough's Pearmain
White Tom Putt
White Pippin
White Quarrenden
*White Transparent
White Winter Pearmain
Whitney Pippin
*William Anderson
*William Ellison
*William's Favourite
*Willow Twig
*Wine
Winter Coleman
*Winter Peach
Winter Queening
Winterstein
*Winter Strawberry
*Winter Strawberry Pippin
Woodstock Pippin
*Worcester Pearmain
*Wormsley Pippin
Wyken Pippin
*Yarra Bank
*Yates
*Yeates' Nonpareil
*Yellow Bellefleur
Yopp's Favourite

APPLES—CIDER VARIETIES.

Belle Norman
Bottle Onions
Bottle Stopper
Corney
Devonshire Bitter Sweet
Forest Styre
Foxley
Garter
Izard's Kernel
Jason's Spice
Kingdom Sour
Kingston Black
Red Cluster
Red Must
Red Sour
Red Store
Siberian Bitter Sweet
Siberian Harvey
Sir Richard
Strawberry Norman
Wilding
Wood's Sour

APPLES—CRABS.

American Cherry
Bowen
Coral
Currant
Darling
Dean (double flowering)
Hyslop
John Downie
Lady
Large Red Siberian
La Trobe
Marengo
Red Siberian
Sutton
Transcendent
Virginian
Yellow Siberian

APRICOTS.

Allen's Early
*Alsace
*Angoumois Hatif
*Aspasia
Beauge
*Bush Peach
*Campbellfield Seedling
Canino Grosso
*Dundonald
Early Turkey
*Elruge
*Frogmore Late Pine
*Hâtif d'Auvergne
*Hemskirke
*Kaisha
La Delicieuse
*Large Early
*Large Red
Luizet
*Mansfield Seedling
*Montgamet
Montplaiser
*Moorpark
*New Large Early
*Oullin's Early Peach
Pennant Hill's Oval
Précoce d'Oullins
Précoce de Wunnie
Prolific
Roman
Royal Orange
*Russian
*Shipley's
Sydney Orange
Turkey
Viard
Willis' Early

CHERRIES.

Belle Agathe
*Belle d'Orleans
*Bigarreau, Black
*Bigarreau de Mezel
*Bigarreau Napoleon
*Bigarreau, Scarlet
*Bigarreau, Turkey
*Bigarreau, Twyford
Black Hawk
*Black Tartarian
*Downton
*Early Red Guigne
*Early Strassen
*Florence
Governor Wood
Kirtland's Mammoth
Olivet
*Planchoury
*St Margaret's
*White Heart

FIGS.

A Bois Jaspé
Bourjassotte Blanche
Bourjassotte Grise
*Bourjassotte Noire
Bull's No. 1
Cheameghour
D'Agen
Datte
*De Lipari
*De St. Jean
Dwarf Prolific
Early Violet
*Grosse Verte
*Large Black Genoa
*Longue Blanche de Provence
Madeline
*Marseillaise
Royale Blanche
St. Dominique
Singleton Perpetual
Verdal
Violette Grosse
*White Genoa
White Provence

NECTARINES.

*Albert Victor
*Carrington
*Cricket
*Darwin
Goldmine
*Goldoni
*Hunt's Tawny
*Irrawarra
*Lord Napier
*Mrs. Dr. Chisholm
Napoleon
River's Orange
*Seedling Stanwick
*Shorland Tawny
*Twyford Surprise
Victoria (River's)
Violette Hative
White Slipstone

PEACHES.

*Brigg's Red May
Buck's Prolific
*Early Albert
*Early Louise
*Elberta
*Foster
Fox's Large Red
George's Late Cling
*Hain's Early
Jersey
La Grange
*Mountain Rose
Reine des Vergers
Warrington
Wheatland
Wilkins' Cling

PEARS.

Aglæ Grégoire
Alama
Albert Burbridge
Alexandre Bivort
*Alexandre Lambre
Althorpe Crassane
Ambrosia
Amiré Joannet
Amy Chalmers
André Desportes
*Anna Nelis
*Auguste Mignard
*Autumn Bergamot
Autumn Prolific
Avocat Allard
Baden Powell
*Bakehouse's Bergamot
Barbe Nelis
Barland
Baronne de Mello
Barry
*Beacon
Beadnell's Seedling
Bergamotte Cadette
*Bergamotte Cole
Bergamotte Esperen
*Bergamotte Gansel's
*Bergamotte Gansel's Late
*Bergamotte Hertrich
Bergamotte Molle
Belle de Malines
Belle et Bonne
*Belle Julie
*Bellissime d'Hiver
Besi Esperen
Besi Maie
Besi Montagne
Beurré Ananas
*Beurré Bagnet
*Beurré Baltet Pere
Beurré Benoit
*Beurré Berckman's
*Beurré Bergamot
Beurré Beymont
Beurré Blumenbach
*Beurré Bosc
*Beurré Brown
*Beurré Capiaumont
*Beurre Clairgeau
*Beurré d'Amanalis
Beurré d'Amanalis Panachée
*Beurré d' Anjou
*Beurré d'Aremberg
Beurré de Caen
Beurré de Fevrier
*Beurré de Jonghe
*Beurré de l'Assomption
*Beurré Delfossé
Beurré de Wetteren
*Beurré Diel
Beurré Dumont
Beurré Duval
*Beurré Easter
*Beurré Giffard
Beurré Gris
*Beurré Gris d'Hiver
*Beurré Hardy
Beurré Langelier
Beurré Preston
*Beurré Rance
*Beurré Six
Beurré Spae
Beurré Sterckmans
*Beurré Superfin
*Beurré Van Driessche
Bishop's Thumb
*Black Achan
Blanche
Bloodgood
Bon Chrêtien Fondante
Bon Chrêtien Seedling
Bon Chrêtien Summer
Bon Chrêtien Turc
*Bon Chrêtien, Williams'
Bon Chrêtien (Whatmough's)
Bouvier Bourgmestre
*British Queen
*Brockworth Park
*Broompark (English)
*Broompark (of the Colony)
Brougham
*Buffam
Calebasse Boisbunel
*Calebasse Cole
*Calebasse Grosse
*Catillac
Catinka
Céleste
Charles Cognac
*Chaumontel
Chaumontel Striped
Chinese
*Coit's Beurré
*Cole
Cole's Coreless
Colmar
Colmar d'Aremberg
Colmar d'Été
Colmar de Jonghe
Commissaire Delmotte
Comte de Chambord
*Comte de Lamy
Comte de Paris
*Conference
*Conseiller de la Cour

Culotte de Suisse
*Cumberland
Dana's Hovey
De Maraise
*Désirée Cornelis
De la Chine (331) (Chinese)
De la Chine (1404) (Chinese)
De la Chine (1405) (Chinese)
Délices de Hardenpont
Dempsey
Deux Sœurs
*Dix
*Dr. Hogg
Dr. Lentier
*Dr. Nelis
*Dorendeau
*Doyenné d'Alençon
*Doyenné Blanc
*Doyenné Boussoch
Doyenné Defais
*Doyenné d'Été
*Doyenné Du Comice
Doyenné Goubalt
Doyenné Gris
Doyenné de Mérode
Doyenné Richard
Duc d'Aumale
Duc de Morny
*Duchesse d'Angoulême
Duchesse d'Hiver
*Duchesse d'Orleans
Duffy's Seedling
*Elisabeth Cole
*Elisabeth Sophia
*Elisa d'Heyst
*Embassy (Draper's)
*Emilie de Heyst
Eugene Appert
*Eyewood
Fame
*Fertility
*Figue de Naples
Fladberg
*Flemish Beauty
*Flemish Rose
Fondante d'Automne
Fondante de Bihoral
Fondante de Cuerne
Fondante de Malines
Fondante de Mars
Fondante de Noel
Fondante de Panisel
Fondante de Thirriott
*Forelle
Franc Real d'Hiver
*Frederick Clapp
*Fulvie Grégoire
*Garber's Hybrid
*General Todleben
*Giblin's Seedling
*Gilogil
*Glou Morceau
*Golden Beurré
Golden Drop
Great Britain
*Green Chisel
Grégoire Bordillon
*Groom's Princess Royal
Hacon's Incomparable
*Harrington's Victoria
Henri le Docte
Hérault d'Angers
Hessle
Hoosic
*Howell
Huyshe's Prince Consort
*Huyshe's Prince of Wales
*Huyshe's Victoria
*Idaho
Incomparable de Beauring
Iris Grégoire
Isse Bonne
Jalousie de Fontenay
*Jaminette
Jargonelle
*Jean de Witte
*Jersey Gratioli
*Jones' Seedling
*Josephine de Malines
Joyeau de Septembre
*Keiffer's Hybrid
King Edward
King Harry
*Knight's Monarch
Koonce
*L'Inconnue
La Juive
*Lammas
La Sœur Grégoire
*Late Crawford
*Lawrence
Lawson
*Le Conte
*Le Lectier
*Leon Leclerc de Laval
*Leopold the First
*Lionel de Barny
Lion Rex
London Sugar
*Louise Bonne de Printemps
*Louise Bonne of Jersey
*Lucy Grieve
*Madame Cole
*Madame Eliza
Madame Grégoire
*Madame Henri Desportes
*Madame Lang
*Madame Loriol de Barny
Madame Marshall
*Madame Meuller
Madame Millet
*Madame Treyve
Madame von Siebold
Maggie Seckel
*Magnate
Manning's Elisabeth
*Maréchal Valliant
Maréchal Wilder
Marguerite Marillat
Marie Guisse
*Marie Louise
*Marie Louise d'Uccle
Marie Louise Nouvelle
Marie Marguerite
Mash Putti
Mélanie Michelon
Melon de Namier
Miel de Waterloo
Millot de Nancy
*Monchallard
Mons. de Hons
Morel
*Mossmont
*Mother (Cole's)
*Mount Vernon
Muirfowl's Egg
Napoleon
Napoleon Sauvigneau
Nashir
Navez Peintre
*Nec Plus Meuris
*Neverfail
Nouveau Poiteau
*Nouvelle Merveille
Old Crassane
Oldfield
Olivier de Serres
Osband's Summer
Packham's Triumph
*Paradis d'Automne
*Passans de Portugal
*Passe Colmar
*Peach
Pierre Pepin
*Pitmaston Duchess
*Poire de Berriays
*Poire Decima
Poire du Voyageur
Prevost Van Mons
Prince Albert
Prince Napoleon
Princess of Wales
*Professor Barral
Reine des Précoces
Richmond Nelis
Rivers
Rousselet de Stutgardt
*Rutter
St. Germain
*St. Michael Archangel
Sebastopool
*Seckle
Sellick
Senateur Mossleman
Senateur Reivel
*Sheldon
Shobden Court
*Smith's Hybrid
*Souvenir du Congrès
*Souvenir d'Esperen
Suffolk Thorn
*Summer Beurré d'Aremberg.
Summer Crassane (Cole's)
Summer Franc Real
Surpasse Crasanne
Susette de Bavay
Swan's Egg
Tasman
*Telegraph
*Thompson's
Tresor d'Amour Belle Angelina
*Triomphe de Jodoigne
Triomphe de Louvain

*Twyford Monarch
Tyson
*Urbaniste
*Uvedale's St. Germain
Van de Weyer Bates
*Verulam
*Vicar of Winkfield
Victoria Langelier
*Vineuse
Virgouleuse
Vookies, No. 1
Vookies, No. 2
*White Monarch
Willermoz
William's Victoria
Windsor
Winter Bartlett
*Winter Cole
Winter Crassane
*Winter Nelis
Yat
Zéphirin Grégoire
Zéphirin Louis Grégoire
Zoe

PLUMS.

Admiral Togo
Altesse Blanche
Andrew's Superb
*Angelina Burdett
Apricot (Leigel's)
Autumn Compote
Ballena
*Belgian Purple
*Belle de Louvain
*Belle de Septembre
*Belle Schomburgh
*Black Gage
Blue Impératice
Bolankio
Bonnet d'Evêque
*Boulouf
*Bradshaw's Large Red
*Brahy's Green Gage
Bryanston Gage
Bulgarian Prune
*Burbank
*Cant's Late Green Gage
*Chabot
*Cherry Plum Red
*Cherry Plum Yellow
*Climax
*Clyman
*Coe's Golden Drop
*Coe's Golden Drop Purple Sport
*Cole's Blue Superb
*Cole's Purple Drop
Cumberland
*D'Agen (Prune)
*Damson, American
Damson, Bolwarra
Damson, Cluster
*Damson, Cole's Prolific
Damson, Cole's Superior
*Damson, English
*Damson, French
Damson, Herefordshire
*Damson, Kneeshaw's
*Damson, Lutherborough
Damson Plum
Damson, Rivers' Early
*Damson, Shropshire
Damson, Summer
*Damson, Vermont
*Damson, White
*D'Automne de Schmale
De Caradeuc
*De Montfort
*Decaisne
*Denbigh
*Deneyer's Victoria
*Denniston's Superb
*Diamond
*Diapreé Rouge
Dove Bank
Downton Impératrice
*Duke of Edinburgh
*Early Admirable
*Early Orleans
Early Gem
Early Golden Drop
Early Mirabelle
Eugène Fürst
*Evan's Early
Federation
Formosa
*Fotheringham
*Fellemberg (Italian Prune)
*French Prune, Californian
*French Prune, Early
*French Prune, Late
*Frogmore, Purple Gage
Fulton
Furngiya Beni
Garfield
Gaviota
General Hand
*General Saigo
German Prune
Giant Prune
Golden Esperen
*Golden Heart
Golden Prune
*Golden Tines
Goliath
*Grand Duke
*Grape
*Green Gage
*Guthrie's Late Green
Haku Botan
Hale
Harpers
Hattankio
Hermosillo
*Hill End
*Huling's Superb
*Ickworth Impératrice
Iko Botan
Imperial Gage
*Impériale de Milan
*Isabella
*January Prolific
*Japanese Large Red
*Jefferson
*Jodoigne Green Gage
Julien
Kanawaba
*Kelsey
*Kirke's
La Delicieuse
*Lafayette
*Large Black Imperial
*Late Black Orleans
Late Harvey
*Late Rivers
Lawrence Orleans
Lincoln
Lombardy
Lord Kitchener
*McLaughlin
Madiera
*Magnum Bonum Red
*Magnum Bonum White
Marianne
Masu
Maynard
Meredith's
*Mikado
Mirabelle Jaune
*Mirabelle Tardive
*Mirabelle Von Flowtow's
*Mitchelson's
*Monarch
*Moyola
Mussel
Newman's
*Normandie
*Nouvelle de Dorelle
*October Green Gage
*October Purple
*Oregon Silver
*Oullin's Golden Gage
*Overall
*Peach Plum
*Perdrigon Violette Hatif
Pershore
Petite d'Agen
Petite d'Été
*Pond's Seedling
Pourparts
Précoce de Berthgold
Précoce de Tours
*Prince Englebert
*Princess Alexandra
Prunus pisardi
*Purple Gage
*Quetsche St. Martin's
*Red Nagate
Reine Claude Boddaert
Reine Claude Braunau
*Reine Claude de Bavay
*Reine Claude Rouge
Reine Claude Victoria
*Reine Victoria
*Rivers' Early Favourite
Rivers' Early Prolific
*Robe de Sargent
*Royal Dauphin
Royal de Tours

Royal Hâtive
Royal d'Braunau
Rubio
Rutland Plumcot
*Sans Noyeau
Santa Rosa
*Satsuma or Blood Plum
Spinosus or Black Thorn
Splendour Prune
*Standard of England
Stint
Sugar Prune
*Sultan (English—Rivers')
Sultan (Japanese)
Takapuna Drop
*Tardive Musque
*The Czar
Tragedy Prune
*Transparent Gage
Victoria
Victoria Gage
Violette de Galopin
*Violette Hâtive
*Washingon
White Bullace
*Wickson
Wild Goose
Wilmot's Late
Winesour
*Woolston Black Gage
*Wright's Early
*Yabose
*Yellow Gage
*Yellow Impératrice
*Yellow Japan
Yellow Victoria

QUINCES.

*Angers
*Apple Shaped
Chinese
Common
French
*Hertfordshire
*Manning's Seedling
*Master's Early
Orange
*Pear Shaped
*Portugal
*Rea's Mammoth
Rivers

VINES.

Aleppo
Almeria
Alnwick Seedling
*Bashan's Mammoth
Beau Noir
*Blue Imperial (Œilliade)
*Black Constantia
Black Frankenthal
*Black Grenache
*Black Hamburgh
*Black July (European)
*Black Muscat
*Black Prince
*Black St. Peter's
*Black Tripoli
Bouzzy Noir
*Bowood Muscat
*Braddick Hambro'
*Buckland Sweetwater
Burchardt's Amber Cluster
*Cabernet Sauvignon
*Calabrian
*Cambridge Botanic Garden
*Canon Hall Muscat
*Caracossa
Carignane
*Centennial (Victorian)
*Champion Hamburg
*Champion Muscat
*Chaptal
Chardonette
*Chasselas Golden
*Chasselas Musqué
*Chasselas Musqué de Sillery
*Chasselas Noir
*Chasselas Parsley Leaved
*Chasselas Rose
*Chasselas Vibert
*Chavoush (Chaouch)
Clairette Poinceau
*Cornichon Blanc (Ladies' Finger)
*Cornichon Red (Pink Finger)
*Crystal
*Dr. Hogg
Dolce Noir
Dolcetto
*Doradillo
Duc de Magenta
*Duchess of Buccleuch
*Duke of Buccleuch
*Dutch Sweetwater
*Early Auvergne Frontignan
*Early Black Bordeaux
*Early Golden Frontignan
*Early Malingre
*Early Saumur Frontignan
*Early Silver Frontignan
*Early White Malvasia
Esperione
Fieldinger
*General Della Marmora
*Golden Queen
Graham's Large Black
*Grand Turk
*Gros Colman
Hambro' Francais
*Hermitage
*Hunter River Pineau Blanc
*Icy
*Ingram's Hardy Prolific
Jura Muscat
*Kesh Mish
Knight's Large Black
La Bruxeloise
*Lady Downe's Seedling
*La Gloire
La Mamelone
*Lombardy
*Madeline Royale
*Madresfield Court Black Muscat
*Malaga Muscatel
*Mataro
*Medoc
*Melville Castle
*Meredith's Alicante
Mesnie Blanc
Meurthe Frontignan
Middlemiss' Seedling
Miller's Burgundy
Millhill Hambro'
*Mrs. Pearson
*Mrs. Pince's Black Muscat
*Morocco Prince
Muscat d'Aout
*Muscat of Alexandria
*Muscat Hamburgh
*Muscat Houdan
Muscat Lierval
Muscat St. Laurent
Neri
*Pedro Ximenes
*Pitmaston White Cluster
*Raisin des Dames
*Red or Grizzly Frontignan
*Red Prince
*Reeves' Muscadine
*Reissling Black Spanish
*Reissling Red
Rochelle
*Royal Ascot
*Royal Muscadine
*Royal Vineyard
*Ryton Muscat
St. Giovette
*Shepherds' Reissling
Sherry
*Sicilian
*Sultana
*Sweetwater
*Syrian
*Tasca de Lorca
*Thompson's Golden Champion
*Thompson's Seedless
Tinto
*Tokay Frontignan
*Trebbiano (Curnow's)
*Trentham Black
*Trovèren Frontignan
*Verdelho
*Victoria Hamburg
*Waltham Cross
*Wantage
Wax
*West's St. Peters
*White Corsican
*White Frontignan
*White Hermitage
*White Morillon
*White Tokay
White Zante
*Wilmot's Sweetwater
*Winter Muscadine
*Woodward's Black
*Wortley Hall
*Xeres
*Zante Currant

PHYLLOXERA RESISTANT VINES.

This list has been fully elaborated by Mr. F. de Castella, who has furnished the pedigrees, as well as the degrees of resistance, of the various vines and hybrids. The letter R signifies phylloxera resistance in accordance with Vialla's scale, which ranges from 0 to 20.

Adirondack. Isabella seedling. R. 3-4.
Allen's Black.
Alvey. Complex Æstivalis hybrid. R. 7.
Anna. Catawba seedling. R. 3-4.
Canby's August. Labrusca hybrid. R. 3-4.
Catawba. Labrusca hybrid. R. 3-4.
Clinton. Æstivalis-Labrusca hybrid; grown in some parts of France in sandy soils as a direct producer. R. 8.
Cordifolia. Vitis cordifolia is very resistant. R. 18.
Delaware. Vinifera-Labrusca hybrid. R. 3-4.
Devereux. In France synonym of Black July. R. 11.
Diana. Catawba seedling. R. 4.
Elsinburgh. Æstivalis hybrid. R. 8-10.
Flowers. Variety of V. rotundifolia; very resistant. R. 19.
Genevieve.
Goethe. Labrusca hybrid. R. 3.
Holding.
Hybrid Fenouil. R. 8-10.?
Iona. Catawba seedling. R. 3.
Isabella. Very old Labrusca hybrid. R. 3-4.
Israela. Isabella seedling. R. 3.
Ive's seedling. Labrusca seedling. R. 3-4.
Lenoir. In France known as Jacquez, formerly much grown as a direct producer, and also as a stock. R. 12.
Lindley. Labrusca x Vinifera. R. 3.
Logan. Labrusca x Vinifera. R. 3.
Martha. Concord seedling. R. 3.
Maxatawney. Labrusca hybrid. R. 3.
Miles. Labrusca x Æstivalis. R. 3-4.
Monuka.
Pearson's Ironclad.
Perkins. Labrusca hybrid. R. 3.
Rebecca. Labrusca seedling. R. 3.
Rowland's Perkins. An improved variety of Perkins, raised in Melbourne.
Salem. Labrusca x Vinifera. R. 3.
Solonis Othello. R. 10-12.?
Thomas. Variety of Vitis rotundifolia; very resistant. R 19.
Tokaylon. Labrusca hybrid. R. 3.
Wilder. Labrusca x Vinifera. R. 3.
A.R.G. 2.† Aramon x Rupestris Ganzin, No. 2.
41 B.† Chasselas x Berlandieri.
1202.† Mourvedre (Mataro) x Rupestris.
601.† Bourrisquou x Rupestris.
Gamay Couderc.† Colombeau x Rupestris.

For these five vines marked †, which are Vinifera x American hybrids, it is difficult to assign resistance exactly; authorities differ. The best of them have now been proved to have resistance ample for all practical purposes. The first three are excellent stocks.

1616. Solonis x Riparia. R. 16-17.
34 E. Berlandieri x Riparia. R. 17.
Rupestris des Causettes. R. 17.?
420 A. Berlandieri x Riparia. R. 17.
3306. Riparia x Rupestris. R. 18.

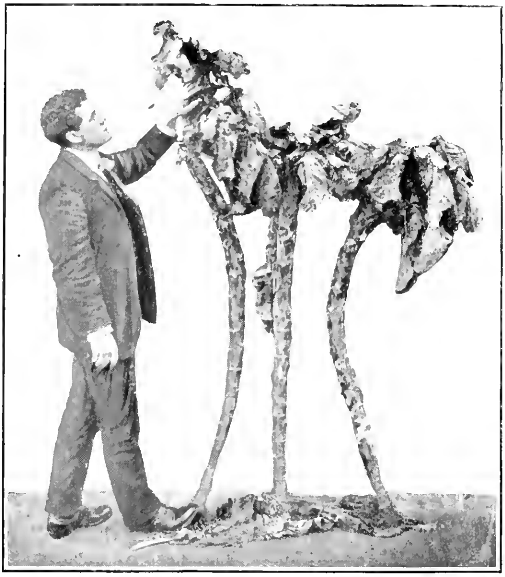
MISCELLANEOUS FRUITS.

Bramble, Himalayan
*Bramble, Lawton
Chestnut, Downton
Chestnut, Marion's Large Fruinka
Citron, Knight's
*Currant, La Versaillaise
*Dewberry, Lucretia
*Gooseberry, Billy Dean
Gooseberry, Bottle
*Gooseberry, Heart of Oak
*Gooseberry, Ploughboy
*Gooseberry, Roaring Lion
*Gooseberry, Sir H. Robinson
*Gooseberry, Warrington
Guava, Aromaticum
*Guava, Purple
*Lemon, Lisbon
*Lime, West Indian
*Loganberry
*Loquat, Common
*Loquat, Early Golden
Medlar, Dutch
*Medlar, Monstrous
Medlar, Nottingham
*Mulberry, Black
Mulberry, Indica
Mulberry, Macrophylla
Olive (variety from Spain)
*Passiflora edulis
*Rhubarb, Topp's Winter
*Rhubarb, Topp's Winter Improved
*Rhubarb, Wilson's Early
*Shaddock, Common
*Strawberry, Up-tut-Mark
*Strawberry, White Chilian
*Walnut, Dwarf Prolific
Walnut, Pecan
*Walnut, Santa Barbara

THE CHOU MOELLIER.

J. M. B. Connor, Agricultural Superintendent.

That the writer's recommendation of the growing of the fodder plant "Chou Moellier," which appeared in the October, 1908, issue of the *Journal*, has proved to have been justified is borne out by the many letters received from dairy farmers throughout the States who have secured excellent returns by the growing of this valuable fodder plant. The latest to hand is from Messrs. Thompson and Anderson, of "Koongal," Harcourt, who intend putting in a larger area this coming season. They write as follows:—



WEIGHT: 17, 16, AND 16 LBS.
Owing to some days having elapsed the plants were somewhat wilted when photographed.

"We are forwarding to you three Chou Moellier plants, weighing 17, 16, and 16 lbs. each respectively, and we think you will admit for new ground the result is distinctly good. We have already had three cuttings of leaves giving an average (total of three cuttings) of 14 lbs. per plant. The seed was planted in May last year, but we cannot say when the young plants were bedded out. The method of planting was as follows:—The paddock when cleared was ploughed, then left to fallow for about a month, then cross ploughed and harrowed. The young plants were put in rows three feet apart and eighteen inches between each plant. A small quantity of stable manure was applied as a mulching; at a later period when the plants were about 12 inches high bone manure was applied, a dressing equal to half-a-ton per acre. Each row was hilled up so that when irrigating the water could run down between each row of plants, the method of watering being the "Chinese Garden" style. Four waterings were given during the summer, hand cultivation following each watering. Leaf cutting resulted in an average of $5\frac{1}{2}$, $4\frac{1}{2}$, and 4 lbs. respectively being gathered from each plant. Some of the leaves weighed as high as $1\frac{1}{4}$ lbs. each. The total yield for the three cuttings works out at the rate of $60\frac{1}{2}$ tons per acre."

STATISTICS.

FIRST QUARTER, 1910.

Rainfall in Victoria.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with the corresponding monthly and quarterly averages for each Basin, deduced from all available records to date.

Basin or District.	January.		February		March.		Total for First Quarter.	Average for First Quarter.
	Amount, 1910.	Average.	Amount, 1910.	Average.	Amount, 1910.	Average.		
	points.	points.	points.	points.	points	points.	points.	points.
Glenelg and Wannon Rivers	116	121	43	89	459	149	618	359
Fitzroy, Eumeralla, and Merri Rivers	114	147	50	164	415	165	579	476
Hopkins River and Mount Emu Creek	148	145	48	104	496	160	692	409
Mount Elephant and Lake Corangamite	168	153	32	107	400	176	600	436
Cape Otway Forest ...	185	211	67	147	415	258	667	616
Moorabool and Barwon Rivers	122	146	38	116	332	177	492	439
Werribee and Saltwater Rivers	116	144	35	134	250	183	401	461
Yarra River and Mount Dandenong Creek	197	250	85	172	289	277	571	679
Koo-wee-rup Swamp ...	197	242	79	158	273	270	549	670
South Gippsland	268	224	87	171	171	315	526	710
Latrobe and Thomson Rivers	240	231	111	166	160	288	511	685
Macallister and Avon Rivers	363	146	39	149	79	209	481	504
Mitchell River	423	237	51	219	65	223	539	679
Tambo and Nicholson Rivers	406	200	35	163	55	282	496	645
Snowy River	539	252	71	217	141	273	751	742
Murray River	158	111	30	101	205	159	393	371
Mitta Mitta and Kiewa Rivers	185	169	23	142	251	308	459	619
Ovens River	149	174	13	131	190	290	352	595
Goulburn River	169	133	21	102	262	176	452	411
Campaspe River	111	116	43	94	342	149	496	359
Loddon River	145	96	35	83	269	116	449	295
Avon and Richardson Rivers	59	71	3	62	327	98	389	231
Avoca River	128	67	22	62	370	107	520	236
Eastern Wimmera	73	86	27	72	469	119	569	277
Western Wimmera	45	69	17	61	498	83	560	213
Mallee Country	79	55	16	57	418	79	513	191
The whole State	169	131	37	109	320	170	526	410

100 points = 1 inch.

H. A. HUNT, *Commonwealth Meteorologist.*

Perishable and Frozen Produce.

Description of Produce.		Exports from State. (Oversea). Quarter ended 31.3.1910.	Exports from State. (Oversea). Quarter ended 31.3.1909.	Deliveries from Government Cool Stores. Quarter ended 31.3.1910.	Deliveries from Government Cool Stores. Quarter ended 31.3.1909.
Butter	lbs.	9,357,852	3,577,404	6,971,720	2,627,688
Milk and Cream ...	cases	66	141	10	96
Cheese	lbs.	52,200	44,520	94,580	29,750
Ham and Bacon ...	"	480	1,440	...	...
Poultry	head	1,080	...	1,948	397
Eggs...	dozen	...		9,506	3,819
Mutton and Lamb	carcases	261,902	191,297	39,952	17,193
Beef	quarters	5,283	3,125	..	543
Veal	carcases	919	608	53	301
Pork...	"	37		50	876
Rabbits and Hares ...	pairs	179,592	503,616	32,016	149,638
Sundries	lbs.	...	...	38,924	10,454

R. CROWE, *Superintendent of Exports.*

Fruit, Plants, Bulbs, Grain, &c.

Description of Produce.	Imports. Inter-State.	Imports. Oversea.	Exports. Inter-State.	Exports. Oversea.
Apples ...	935	—	26,315	109,587
Apricots ..	58	—	2,786	—
Bananas, bs.	87,592	21,246	—	—
Bananas, cs.	5,678	2,615	574	—
Barley ...	54,399	2	—	—
Beans ...	25	181	—	—
Blackberries	385	—	—	—
Black Currants	2,225	—	6	—
Bran ...	1	—	—	—
Bulbs ...	11	133	12	21
Chaff ...	2	—	—	—
Cherries ...	5	—	193	—
Chillies ...	—	283	—	—
Cocoa beans	—	987	—	—
Cocoanuts..	—	24	—	—
Coffee beans	—	325	—	—
Copra ...	16	—	—	—
Cucumbers	225	—	9	—
Currants ...	—	1,069	—	—
Dates ...	—	4,405	—	—
Figs ...	2	123	582	—
Fruit—				
Canned...	—	—	—	1,339
Dried ...	—	—	22	277
Mixed ...	14	—	368	—
Grapes ...	16	—	1,700	413
Green ginger	1	269	2	—
Hops .	—	147	—	—
Jams, Sauces, &c.	—	—	—	1,107
Lemons ...	56	5,765	873	—
Lentils ...	—	28	—	—
Linseed ...	—	452	—	—
Totals ...	151,646	38,054	33,442	112,744

Description of Produce.	Imports. Inter-State.	Imports. Oversea.	Exports. Inter-State.	Exports. Oversea.
Mace ...	17	26	—	—
Maize ...	—	1,451	—	—
Mangoes .	29	—	—	—
Malt ...	13	—	—	—
Melons ...	—	—	5	1
Nectarines	1	—	88	24
Nutmegs ...	—	100	—	—
Nuts ...	2	1,363	5	—
Oats ...	38,331	300	—	—
Oranges ...	220	3,160	207	—
Passion fruit	1,539	—	107	1
Peaches ...	17	—	3,731	27
Pears ...	119	—	41,211	4,902
Peas, Dried	9,925	50	—	—
Persimmons	68	—	—	—
Pineapples	24,229	—	532	245
Plants, Trees. &c.	493	254	43	10
Plums ...	8	—	10,174	433
Popcorn ...	—	52	—	—
Potatoes ...	6	—	—	—
Prunes ..	—	601	—	—
Quinces ..	—	—	4	—
Raisins ...	—	6,075	—	—
Rice ...	1,579	22,130	—	—
Screenings (Grain)	2	—	—	—
Seeds ...	872	2,693	—	—
Strawberries	1	—	—	—
Tomatoes ...	194	—	196	—
Turnips ..	1,681	—	—	—
Vegetables	677	193	2	—
Wheat ...	39	85	—	—
Yams ...	39	157	—	—
Grand Totals	231,747	76,744	89,747	118,387

Total number of packages inspected for quarter ending 31st March, 1910 = 516,625.

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Mildura ...	11th ,,	Minyip ...	22nd ,,
Devenish ...	18th ,,	Colbinabbin ...	29th ,,
Buckrabanyule ...	25th ,,		

Applications relative to the above Institutions, Lectures, and Classes should be sent

TREE PLANTING.

Vol. VIII. THE DAIRYING SEASON, 1909-10. Part 7.

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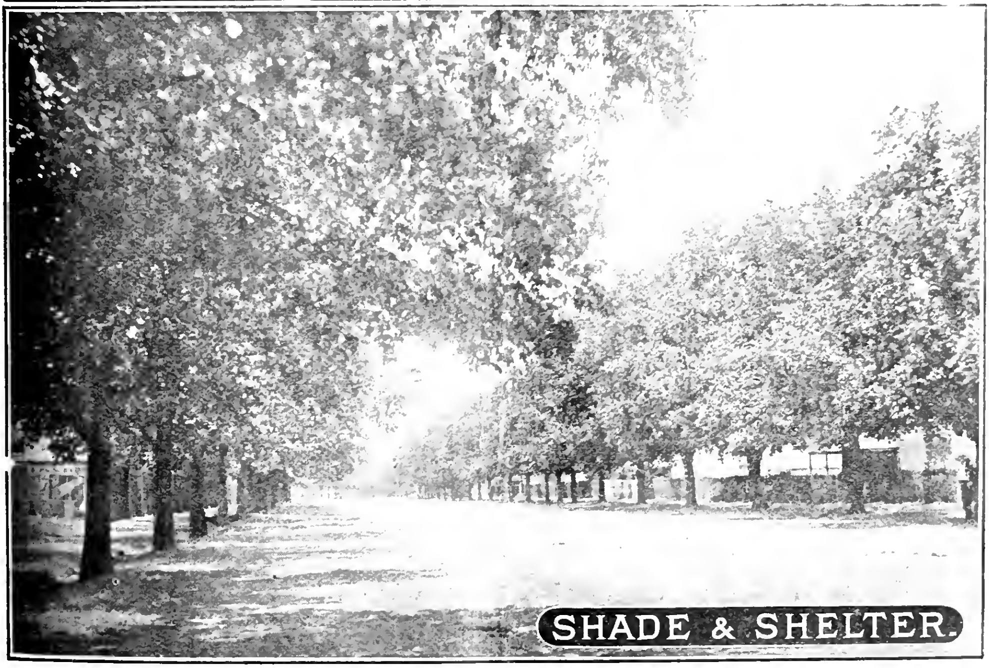
The Journal of the Department of Agriculture of Victoria

July, 1910.



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OF
THE DEPARTMENT OF AGRICULTURE.

A. T. SHARP, Editor.

CONTENTS.—JULY, 1910.

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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. VIII. Part 7. 11th July, 1910.

TREE PLANTING FOR THE BEAUTIFYING OF CITIES AND TOWNS.

A. W. Crooke, late Acting Conservator of Forests, and J. Blackburne, Inspector of Forests.

Although the adornment of our streets and roads with shade trees may not strictly be called forestry, we crave the indulgence of our readers when we place before them a few remarks and suggestions upon what is really a very important matter, bearing, as it does in so many directions, upon the comfort, health, and happiness of a large proportion of the inhabitants of this State. Many mistakes have been made in the past by planting unsuitable and unsightly trees in the streets of our towns, but it may safely be assumed that the lessons taught by such errors should only lead to future successes. Then, again, if failure has come in some instances, magnificent results have been achieved in others, as may be seen from the accompanying photographs. And what of the men who planted these trees? Their good work is, we know, fully and gratefully appreciated by the present generation, and they have also created for future ones "the joy that unborn eyes shall see." Surely the memory of these benefactors will always be kept fresh and green in the hearts of the people they have done so much for.

Have shade trees an influence in moulding the character and habits of the populace? Some scientific writers assert that they most assuredly have, and maintain that the quiet, contented and social manners of the inhabitants of the Dutch and of some German cities, are caused, in a measure, by the planting, long ago, of trees in the streets.

These trees are often surrounded by a railing or seat, and here on the hot summer evenings, in the grateful shade afforded, the father of the family may be seen comfortably smoking, holding friendly confab with his neighbours, and discussing with them the politics of the day, while the housewife still keeping a vigilant eye on her children, is busily working at her knitting and gossipping with her cronies. Everything breathes peace, contentment and happiness. There is none of the feverish fight for "appearances" so characteristic of treeless towns in other lands.

The green lustre of trees takes away the *hardness* of city life and tends to make it more endurable, pleasant, and healthy. The reason that large trees in the streets of thickly populated cities promote health, is easily understood. The more foliage for evaporation, the more oxygen, the more shade, the more even temperature.

Here, in this happy State of Victoria, making due allowance for the good work already done, we have yet opportunities enjoyed by no other southern land to carry on a project so beneficial as is tree planting, not only to our physical, but to our moral health.

It should be remembered that the effective planting of street trees, trees that may last many generations, is not a matter in which cheapness and economy should be allowed to mar effective work. Cheap planting is usually bad planting.

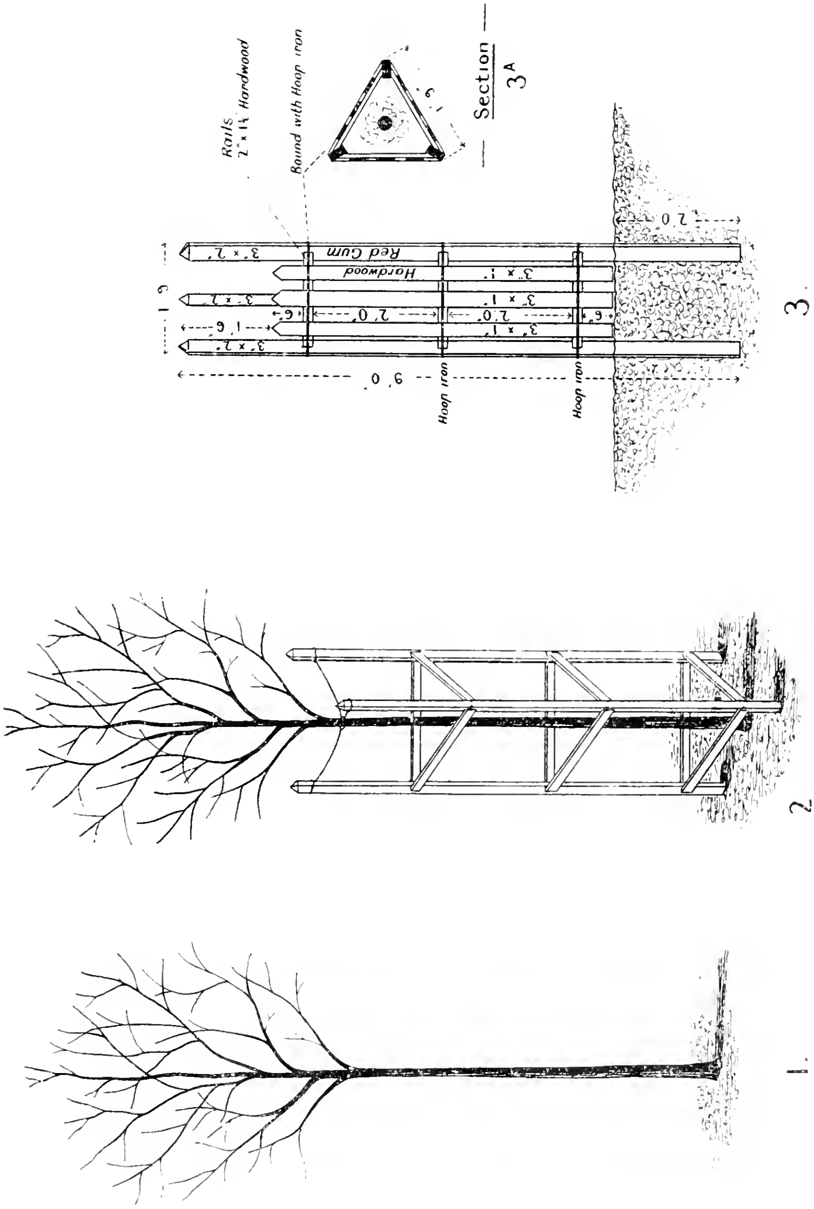
"Select the strong, the fair,
Plant them with earnest care,
No toil is vain."

How to Plant.

If a street or road is a chain and a half (or more) in width, it can be effectively ornamented with large trees, such as the Plane, Elm, or Poplar, and they should undoubtedly be *planted on the road*, 5 or 6 feet from the gutter. For narrow streets, smaller-growing species must be selected, and they may be set out on the footpath, if the same has a reasonably sufficient width. The distances apart must be regulated by the ultimate sizes to which the trees will attain. This subject will be dealt with later on in the article. One of the greatest charms of a leafy avenue is regularity and uniformity of growth; therefore, if in parts of the street to be planted the soil is poor and shallow, make the holes larger and deeper, and add good, rich soil copiously, with a liberal admixture of bone dust. A hole for a plantable street tree should never be dug less than 6 feet in diameter, and 3 or 4 deep. In a wide road or street, it is preferable to thoroughly trench a strip right along the same, and provide, if possible, for effective drainage.

Trees should either be specially grown by the Council controlling a town, or selected from the stock of some reputable nurseryman. They must be clean, well-rooted, and healthy, and have a strong, sturdy stem at least 6 or 7 feet in height. The head—*i.e.*, the branches springing from the top of the stem—should be of uniform growth and evenly balanced. (See Fig. 1.) The planting is a very important matter, and the employment of skilled labour is a *sine qua non* if successful results are to be hoped for. The roots must be spread evenly, neither too deep nor too shallow, and should be covered up and packed between with fine soil pressed down firmly with the foot of the operator.

After the tree guard is placed in position, a good watering can be given, and the tree secured from blowing about by three strong cords affixed to the uprights of the guard. (See Fig. 2.) Place some bagging, a strip 6 inches wide will do, around the stem, so as to prevent any chafing by the cords. It is better for a tree to be able to sway about a little than to be tied up too rigidly. If possible, never fasten to a stake, such a process being harmful and unnatural. During the *first year especially*, newly-planted street specimens should be carefully attended to in the matter of mulching, watering, and cultivation—*i.e.*, stirring and keeping loose the surface of the soil around them.



A CHEAP AND EFFECTIVE TREE GUARD.

TREE GUARDS.

Under present conditions, tree guards are a necessity, and will remain so while boys continue to be mischievous, and cattle are permitted to wander in our streets. They are, however, rather a disadvantage to the well-being of the tree itself, which probably would do much better if held by a cord, as described herein, to three posts standing at a couple of feet each way from the tree. Guards create draughts, and these are as hurtful to trees as to human beings. But since guards are, as stated, under existing conditions, a necessity, we have given the matter consideration with a view to recommending one that is cheap, durable, strong, and effective.

We are of opinion that the guard illustrated on page 423 more nearly meets these requirements than any other, but it is not without its drawbacks. To a certain extent it is clumsy, unlovely, and obstructs the light from street lamps. The appearance can, of course, be improved by dressing the timber and painting it, but, after all, the purpose of a guard is to protect the tree during its youth. The tree itself is the ornament.

Guards made of rod iron overcome, to a great extent, both of the foregoing objections, but they have the serious defects of being costly, easily injured by ill-behaved persons, and badly barking the trees should the lashings break. Lashings, with all classes of guards, should be periodically inspected. Too often they are only attended to when serious mischief has been done. For those, and they are many, who have a strong objection to the wooden guard, one made of expanded metal might be tried, similar to those recently erected in Queen-street, Melbourne. They are light, and seem suitable for elms, planes, &c.

With some trees, it is well to erect the guard first, leaving the pickets off one side until the tree is planted, and it is well in all cases to keep the bottom rails and pickets a few inches above the ground level in order to allow of the soil being cultivated around the tree without removing any portion of the guard.

When the great importance of growing street trees is more generally recognised, when citizens are educated to care for, protect, and take a pride in them, and cattle are restrained from wandering, guards will no longer be necessary.

PRUNING.

Street trees, if properly selected, require very little pruning after being planted, other than the removal of branches that may be growing too low down on the stem, or the shortening back of any that may have a tendency to make the head of the tree uneven or badly balanced. This operation should be accomplished with a sharp pruning knife when the *trees are young*. Any work with the axe or saw in after years is thus rendered unnecessary, and, at all events, it should be carefully avoided, as the ruthless cutting away of large limbs and branches has not a tendency to promote health and longevity.

WATERING.

When gutters are formed in the natural soil, or pitched with bluestone, or granite cubes, enough water generally soaks through to keep the roots of street trees fairly moist. When the channels are of asphalt or cement, through which no water can penetrate, provision should be made to allow water to percolate through the gutter opposite each tree. A good method of watering is to put down, to the level of the ground just outside the tree guard, an earthenware pipe, 6 inches in diameter. This can be done at planting time, and a cover fitting on the top of the pipe does away with any liability of accident. If filled with water occasionally during the summer months, the bottom of the hole will be kept moist, and the roots of the tree encouraged to strike downwards. Light surface watering has just the opposite effect. In the *sewered* streets of the city and suburbs of Melbourne, the trees are suffering from want of water, some of them are gradually dying, and unless artificially watered, will not survive many years longer.

WHAT TO PLANT.

We are here again indebted to the men of the "old brigade" for many useful object lessons scattered about our towns. It may be laid down as a broad general rule that deciduous trees are more suitable for street-planting than those which retain their foliage all the year round. In the winter months, we want sunshine, not shade, and in addition the autumn leaves add a new tone to Australian landscapes, while we may "rejoice and be glad" when the breath of spring brings again to our view the tender green of bud and foliage.

1.—ORIENTAL PLANES, LYTTLETON-STREET, CASTLEMAINE.

In Melbourne, Bendigo, Castlemaine, and other districts enjoying a temperate climate, the Oriental Plane (*Platanus orientalis*) makes an ideal street tree. (See illustration, No. 1, of Lyttelton-street, Castlemaine). The Castlemaine streets were planted in the years 1872-3 by Mr. P. Doran, curator of the local Botanical Gardens. Mr. Doran still holds this important position which he has adorned for so many years. The Planes were put in 60 feet apart, with a Bluegum (*Eucalyptus globulus*) in between each of them. The gums eventually became diseased, and were removed some years ago. Many of the planes are now 50 feet high. The one at the right hand corner of the photograph is 50 feet high, has a head diameter through branches of 60 feet, and a trunk girth at 3 feet from the ground of 6ft. 3 in. It will thus be understood that this species must be set out at least 50 or 60 feet apart, to allow of full development, but

2.—ELMS, CAMP RESERVE, CASTLEMAINE.

to produce an immediate effect such trees as Cootamundra Wattle (*Acacia Baileyana*), *Jacarandra mimosifolia*, Flame tree (*Brachychiton acerifolius*),

3.—ELMS, WILLIAMSON-STREET, BENDIGO.

Currajong (*Brachychiton populneus*), Scarlet-flowering Gum (*Eucalyptus ficifolia*), or even the Silky Oak (*Grevillea robusta*) might be placed between each permanent tree and gradually removed when necessary.

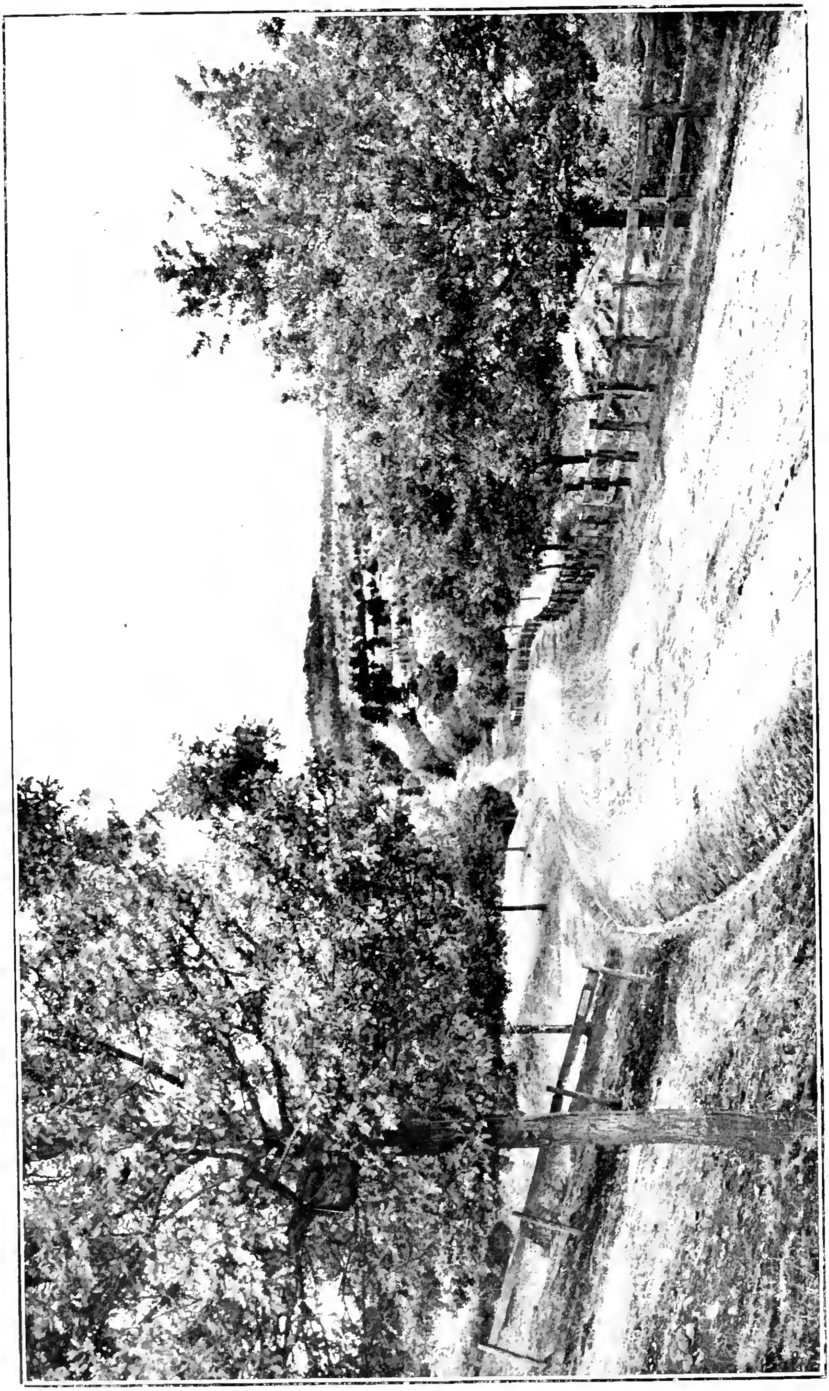
Next in importance come the Elms, and we consider the three best to be *Ulmus suberosa*, *U. canadensis*, and *U. campestris*. Photograph No. 2

4.—ELMS, KING-STREET, BENDIGO.

shows a double avenue of *U. suberosa* at the Camp Reserve, Castlemaine; these were planted in 1884. No. 3 gives a view of elms in Williamson-

5.—SILVER POPLARS, SHERIFF'S BRIDGE, CASTLEMAINE.

street, Bendigo; whilst No. 4 illustrates the appearance of King-street, a narrow street running at right angles to Mitchell-street. In the one all is glare, life, and bustle; in the other, on the hottest day, quietude, peace,



6.—OAKS ON THE GISBORNE-ROAD.

and grateful shade. The green branches of the trees meet, and intermingle overhead, forming a perfect arboreal sanctuary, and certainly here

"From the burning heat of summer,
Is offered cool retreat."

The trees of the Elm family like a fairly deep, cool soil. In many places in Bendigo, where they have been very extensively used for affording street shade, they are already showing signs of decadence, chiefly caused by desiccation and the want of adequate root room. Many fine specimens of this family are to be met with in the cooler and wetter parts of Victoria.

In a porous, deep, moist soil, *Populus alba* is quite at home, and makes a splendid street tree. View No. 5 shows a fine avenue at Sheriff's Bridge, Castlemaine. *P. Fremontii* and *P. angulata* succeed well in moderately temperate localities.

It may be mentioned here that *P. alba*, like the Oriental Plane, requires plenty of room for full development—not less than 50 or 60 feet—and therefore a suitable temporary tree can with advantage be planted between each permanent specimen.

The Oak (*Quercus robur*) does well in cool districts. It is, however, subject to the attacks of a species of scale (*Planchonia Quercicola*), that often kills back the young branches. *Q. rubra* and *Q. palustris* are considered to be eminently adapted for street decoration south of the Dividing Range. The foliage is large, handsome, and beautifully tinted in the autumn.

Illustrations are also given of a beautiful road scene approaching the township of Gisborne, and of a charming street scene in the township of Camperdown.

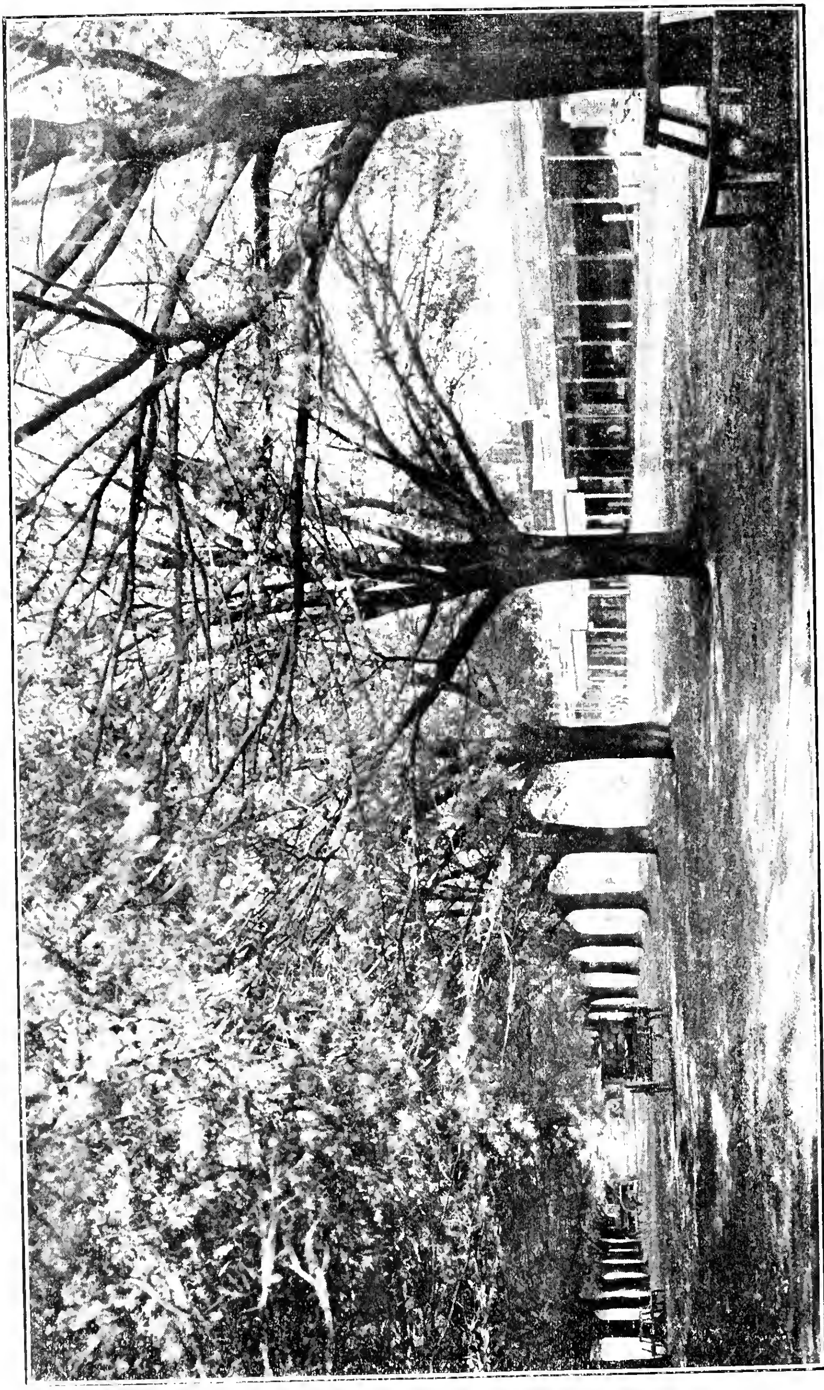
Trees for Narrow Streets.

When streets are only a chain, or less, in width, it is perhaps advisable to plant on the footpath, 3 or 4 feet from the gutter. It is necessary to avoid putting in any species that will eventually attain large dimensions. As suitable, we may mention *Catalpa speciosa*, a tree not much known here, but very highly spoken of in America. *Magnolia grandiflora* grows in Victoria to a moderate size only, but in Porto Santo, in the island of Madeira, it attains the size of timber trees, and the large wax-like flowers shed, it is needless to say, a delicious fragrance. They have also, we note, Magnolia avenues in some American cities.

Some of the Oak family, the Almond (*Prunus Amygdalus*), Scarlet-Flowering Gum (*Eucalyptus ficifolia*), White Cedar (*Melia Azedarach*), Tree of Heaven (*Ailontus glandulosa*), Spanish Chestnut (*Castanea vesca*), Pyramid Tree (*Lagunaria Patersonii*), *Jacaranda mimosifolia* (should be planted in sheltered situatons), Tulip Tree (*Liriodendron tulipifera*), *Paulownia imperialis*, *Pittosporum undulatum*, *Tristania conferta*, and many others might be planted with advantage in thoroughfares of limited width. Some of the Queensland cedars are also worthy of a trial, as they are doing well in sheltered places at Maryborough. They must, however, be protected from frost when young.

Trees for Dry, Hot, Districts.

The Locust Tree (*Robinia pseudacacia*) makes a good, lasting street specimen, and can with advantage be planted about 30 feet apart. It succeeds well in hot, dry localities, provided the soil is fairly deep. In Kerang, Swan Hill, and other northern towns in Victoria, where other trees fail, the Pepper (*Schinus Molle*) grows with great rapidity, and must



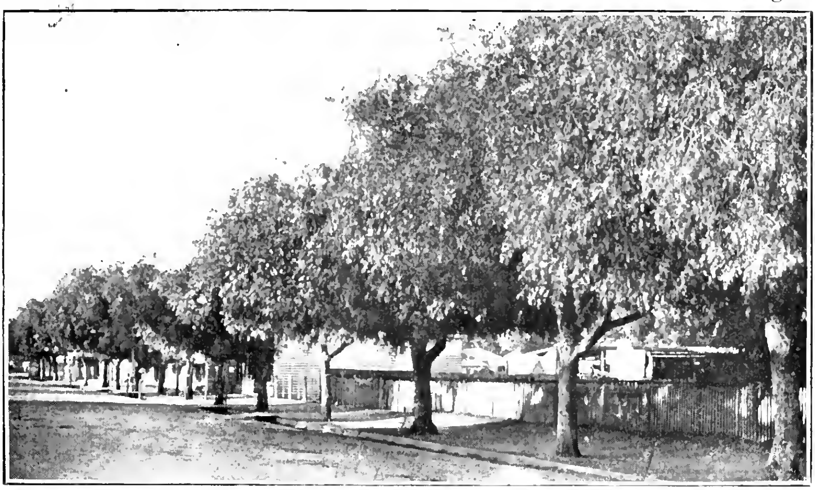
7.—Elms, Manifold Street, Camperdown.

therefore be accorded due prominence as suitable for similar localities. It is, however, a great "robber," and the roots of it travel long distances intelligently in search of moisture. Instances of what may safety be termed intelligence in plants are numeroues. They are of common occurrence in every suburban garden. Erect a post in the garden within, say, 10 feet of a Morning Glory, and see what will happen within a few days.

Do trees feel pain when struck with the woodman's axe? Do they enjoy sunshine and rain, calm and storm? Do they feel life circulating through their stems and branches in the spring time? Have they likes and dislikes to trees of different species, and, but for the "tragedy of the tree,"—its inability to move—would not many of them seek other neighbours? We certainly think so.

> "There lives and breathes a soul in all things.
> And that soul is God."
>
> —*Cowper.*

Even the old Roman, the elder Pliny, pagan although we may deem him, places on record his belief that "Trees have a soul, since nothing on

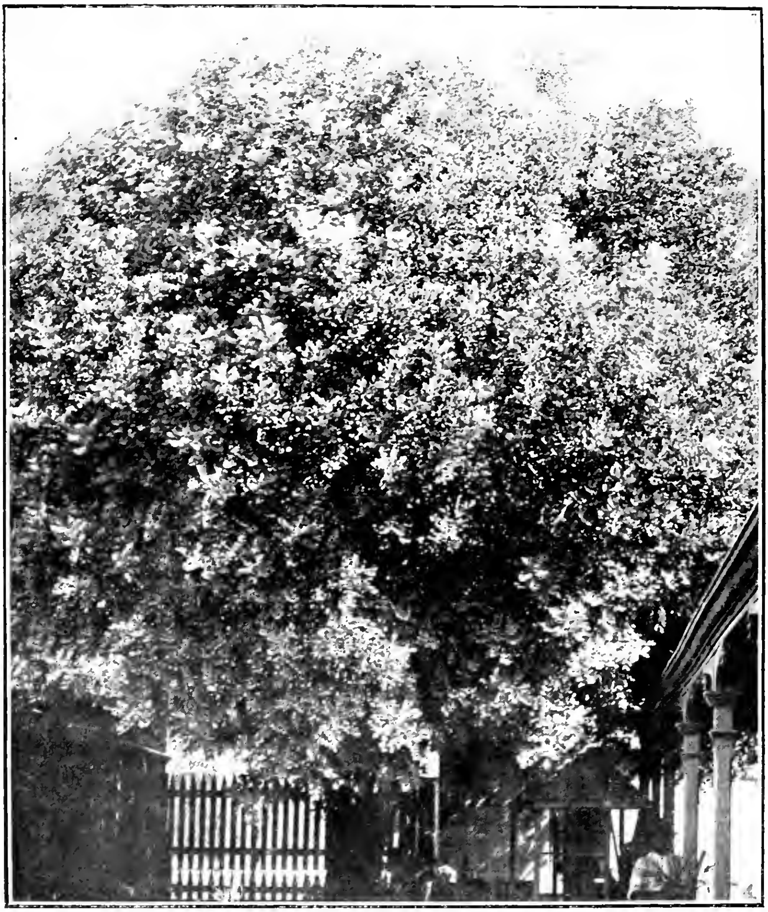


8.—PEPPER TREES, SWAN HILL.

earth lives without one." (*See* many articles—now published in book form—by Maurice Maeterlinck, but particularly one entitled, "The Intelligence of the Flowers," in *Harper's Monthly Magazine* for December, 1906.)

Although an evergreen, the Carob Tree (*Ceratonia siliqua*) is suitable for hot localities. An illustration is given of a specimen at Swan Hill, this particular tree is 27 feet high, diameter through branches 40 feet, girth of stem 2 feet from ground 5 ft. 3 in. The Silky Oak (*Grevillea robusta*) is a shapely tree, and is adapted for northern district planting. Much that is good can be said of the Currajong, which makes a splendid avenue tree for hot, dry districts; on account of its pyramidal habit of growth, it should be planted not more than 25 feet apart.

The Sugar Gum (*Eucalyptus corynocalyx*), brought into prominence and distributed largely by the late Mr. G. S. Perrin, Conservator of Forests, stands drought well, and a Western Australian species (*E. salmonophloia*), recently introduced into Victoria by the writers of this article, is being grown largely at the State Nursery, Macedon, for distribution amongst public institutions. This species flourishes in Western Australia in places where an annual rainfall of only 11 inches exists, and it is to be hoped that it will prove to be a valuable acquisition for arid Victorian territory. We are not at all enamoured with eucalypts for street planting, but where the choice of other trees is exceedingly limited, some plea can be urged for not overlooking the merits of the two species we have mentioned.



9.—CAROB TREE, SWAN HILL.

Pittosporum undulatum and *Melia Azedarach* also do well in hot localities if a supply of water can be occasionally afforded to them in dry weather. It must not be assumed that the trees we have mentioned under the above heading will only flourish in *arid places*. Many of them do well in the temperate parts of Victoria.

EXPERIENCES IN CALIFORNIA.

Strange to say, in this progressive land, the results achieved are almost identical with those accomplished in Victoria. We find pride of place given to the Oriental Plane, Cork Elm, Silver Poplar, and Locust Tree. The Carolina Poplar (*P. angulata*) and the Lindens (*Tilia europæa*), and

(*Tilia americana*) are highly spoken of. Our climate is generally too hot for the Lime Tree (Linden), but we have seen them doing well at Daylesford and other cool places in Victoria.

OVERHEAD TELEGRAPH WIRES.

One great drawback to successful tree growth in many of our cities and towns is overhead telegraph, telephone, and electric-light wires.

In order not to interfere with these by contact, the trees have to be continually headed back. Notable examples of this disfigurement are to be seen in Collins and Flinders streets, Melbourne. Contrast the appearance of the Oriental Planes there with those growing in Castlemaine. In one case, you have noble well developed specimens with—

> "The shaft of beauty towering high,"

In the other, mutilated round-headed examples of everything that a tree should not be. In America they manage things better. Mr. Ernest Braunton, the talented horticultural editor of the *Californian Cultivator*, in an able article on "Street Planting," published in that journal on 22nd November, 1906, advises thus:—

> Don't permit telegraph or telephone linemen to mutilate street trees. Secure the passing of ordinances forcing wires and cables underground wherever practicable. Telegraph and telephone wires are unsightly and interfere with all schemes of street improvement and tree planting. The wires are fast going underground in the Eastern States and in California.

When will a beginning be made in Victoria generally?

CONCLUSION.

We would also recommend intending street decorators to keenly observe what trees succeed best in the districts they wish to adorn, and also to obtain expert advice before buying trees and planting them. Do not leave everything to City, Borough, or Shire Councils. Individual effort can do much in the required direction, and the force of example will lead others to follow. What nobler gift can a rich man leave to posterity than a row of fine shade trees? We do not know of anything in this life more elevating or interesting than to watch trees that our own hands have planted years ago, growing and thriving and gradually mounting skyward, until the tiny sapling is a transformed, stately tree, admired by all. Quietly the years and seasons come round one after the other, and pass away unnoticed and unmarked; but the growth of a tree at once brings the relentless march of time forcibly home to us.

In America we have many object lessons and fine examples of individual effort in connexion with arboriculture. Julius Sterling Morton's Arbor Day crusade in favour of tree-planting has resulted in hundreds of millions being set out on the plains of Nebraska. Nearly fifty years ago Mr. C. M. Loring settled in what was then the small village of Minneapolis (Minnesota), now a prosperous and large city. It is asserted that Mr. Loring *made* Minneapolis by the interest he took in street and park tree-planting, and the vigour he infused into everything connected with this important work. He undoubtedly inaugurated the feature that made the city attractive, and people of taste and culture sought it for their homes. Business increased. Minneapolis flourished, and to-day it is one of the most beautiful places in the great republic. Hartford (Connecticut) is stated to be the *loveliest* city in America. To Mr. Horace Bushnell is due the credit of this proud distinction. For nearly fifty years he has given most of his time *gratis* in the work of clothing the place he loves so well with arboreal verdure.

In our own State, we have reason to be grateful to such men as Baron Von Müeller, Messrs. Hodgkinson, Guilfoyle, Doran, and many others who have planted for us delightful gardens and shady streets. We shall be gratified exceedingly if this article pushes forward and helps the good work of tree-planting on streets and roads. Our school children are now being taught that trees are something more than encumbrances on the land, that must at once be destroyed by ring-barking.

In this connexion it is well to point out that the State Forests Department, in an unassuming way, has been growing and distributing hundreds of thousands of seedling trees to Councils, Churches, State schools, public institutions, &c. One hears a good deal from time to time of successful arbor days. It is not generally understood that, but for the generosity of the State Forests Department, there would be practically no arbor days in Victoria.

With the gradual spread of arboricultural knowledge amongst both young and old, we look forward with confidence to the dawn of a better day, when trees will be universally regarded as essential to human existence, comfort, and happiness, and therefore duly reverenced as one of the best and noblest gifts of the Creator.

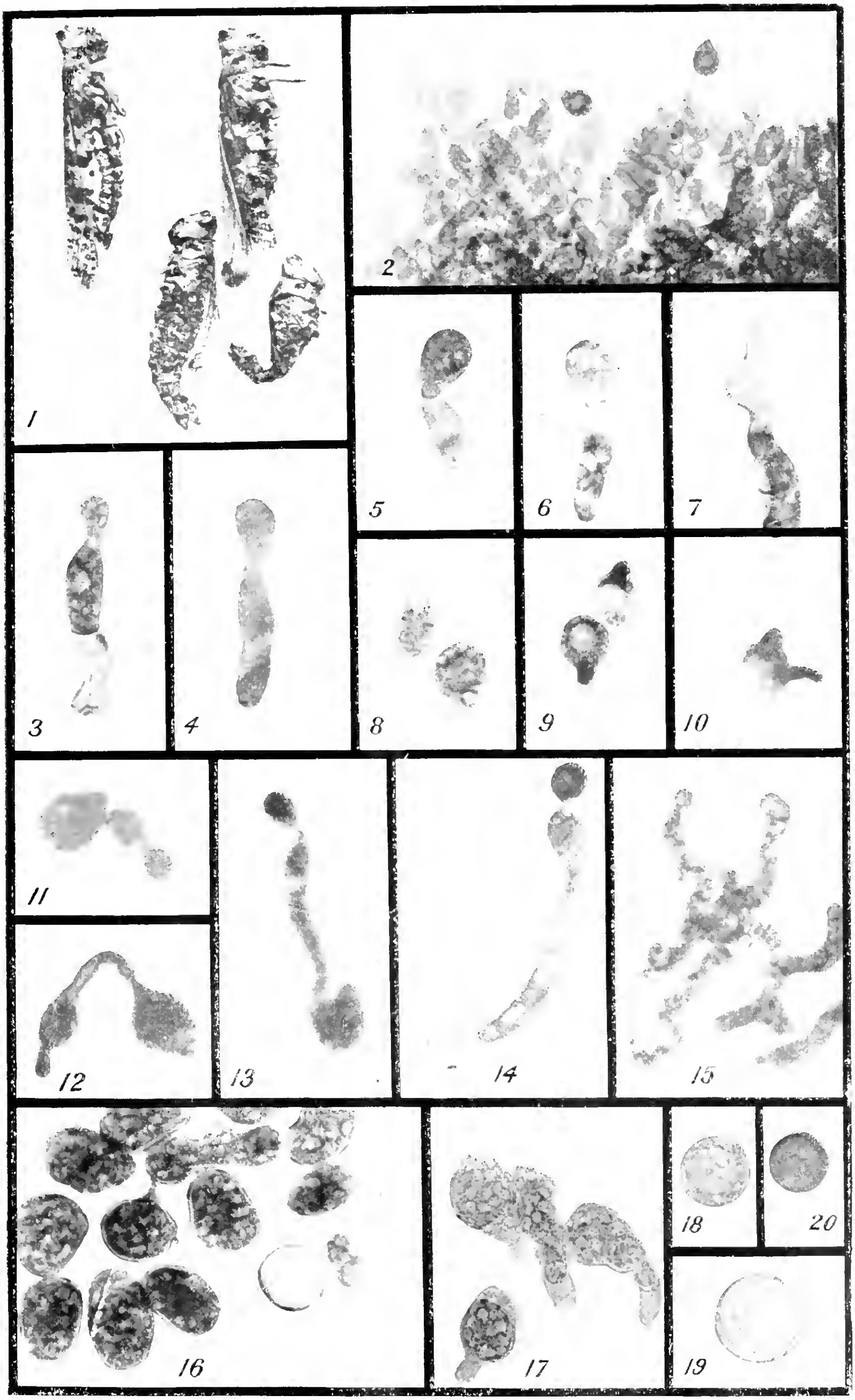
THE GENUINE LOCUST FUNGUS.

(EMPUSA GRYLLI, FRES.).

D. McAlpine, Vegetable Pathologist.

While investigating the plague of locusts in New South Wales during 1907, Mr. Froggatt found a large number clinging to the grass and weeds, with their legs spread out, dead and dry. They had crawled up to the top and remained there long after they were dead. For six months, swarms of them had been devouring the grass and herbage, and considerable loss had been caused by their ravages.

These plague locusts are popularly called "grasshoppers," and their scientific name is *Œdaleus senegalensis*, Kraus, being originally described from Eastern Africa. Some of the dead locusts were forwarded to me by Mr. Froggatt for examination, and on placing them in a moist chamber, a fawn coloured furry fungus protruded from between the joints of the abdomen and produced the various reproductive bodies shown in the plate. The fungus was determined as *Empusa grylli*, Fres. and is recorded in the



A LOCUST-KILLING FUNGUS (EMPUSA GRYLLI, FRES.).

Agricultural Gazette of New South Wales, p. 41, 1907. It is well known in America and South Africa as producing disease and death among the locusts there, and has also been found in Europe.

As a locust destroyer, this fungus is of special interest, but only brief reference will be made to the fungus itself. There is a well-known and closely related example which is parasitic on the common house fly and known as *Empusa muscæ*. Every one is familiar with the dead fly stuck to the window pane and a white halo round its body—the shroud which has also been the cause of its death. The tubes or hyphæ of the fungus are inside the body of the locust, as shown in Fig. 15, and when they have used up all the nutrient material in the tissues, they project at the surface and produce the pear-shaped conidia (Fig. 2). When the conidia are ripe they are shot out as if from a pop-gun, and if they strike the body of another locust they may infect it, and in this way the disease is spread. These conidia are produced in countless myriads and scattered, so that the fungus is not only widely distributed, but also rapidly reproduced. The locusts have all disappeared during the winter months, and so the fungus has to provide for a period of rest, which it does by means of the resting-spores (Fig. 20). This fungus will only grow on the living tissues of the locust, and has never been cultivated on dead substances.

The "South African Locust Fungus," which is the same as the Australian one, has attracted considerable attention, because it was at first thought to be capable of being artificially cultivated and used for getting rid of the destructive locust. But, by an unfortunate mistake, the locust fungus which was sent out in tubes with gelatine was not that fungus at all, but a species of Mucor or a mould which is not a parasite. The parasitic fungus which killed the locusts was *Empusa grylli*, but Mucor was also present on the *dead* locusts and so it came to be mistaken for, and cultivated and sent out as an insect destroyer which it really never was. Cultures from the Cape were received by me in 1899 and determined to be a Mucor as described and illustrated in the *Agricultural Gazette of New South Wales*, p. 184, 1900. Now that we know the true state of affairs that we have been importing the spurious article from the Cape, while the genuine article was produced within our own borders, it behoves us to study the natural conditions under which epidemics of the locust disease occur, and see how far the true locust fungus can be utilized and controlled by us.

EXPLANATION OF PLATE.

(*Empusa grylli*, Fres.)

Fig. 1. Locusts killed by the fungus	nat. size
Fig. 2. Conidiophores or conidia-bearers projecting from the junctions of the abdominal segments, two loose conidia above	×100
Figs. 3, 4, 5, 6. Successive stages in the development of conidia within the conidiophore	×250
Fig. 7. Conidiophore after ejectment of conidium	×250
Fig. 8. Conidium on left forming a secondary conidium, upper half projecting	×250
Fig. 9. Secondary conidium escaping from the mother-cell	×250
Fig. 10. Conidium beginning to germinate	×250
Figs. 11, 12, 13, 14. Various stages in the development of secondary conidiophores and conidia from a conidium. Culture in moist air...	×250
Fig. 15. Mycelium in abdominal cavity, showing commencement of aggregation of contents in the formation of mycelial bodies ...	×250
Fig. 16. Mycelial bodies, two pale immature resting spores at right ...	×250
Figs. 17, 18, 19, 20. Successive stages in the development of resting spores from mycelial bodies	×250

THE PURIFICATION OF MUDDY WATERS.

A. C. H. Rothera, M.A., M.R.C.S., Lecturer in Bio-Chemistry, Melbourne University.

Much of the water available in the State of Victoria is rain water stored in open tanks with puddled clay embankments and floors. Such water is practically never clean, but generally discoloured, with a fine suspension of mud.

This mud is so finely divided that it does not sink under the force of gravity nor can it be separated under the greater force exerted by the centrifugal machine. In the language of physical chemists, it is in a condition of "colloidal suspension," and its separation from the water requires either an effective filter, or the use of a chemical reagent.

FILTERS.

An effective filter is, however, generally speaking, a slow filter, and will not allow large volumes of water to pass in short intervals of time. Further, they are costly to buy, and unless treated with care, and regularly cleaned, they may signally fail to purify water which contains harmful bacteria.

In fact, a badly cared for filter may be a source of actual danger, for bacteria may thrive in countless numbers amongst the material collected in the filter, and may later be washed through into the filtered water

CHEMICAL PRECIPITATION.

By the second process of purification, namely, chemical precipitation, no expensive initial plant is required, large volumes of water may be satisfactorily handled, and any one with good common sense can control the process, whereas the management of a filter requires a skilled and intelligent man. It is this second type of process which will now be discussed.

The visible impurity in "muddy water" is, as already mentioned, a fine "colloidal suspension" for which the silicates of the puddled clay floor are largely responsible. On the addition of certain chemicals this fine suspension alters in character.

The extremely minute particles, which, owing to their smallness, were able to float in the water, begin to collect together until they form large flocculent masses.

These masses, which are easily seen to form a bulky precipitate, settle to the bottom of the water at a speed depending on their weight, and the manner of their formation; but the important point is that they do settle to the bottom, and at a rate which is perfectly satisfactory from the practical standpoint. When the precipitate or flocculi have thoroughly sedimented the water above is perfectly clean and sparkling.

The whole process, to make a comparison, is exactly similar to the clearing or "fining" of wine, whereby after the sedimentation of flocculi the wine is left bright and sparkling.

The clean water above the suspended mud is completely free from even the finest suspended particles.

Its Bacterial Purity.—It is a well-known fact that bulky flocculi, separating in a fluid, enclose and carry down with them, the micro-organisms present at the time. In this way, the falling mud removes from the water, the bacteria polluting it.

A number of Australian waters cleared by chemical means have, through the kindness of Dr. Bull, been examined at the Bacteriological Laboratory of the University of Melbourne, and the reduction in the number of organisms present has been most pronounced. Not only does the settling mud remove bacteria, but it also carries down the eggs of hydatids, thus giving the means of protecting stock against the most fruitful source of hydatid infection—dirty drinking water.

It is only the actively swimming water Crustaceæ which escape the precipitating action of the mud, and they do not live long in the clean water, owing to an absence of food supply.

The Water is also Chemically Pure.—None of the chemical added to the water remains in it. It separates completely with the precipitate, and the most delicate chemical tests fail to show a trace of it in the clean water after the sedimentation is completed.

THE ACTION OF CHEMICAL PRECIPITANTS (THEORETICAL).

The change in the muddy water produced by adding certain salts is not that a combination or insoluble chemical compound is formed, but the action is more difficult to explain, and requires certain theoretical assumptions.

The explanation which most satisfactorily meets the known facts is as follows:—The fine mud particles are assumed to have minute negative electrical charges associated with them. These negative electrical charges keep the tiny particles asunder and prevent them uniting to larger and heavier masses. If, however, the negative electrical charges are removed, or, better, neutralized with equal positive charges, then fusion and collection of the fine mud into large flocculi occur. This explanation makes it possible to understand the enormous effect produced by the small amounts of chemicals usually employed in the chemical purification of water.

The Action of a Chemical Precipitant.—This is determined by the fact that the fine mud suspensions, met with in tank waters, carry electrical charges of a negative character.

When a given salt M X is added in solution to such a water, the negatively charged mud particles absorb or attract to their surface the M or metal half of the salt which is electrically positive in character. Thus is formed a mud particle of electro-negative character, associated with a metal "ion" of electro-positive character, and if the proportions be right negative and positive neutralize one another, and the mud particles being now without an electric charge to keep them apart, run together and coalesce to large flocculi.

Now it is found that, in such a case, the metal M is more efficient in its action the higher its valency. A metal M^{II} is better than M^{I} and better still is a metal M^{III}. The M^{III} metals are iron, aluminium, and chromium, and it is salts of these metals which act most efficiently.

Thus (*a*) 1 lb. Aluminium Chloride will clear 2,500 gals. muddy water.
(*b*) 1 lb. Ferric Chloride will clear 1,000—2,500 gals. of muddy water.
(*c*) 1 lb. Chromium Chloride will clear 1,000—2,000 gals. muddy water.
(*d*) 1 lb. Alum will clear 500—1,000 gals. muddy water.

Salts of the divalent metals, such as those of calcium, copper, zinc, barium, magnesium, and ferrous iron, are, in terms of their chemical equivalents, only about one-fourth as effective as the salts of the trivalent metals. Also, several of them are poisonous in character, *e.g.*, copper, zinc, and barium amongst those mentioned. Calcium as lime may, however, be used, and owing to its great cheapness it does not matter that it takes rather more of it to be effective. The salts of monovalent metals, such as sodium and potassium, are of no use.

An interesting observation which was made was the power of acid to reduce the quantity of chloride of iron, otherwise necessary to clear a given volume of water.

It was found that $\frac{1}{2}$ lb. of ferric chloride + $\frac{1}{2}$ lb. of 30% hydrochloric acid was as effective in its action as 1 lb. of ferric chloride by itself.

Acid has a similar beneficial effect upon the action of alum, though the degree of improvement is not so marked.

The Geological Factor.—As the precipitation of the mud from any water by the addition of a chemical is a physical process rather than a chemical one, the method is of wide use, and can be applied to waters of different geological regions.

Samples of water have been collected from districts representing many of the chief geological formations of Victoria, and in every case the chloride of iron acted rapidly and well. Alum was not tried in every case, but may be definitely assumed to act well also.

The samples were obtained in March, when the water dams were nearly dry and the water at its worst. Here are some of the results:—

Cranbourne.—Water polluted by cattle; growth of weeds. 1 lb. iron chloride per 1,000 gals.

River at Dandenong.—Dirty water. $\frac{1}{2}$ lb. iron chloride cleared 1,000 gals. Excellent bacterial purity of clear water.

Cemetery.—Water fair. $\frac{1}{2}$ lb. iron chloride per 1,000 gals. immediately cleared it (15 min.).

Two Miles N. of Campbellfield.—Very dirty water; cattle. 1 lb. iron chloride per 1,000 gals.

Campbellfield.—Water fair; from clay pits. $\frac{1}{2}$ lb. per 1,000 gals. quickly successful.

Templestowe.—Water with thick red mud. 1 lb. per 1,000 gals. cleared splendidly.

Warrandyte.—Typical muddy water. $\frac{1}{2}$ lb. per 1,000 gals.

These waters are from country whose geological nature comprises the *Tertiary* formations, occurring in patches in Southern Gippsland (*e.g.*, Cranbourne); the *Silurian* formations, which are very extensive and cover Anglesey, with the western half of Wonnangatta; and the *Newer Basalt* of the great Western districts.

Not examined as yet are waters from the *Ordovician*, the gold-bearing country of Bendigo, Ballarat, or the Bacchus Marsh region; the *Jurassic* of Southern Gippsland; and the *Recent formations* of the north and north-west. There is no reason why these waters should not behave as uniformly as those already examined.

The Selection of a Chemical Precipitant.—From what has been shortly stated in the previous paragraph, the ideal substance would be a *cheap* salt of aluminium, iron, or chromium. From the practical point of view, the cheapness is almost as important as the chemical-efficiency, and consequently for actual use only the following need be named, viz., alum, chloride of iron, lime.

The last of these is able to compete only on account of its cheapness. It is especially to be noted that it is not nearly so "brilliant" in its action as either alum or chloride of iron. It is, however, a practical substance to use.

In choosing between alum and chloride of iron, the price is at first sight in favour of the former. Weight for weight, however, 1 lb. of chloride of iron is worth 2 lb. of alum, and this fact, together with its easy solubility, turns the scale in its favour.

The "brilliancy" of the action of iron chloride, that is, the efficiency with which it acts, the rapidity with which it causes the mud to settle, and the ease with which it can be handled owing to its solubility, make it ideal, and it is most desirable that it should be on the Australian market at as cheap a rate as possible. In Germany, it is advertised at about 2½d. per lb., and this price doubled would still leave it a cheap chemical for clearing water.

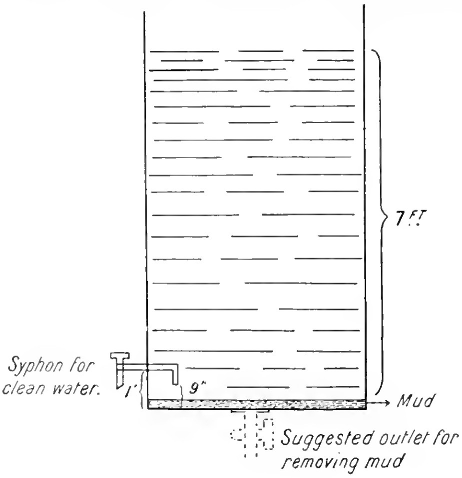
Chloride of iron is not merely harmless. It is more, it is a most valuable mineral constituent for all animals. There is consequently a distinct gain, even if too much is added to the water.

As previously mentioned, however, the added chemical (if not in larger quantity than required) is thrown out with the mud.

EXPERIMENTS ON A PRACTICAL SCALE WITH CHLORIDE OF IRON.

These consist of the clearing of large volumes of water (*a*) in iron tanks, (*b*) in the open field.

Tank Experiments.—A large cylindrical tank fitted as in the accompanying diagram was kindly supplied by Messrs. Felton, Grimwade, and Co., of Melbourne. It is suggested, however, as the result of experience gained with this one, that the elbow piece inside is not necessary. For a tank, which it was intended to use continuously, a wide outlet, with tap in the centre of the floor, would be useful for flushing out deposited mud.



CYLINDRICAL TANK.

The dimensions of the tank were—height 7 feet, diameter 5 feet. Calculated total capacity, 850 gallons.

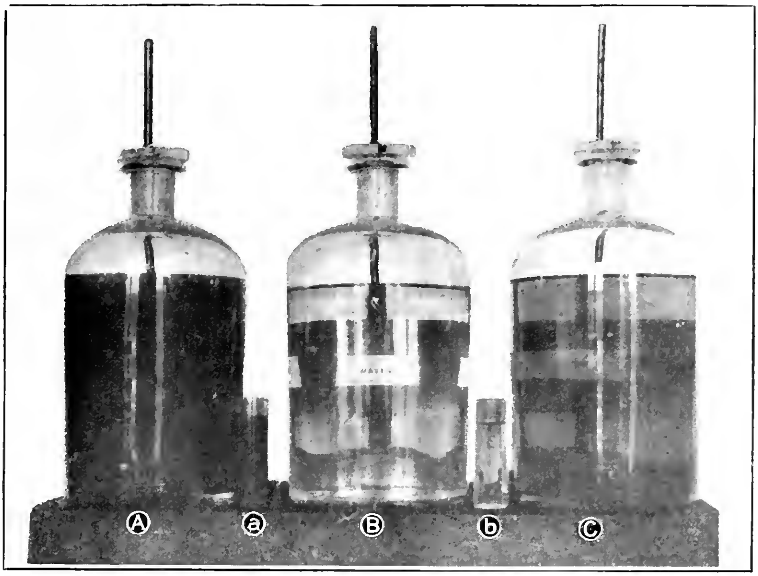
At 2 p.m. (20th April) a 1 lb. bottle of chloride of iron was opened and filled with water up to the neck. All the solid dissolved in this volume of water, and at 4.30 p.m. half the bottle was emptied into the tank which contained 600 gallons of muddy pond water. The water was stirred round with a short stick for half-a-minute in order to uniformly distribute the iron chloride solution.

Next morning, at 9 o'clock, water was drawn off from the bottom of the tank by the tap and syphon. It proved perfectly clear and clean, and the photograph on page 441 shows it contained in a large bottle 10 inches in diameter and standing between a like bottle containing Yan Yean (at its best), and another containing the muddy water as it was prior to treatment. Thus, overnight, 600 gallons of dirty muddy water not fit for drinking, for use in the dairy, or the house, were converted into so much clean and attractive water, of good bacterial purity and uncontaminated by any chemical. And this result was obtained by the use of only half-a-pound of iron chloride without the need of any expensive plant, such as a large filter, or of any skilled labour.

A second experiment proved an equal success, and a description illustrates a further practical detail.

This time the tank was filled to its full capacity (850 gallons), and $\frac{1}{3}$ lb. of iron chloride in solution stirred into the water at the top (2nd May, evening). Next morning the water drawn off at the bottom still showed a slight opalesence, and had not the perfect cleanliness and brightness which it has when enough of the chemical is added. In consequence, a further 1-6th of a pound of dissolved chloride of iron was added, and again the water allowed a night in which to clear. The following morning, 4th May, the water drawn off proved perfect.

This experiment well illustrates how the addition of insufficient chemical in the first place can be rectified by a further small addition afterwards. In this way, just the right amount necessary is added, and no waste occurs through adding too much.



EXPERIMENTS WITH CHLORIDE OF IRON.

Jars 10 inches diameter with vertical iron rod, and printed label behind.
A. Pond water. Opaque and yellow brown.
B. Same after treatment, 600 gals. + $\frac{1}{2}$ lb. iron chloride.
C. Yan Yean from tap in Melbourne. Far inferior in brightness and cleanness to B.
(*a*) Pond water (Mr. Ross, Deep Creek). Thick yellow-red mud.
(*b*) Same after treatment in open dam (1 lb. iron chloride per 1,000 gals.).

It will be noted that in this experiment the precipitated mud had settled through 7 feet of water during the night. The actual deposit of mud was not more than half-an-inch in thickness.

The bacterial count of the water before treatment was 22,000 organisms per cubic centimetre. After treatment, the count was 240 per c.c.

Experiments on Open Dam Water.—A small water hole, containing an estimated 1,000 gallons of a thick and dirty muddy water, situated on the property of Mr. Ross, of Deep Creek, Templestowe, was treated on the evening of 2nd May, with 1 lb. of iron chloride. The concentrated iron chloride solution was diluted, and just thrown out over the surface of the pond, keeping the distribution as uniform as possible. The water was not stirred at all, though it would have been more advisable to have stirred the surface layers, so as to insure a regular distribution of the chemical.

Next morning, 3rd May, the water was clean, and every leaf and twig could be seen on the bottom of the tank.

A second experiment with a water hole on the property of Mr. Neilson, Warrandyte, was equally successful. The water had a surface area estimated at 400 square feet, and an average depth of 9 inches. Capacity, 1800-1900 gallons. At 4 p.m. on 7th May 2 lb. of iron chloride in solution were thrown out as evenly as possible over the whole surface of the dam. With a long pole the surface layers were then gently stirred.

The water was next seen at 9 p.m., when it was perfectly clean and all the mud had settled out to the bottom. The bacterial results with these waters were just as satisfactory as with the tank experiments. It should, however, be borne in mind that in clearing an open water hole a heavy rain may wash fresh mud in, and so undo all the good work accomplished.

CONCLUSIONS.

The chemical precipitation of the mud in storage tank waters has not been found to fail in a single instance, so that the method should be of general utility, no matter what is the geological nature of the country in which the water dam is situated.

In a country like Australia, where a clean water supply is often not to be had, the case for a general use of chemical precipitation methods is a very strong one indeed.

Alum and lime are widely obtainable, but if arrangements can be made for a cheap supply, it is chloride of iron that is most strongly recommended. From what has already been said, it is apparent how easy and how eminently practical is its use.

If the water prior to treatment is from a doubtful source, such as a storage dam to which cattle have access, then it is recommended that it should be either filtered or boiled before being used as drinking water in the house. But if the water dam is in an enclosure and kept free from pollution by cattle, precipitation alone yields an excellent water.

It may further be added that, if desired, the flocculent mud could be separated by running the water through a centrifugal machine, after the addition of the chemical. This treatment, however, is hardly likely to be necessary, seeing that the precipitated mud will settle down through 7 feet of water in a single night by the ordinary force of gravity.

It is especially thought that clean waters so obtained should be valuable in butter factories and dairies, or for use in steam-engines. Also, stock are the better for a supply of clean, rather than dirty water, and a liberal supply of clean water is often acceptable for domestic purposes.

It is for those who use or would use clean water if they could, butter factory managers, dairymen, stock-owners, and others, to give precipitation methods a fair trial.

Artificial Manures Acts.

SUPPLEMENTARY LIST OF UNIT VALUES OF MANURES IN THE VICTORIAN MARKETS DURING 1910 SEASON.

Description of Manure.	Moisture. Per-centage.	Phosphoric Acid — Water Soluble. Per-centage.	Phosphoric Acid — Water Soluble. Estimated Value in One ton of the Manure.	Phosphoric Acid — Citrate Soluble. Per-centage.	Phosphoric Acid — Citrate Soluble. Estimated Value in One ton of the Manure.	Phosphoric Acid — Insoluble. Per-centage.	Phosphoric Acid — Insoluble. Estimated Value in One ton of the Manure.	Phosphoric Acid — Total. Per-centage.	Phosphoric Acid — Total. Estimated Value in One ton of the Manure.	Potash. Per-centage.	Potash. Estimated Value in One ton of the Manure.	Estimated Value of the Manure per ton.	Price asked for the Manure per ton Delivered at the Local Railway Station.	Where Obtainable.
Mainly Potassic.			£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Potash Chloride (Muriate)	..	..	..	..	..	..	..	..	..	61.52	13 11 9	13 11 9	13 10 0	A. H. Hasell, Melbourne
Potash Sulphate ..	..	..	..	..	..	..	..	..	..	51.18	13 13 0	13 13 0	13 12 6	" "
Mainly Phosphoric. Phosphoric Acid moderately soluble.														
Thomas Phosphate ..	..	..	..	16.20	3 4 10	1.46	0 4 0	17.66	3 8 10	..	..	3 8 10	4 2 6	A. H. Hasell, Melbourne

Description of Manure.	Moisture. Per-centage.	Nitrogen. Per-centage.	Nitrogen. Estimated Value in One ton of the Manure.	Phosphoric Acid. Per-centage.	Phosphoric Acid. Estimated Value in One ton of the Manure.	Mechanical Condition. Per-centage of Fine Bone.	Mechanical Condition. Per-centage of Coarse Bone.	Nitrogen. Per-centage in Fine Bone.	Nitrogen. Per-centage in Coarse Bone.	Phosphoric Acid. Per-centage in Fine Bone.	Phosphoric Acid. Per-centage in Coarse Bone.	Estimated Total Value of the Manure per ton.	Price asked for the Manure per ton Delivered at the Local Railway Station.	Where Obtainable.
			£ s. d.		£ s. d.							£ s. d.	£ s. d.	
Containing Phosphoric Acid and Nitrogen. Phosphoric Acid difficultly soluble.														
Bonedust	7.54	4.29	2 11 6	21.97	4 0 4	72.50	27.50	3.12	1.17	15.93	6.04	6 11 10	6 0 0	G. Benson, Warrnambool
"	6.44	4.95	2 19 5	18.45	3 1 3	45.50	54.50	2.26	2.69	8.40	10.05	6 0 8	5 10 0	A. J. Burge, St. Arnaud

Melbourne, 10th June, 1910.

P. RANKIN SCOTT, Acting Government Analyst and Chemist for Agriculture.

REVIEW OF THE DAIRYING SEASON AND BUTTER EXPORT TRADE, 1909-10.

R. Crowe, Superintendent of Exports.

PRODUCTION.

The production for the season 1909-10 has been creditable, a total of 16,200 tons being exported as compared with 9,402 tons for the previous year. As regards shipments, it has been the fourth largest season in the history of the export trade. Although the season was favourable, it could not have been expected that a record would be made, for the reason that there were 76,000 cows less than when the record was established in 1906-7. The following table gives the number of cows in Victoria for the past seven years:—

1904	... 515,179	1907	... 701,309	1909	... 609,166
1905	... 632,493	1908	... 709,279	1910	... 625,063
1906	... 649,100				

No figures or facts ought to be more suggestive of the necessity for growing and conserving fodder; 100,000 dairy cows at a moderate estimate represents half a million sterling. But that is not all; the produce of that number of cows is sacrificed for the first year, and since it is impossible to replace them within three years, the yield of 66,000 cows is lost for the second year and 33,000 in the third year. At the low average return of £5 per cow the death of 100,000 means a loss of £1,495,000—a sum that would pay for a lot of ploughing, seed, and labour, and not a few mowing machines and silos.

Although many dairymen have gone out of dairying into sheep farming and wheat growing, there are evidences on all hands that dairymen are taking steps to tide over the periods of scarcity. The recent weather has again proved the uncertainty of our climate.

The total arrivals of butter and butter ex. cream in Melbourne by rail for 1909 were as follow:—

District.	Quantities.	Percentage of Whole.	Average Percentage for 8 Years.
	lbs.		
Western	15,072,960	33	35
North Eastern ...	9,142,560	19	19
Northern	5,255,040	11	10
Gippsland .	17,171,840	37	35
Total ...	46,642,400		

From this it will be seen that Gippsland is increasing slightly in production as compared with the Western District.

EXPORTS.

The total quantity exported, 226,743½ tons, is about equal to one season's imports of butter into Great Britain. For the year 1908 the United Kingdom imported £24,082,537 worth, and of this Victoria contributed 5.14 per cent.; for 1909, Great Britain's imports were valued at £22,425,067, and Victoria's quota 5.97 per cent. It will thus be seen that whilst our production is creditable the proportion it forms of Great Britain's imports is as yet comparatively insignificant.

The following table shows the exports since the commencement of the industry :—

EXPORTS OF VICTORIAN BUTTER.

Season.	Quantity.	Value	Season.	Quantity.	Value.
	Tons.	£		Tons.	£
1889-90	369¼	50,300	1900-01	16,163	1,664,790
1890-91	759¼	91,200	1901-02	11,152½	1,226,775
1891-92	2,139½	225,400	1902-03	8,565	1,278,059
1892-93	3,613½	404,432	1903-04	14,736	1,444,167
1893-94	7,652¼	761,273	1904-05	16,181	1,666,714
1894-95	11,584¾	1,081,243	1905-06	18,140	1,950,090
1895-96	9,386	901,000	1906-07	21,562	2,156,200
1896-97	9,895½	942,247	1907-08	15,216	1,749,840
1897-98	7,175	670,000	1908-09	9,402	1,081,230
1898-99	9,744	974,000	1909-10	16,200	1,814,400
1899-00	17,107	1,604,600			
				226,743½	£23,738,360

PRICES.

The prices realized for butter have been higher on the average than for any preceding season during the history of the export trade—some factories have averaged over 117s. per cwt. I have placed the average for all the export butter at 112s. per cwt. c.i.f. On this basis, the value of export butter totals £1,814,400. Whilst prices were low, the difference between superfine, 1st grade, 2nd grade, and 3rd grade butters was pronounced and in harmony with the relative qualities. When the demand was keener, and prices advanced, these differences closed in to almost vanishing point, and secondary butter realized nearly as much, in some cases, in fact, as much, as the very best.

QUALITY.

The quality of Victorian butter for the season was lower than for the preceding year. The percentages of superfine fell from 29.02 per cent. to 25.96 per cent. ; that of first grade from 53.17 per cent. to 52.85 per cent., whilst the second grade butter increased from 16.7 per cent. to 19.28 per cent. ; the third grade butter from 1.05 per cent. to 1.8 per cent., and the pastry grade from 0.003 per cent. to 0.11 per cent.

It is a matter worthy of most serious consideration that the standard of Victorian butter improved and reached the maximum quality when grade-stamping was in vogue. In the year 1904 the Department gave exporters the option of having their butter graded and grade-stamped. This was when the State *Exported Products Act* governed exports. There was then no choice between the grading and stamping. The two proposals went together and shippers had to accept both or none. The grading system was gradually adopted until, for the season 1905-6, over 90 per cent. of butter exported from Victoria was graded and grade-stamped at the voluntary request of butter factories. The percentage of butter which scored superfine points for that season was 36.90 per cent. For the following season the Commerce Regulations came into operation and grading and grade-stamping were made optional, and classification without grade-stamping was offered to exporters. The percentage of superfine for 1906-7 was 34.87 ; for 1907-8, 34.45 ; for 1908-9, 29.02 ; and for this season 25.96 per cent., as already stated.

Points and Percentages Scored, Season 1909–10.

Points—100.	No. of Boxes	Percentages.	Points—100.	No. of Boxes.	Percentages.
99	140		89	32,265	
98	15,066		88	20,985	
97	26,779		87	15,376	
96	34,396		86	11,850	
95	64,059		85	8,685	
			84	8,229	
			83	6,926	
	140,440	25·96			
				104,316	19·28
			82	4,561	
			81	2,095	
			80	1,595	
			79	338	
94	61,529		78	254	
93	67,169		77	400	
92	59,201		76	511	
91	51,278		75	34	
90	46,782				
				9,788	1·80
	285,959	52·85	Pastry	601	0·11

Total Boxes—541,104.

Moisture.

The average moisture contents of the 1,509 samples analyzed was 13.97 per cent., as compared with 13.69 per cent. for the preceding season and 13.44 per cent. for 1907-8. The increase in two years amounts to fully half of 1 per cent. It should be stated that samples are taken of all butters which, upon examination, appear to contain much moisture, and particular attention is paid to brands found to approach the maximum, and also to parcels discovered to exceed the standard. All those samples are included in the average; therefore, to some extent, the average figures are inflated in consequence. However, the same practice has been adopted as in all previous seasons, so the comparison holds good.

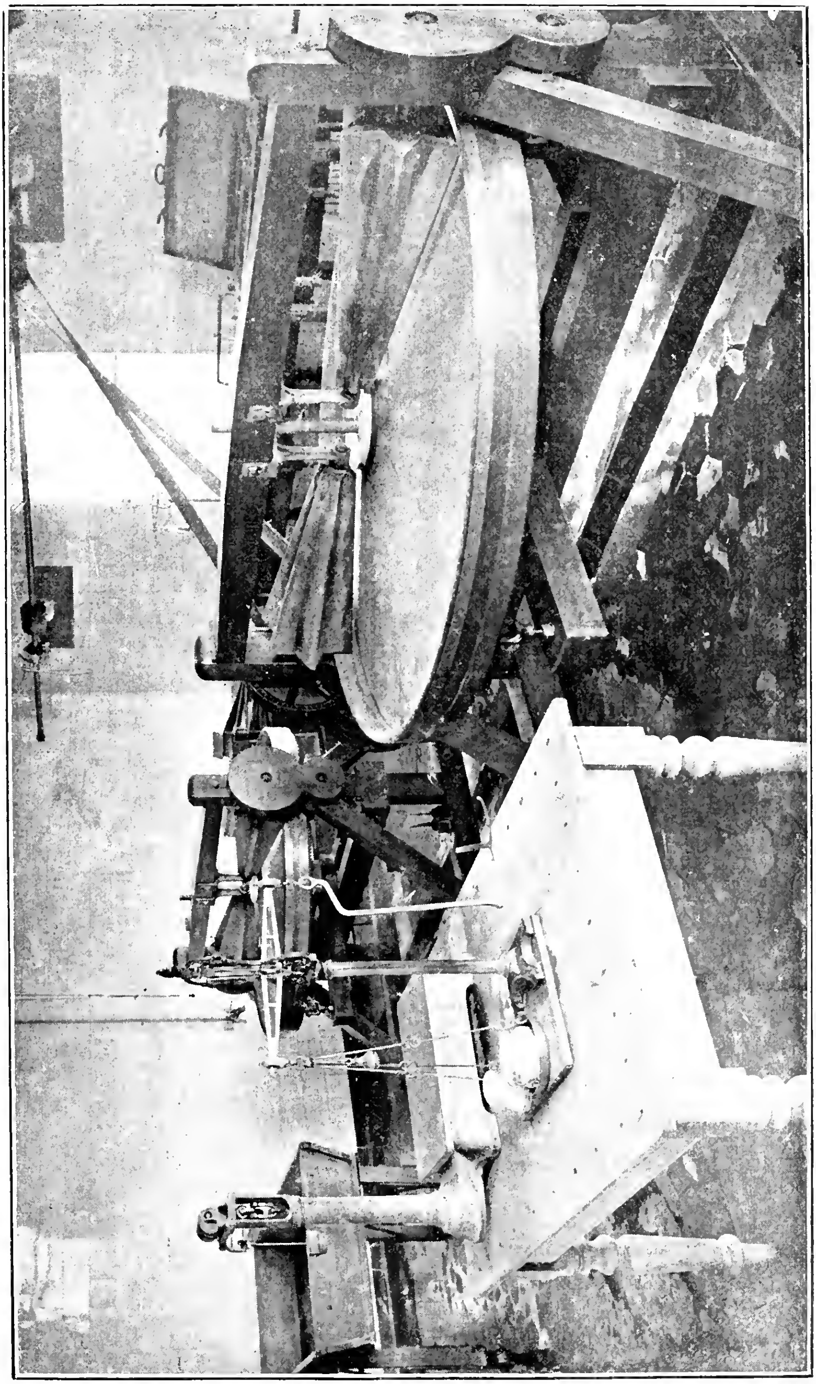
The question of moisture in butter came into prominence during the past season, and 2,107 boxes or 0.38 per cent. of the butter presented for shipment were detained and had to be brought within the standard, as compared with 776 boxes or 0.028 per cent. for the year before, and only 0.08 per cent. for 1907-8.

The following is a summary of moisture percentages:—

Number of Samples Containing Various Percentages of Moisture.

Percentages.	No.	Percentage.	Percentages.	No.	Percentage.
8 to 9	1	·08	14 to 15	314	26·99
9 " 10	10	·86	15 " 16	209	17·97
10 " 11	26	2·24	16 " 17	63	5·41
11 " 12	69	5·93	17 " 18	21	1·81
12 " 13	156	13·41	18 " 19	6	·52
13 " 14	288	24·76			

Total—1,163.



BUTTER-WORKING ROOM, GRASMERE FACTORY.

WEIGHTS.

The number of boxes detained on account of short weight was 610 out of consignments representing 2,100, or equal to 0.11 per cent., of the total exports, as compared with 520 or 0.193 per cent. for the previous season and 10,840 boxes or 2.24 per cent. for 1907-8.

Upwards of 50,000 cases were weighed here. Three boxes are taken out of each consignment, and when the weights are bare an additional three are selected. The larger proportion is also taken from consignments which prove irregular in weight. Notwithstanding the vigilance of the Department, in intercepting butter short in weight, many complaints were made in Great Britain regarding the unsatisfactory way in which butter scaled at the other end.

Dissatisfaction must continue until some alteration can be made either in regard to the regulations on the subject here, or the method of purchasing our butter at the other end. It is well known here that exception can be taken only when the contents of a box fail to take up the beam at 56 lbs. Needless to say, butter found below $56\frac{1}{4}$ lbs. cannot be depended upon to turn out full weight at the London end, whilst all between that and 56 lbs. are almost certain to be short. When butters weigh $56\frac{1}{2}$ lbs. no entry is made on the certificate which has printed on it "Sample boxes weighed and found correct." However, with the weights below $56\frac{1}{2}$ lbs. and not under 56 lbs. the weight of each box is entered on the certificate. It was thought that this would serve as an indication to purchasers in London as to what the real weight was here prior to shipment.

Notwithstanding the fact that the regulations provide that as long as butter scales 56 lbs. prior to shipment no action is taken, the Home and Foreign Produce Exchange Limited in London adopted the following Rules of Arbitration in 1909:—

BUTTER—LANDED SALES.

General Rules for Weighing and Averaging.

21. Packages containing net weight of 30 lbs. and under to be weighed to $\frac{1}{4}$ lb. Packages containing net weight of more than 30 lbs. and up to 60 lbs. to be weighed to $\frac{1}{2}$ lb.

Packages containing a net weight of more than 60 lbs. to be weighed up to 1 lb.

Packages of irregular weights to be weighed gross and tare.

23. Overweight on packages of uniform marked weights can neither be included in the average nor charged for. Should any package taken in average prove to be more than 1 lb. below the average short weight of the parcel, the loss will be allowed and another package substituted in place thereof.

26. Ten per cent. of the bulk to be weighed if required by buyer or seller, but in the case of hot weather not more than five per cent. to be taken.

AUSTRALIAN AND NEW ZEALAND BUTTER AND CHEESE.

Loss in Weight and Method of Weighing.

(*a*) *Butter.*—Butter shall be packed $56\frac{1}{2}$ lbs. per box, exclusive of paper, to cover shrinkage, but shall be invoiced as 56 lbs. per box. Average loss shall be calculated on the basis of $56\frac{1}{2}$ lbs. per box at the time of shipment, or when averaged, which shall be done not more than fourteen days prior to the date of shipment, and the Government grader's certificate of weight attached to each invoice shall be accepted as final.

(*d*) *Butter and Cheese.*—Should no Government grader's certificate of weight be furnished with the other documents or produced for inspection on demand, the goods shall be averaged within three business days after landing at the port of discharge, or if the goods be landed before the buyer has sighted draft, and, or, received invoice, then within three business days after such sighting or receipt; the cost of weighing 10 per cent. for the purpose of averaging shall be paid by the seller, and the buyer shall be entitled to an allowance for short weight (if any).

(*e*) When butter or cheese is so averaged at port of discharge the standard shall be 56 lbs. per box for butter and marked weights for cheese.

(*f*) The seller may be called upon for proof of original invoice weights.

(*g*) In the absence of manifest error, the weights of all goods averaged at any public wharf, quay, or railway depôt, shall be accepted as final between buyer and seller. Standing beam shall be considered as short weight, but should standing beam occur more than once in weighing the same parcel it shall be, in the first instance, as short weight, and in the second as full weight, and so on alternately.

(*h*) For the purpose of this rule, butter shall be weighed one box at a time, and cheese in drafts of six cheese at a time.

From these rules it will be clearly seen that those in the trade in Great Britain did not understand the position here, and they will have to alter the rules, or the regulations here must be changed before a satisfactory solution can be arrived at. It seems a great pity that regulations cannot be altered, in the interest of the trade. If the opinion cannot be modified "that it is impossible under the Commonwealth Act" I consider the matter of sufficient importance for an amended Act.

BORIC ACID.

The average percentage of boric acid found in samples of butter analyzed was 0.18 per cent., as compared with 0.17 per cent. for the year before and 0.23 per cent. for 1907-8. The number of boxes held up on account of having been found to contain more than 0.5 of boric acid was 388 or 0.07 per cent., as compared with 38 boxes or 0.01 per cent. for the season before and 180 boxes or 0.03 per cent. for 1907-8.

BUTTER FAT.

The average percentage of butter fat and casein was 83.71 per cent.; and 2,376 boxes, or 0.43 per cent., were detained from shipment on account of having been found to contain less than the standard 82 per cent. The average of all samples analyzed for the previous season was 84.65 per cent. of butter fat and casein (casein below 1 per cent.—the average casein contents of samples analyzed was 0.78 per cent.); for the year 1907-8 the average percentage of butter fat only was 84.1 per cent. It will be seen therefore that Victorian butter contains 0.94 per cent. less butter fat than for 1908-9, and 1.17 per cent. less than in 1907-8. In other words, if butter of the same composition were made last season as for the season 1907-8 there would have been 7,528 boxes or 188 tons less shipped; and if similar to last season 6,065 boxes or 151½ tons less.

BUTTER ANALYSES.

Altogether, 1,509 samples were taken for analysis or an average of one sample to every 358 boxes. In the report of the Dairy Division in New Zealand for 1908 it appears that 132 complete analyses were made and 1,005 for moisture contents only, making a total of 1,137, whilst 519,918 boxes were exported or equal to one sample to every 458 packages. New Zealand is recognised as having a more thorough check over its export butters than any other country in the world. Therefore, some other means appear to be necessary to keep the composition of butter within bounds than by simple official analyses. The time has arrived when much heavier penalties must be enforced in order to keep the composition of butter within the standard. In the United States the penalties inflicted for some offences, particularly excessive moisture, are 10 cents per lb. or equal to 23s. 4d. a box; therefore, for a consignment of 100 boxes, the penalty would be £116 13s. 4d.

In the report of the principal chemist of the Government Laboratory in Great Britain, on the work of the laboratory for the year 1909, it appears that 1,185 samples of imported butter were analyzed for the season and 1,486 for 1907-8. Only 81 samples were from Australia.

The following is an extract from the report: —

There has been a further reduction in the number of imported samples taken for the year. Since it has not been considered necessary to sample with such frequency consignments of butter arriving from sources which are under Government control or inspection in the country of origin, particular attention has, however, been paid to those sources of supply which experience has shown have been connected with sophisticated butter, but as buyers are purchasing less of this class of butter, the number of samples taken is consequently reduced.

There has been a further decrease in the number of samples found to contain water in excess of the legal limit. In the present year the number is nine as against sixteen for 1907-8 and thirteen for 1906-7.

From this it will be seen what advantages are gained by taking steps to secure and retain the confidence of countries to which our butter goes.

INSTRUCTIONAL WORK.

During the slack of the season, officers of the Department who examine the butter for export devote their attention to butter factories and give advice upon the buildings and plant; water supply and its suitability; drainage and provision for its sanitary disposal; cream collection and its relation to quality; cream cans, their cleanliness and condition; methods of grading, sampling, and testing of cream; the cooling and maturing of cream; temperatures of churning and means of controlling same; manufacture and packing of butter, and the over-run.

RUSTY CANS.

Last season. I had occasion to emphasize the amount of damage incurred through the use of rusty cans by dairymen. Much good has been done by butter factories since then with the assistance of officers of the Department. By taking up the task of repairing faulty cans and debiting owners without consulting them many factories have overcome the difficulty. Notwithstanding the good work done, much more remains to be accomplished. It is quite a pleasure to visit some dairy farms and see the 10 or 12 milk cans nicely ranged under a verandah, spotlessly clean, in striking contrast with other places where the cans are used for holding slops, sour skim milk, and for carting water in cases of emergency. Hundreds of cans are ruined through being used for water carting. By this means a new vessel can be rendered unfit in less than a week, and made a contaminating medium for all milk or cream subsequently put into it.

I strongly recommend factories that have not already done so to take up the firm attitude of having all faulty cans repaired at the owner's charge, pending legislation on the subject to force such damaging utensils out of use.

MILKING MACHINES.

The milking machines in Victoria have now been running for half a dozen years with varied results. As was anticipated by some at the beginning, many plants are rusting, whilst in other places they are regarded as an unqualified success. Strange to say, the successful users are to be found in groups, due most likely to careful instruction by experts when installed and to continued attention by the users. To run milking-machines properly requires a rare combination of qualifications, but first and foremost the user must be a dairyman, and understand cows thoroughly. The udders must be carefully washed, and each quarter checked before attaching a machine. The work must be re-checked immediately after detaching and before the cows are dismissed.

The user of a milking-machine must also be a mechanic and a resourceful one at that. He should undergo a thorough training if complete success is to be achieved, and he should realize to the full the necessity for taking all parts of the machine to pieces, cleansing and sterilizing it after use and keeping it free from contamination until it may be required again. A high standard of cleanliness must be continuously observed.

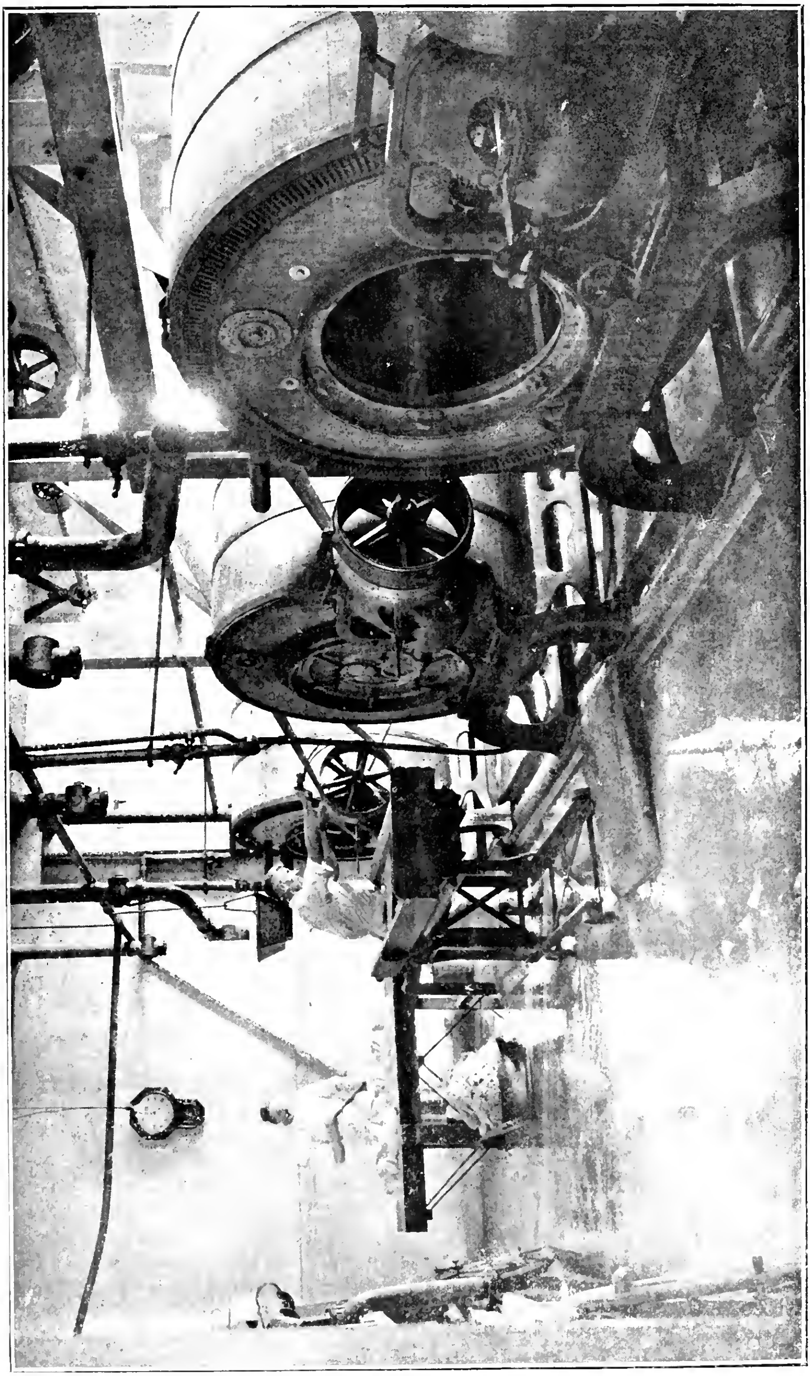
Some time ago the Director of Agriculture requested me to inquire and ascertain what effect the use of the machine had on the quality of the milk. I was able to get monthly tests from a herd for four years prior. and for four years subsequent, to the installation of the machines. I found that the averages were quite as good with the machines as they had been before.

PAYMENT FOR WINTER MILK.

Dairymen are being constantly taken to task for not producing heavier supplies in the winter time. It is regarded as a reflection on them not to have more milk from their herds during the autumn and winter months. Some enthusiasts go so far as to regard it as possible to produce butter for the London market all the year round. Whilst I do not take such an extreme view, it is certainly advisable that all herds be kept in condition, by growing and conserving fodder, and in a state of profit to supply our export connexions with Africa and the East, as well as local requirements.

As a commencement, any class of fodder will do so long as it is luscious and nourishing. The particular method must be determined by environment. One has a block suitable for irrigation; another, in the same district, is not able to irrigate. Elsewhere, a dairyman may have an abundance of maize coming in immediately the pasture is exhausted; this he can feed direct to the cows from the paddock, and also have plenty of green oats and hay for the winter. On such a farm, even a silo is hardly necessary, whilst a farm in the same district not so favourably situated would have, no matter how well the plans were made, a gap of three months between the pasture and the earliest green stuff. On such a farm, *a silo is indispensable.*

There are, however, two very important determining factors which should receive consideration. One is, that short leases discourage winter dairying; it is not considered worth while to erect silos or pay much attention to cultivation, and the farm is exploited to the fullest extent from the grazing point of view. This may be a short-sighted policy, still the facts remain that such is the case to a very noticeable extent in dairying districts. The other factor is, that butter factories handle only a fractional part of the turnover in the winter time to what is manufactured in the spring months. The dairyman who produces butter to enable markets to be retained for patrons who supply in the spring is penalized for their benefit. His cost of production for every pound of butter is greater than that of the spring producer, and yet he is charged a great deal more for his manufacture. Some system is recommended to butter factories that would enable the cost of manufacture to be averaged the year round, or better still, the debit for manufacturing should be in an inverse ratio to the cost. In paying for spring supplies a sum should be set aside each month to enable the cost of manufacturing debited in the winter time to be reduced. The policy of the butter factories in the past has actually discouraged winter dairying; yet those connected with the factories blame the dairymen for not going in more for dairying at that time of the year. The small difference in price is certainly not sufficient to pay those who provide for winter dairying for their greater increased cost of production.



MODERN COMBINED CHURNS AND WORKERS, COLAC BUTTER FACTORY.

Butter Boxes.

The price of butter boxes was a matter that called for attention. Boxes for approximately 16,000 tons, for export, and 12,000, for local trade, or a total of 28,000 tons, with 40 boxes to the ton, are required annually —in round numbers, over a million boxes, after allowing for many of those used in the local trade to be filled two or three times. The Hon. the Minister, when satisfied that an understanding existed to unduly keep up prices, announced that unless reasonable charges were reverted to, some decisive action would be taken. The contract price was 1s. 6d. per box, and as no notice was taken an officer was sent to Queensland to make inquiries with a view to securing supplies at a lower cost. He submitted a report showing that any amount of timber was available, all that was needed being some organization amongst the butter factories to insure supplies at bedrock prices. Recently, however, it has been announced that box-makers had agreed to reduce the price to 1s. 4d. and the butter factories had taken steps to supply their own requirements at prices which are believed to be even lower than this figure. The difference between 1s. 4d. and 1s. 6d. on 1,000,000 boxes per year comes to over £8,300, and the dairying community is indebted to the Minister for his share in bringing about the reduction.

A new wire-bound box, made of just half the thickness of the ordinary box, came into use last year and passed through the preliminary stages satisfactorily. A thorough trial lasting throughout the season was given and the results were closely watched at the London end. The Agent-General has reported that there were fewer breakages than with the plain boxes, and on the whole they compared more favourably with the other packages. On account of their thinness and mode of construction they are not so likely to be used the second time for inferior butters or margarine. At the moment, there are different classes of butter boxes being introduced.

Milk Preservation.

A report recently appeared in the daily press giving particulars of the Pusey process of milk preservation, an Australian discovery originating in Western Australia. A bottle was tested by Dr. Ham, Chairman of the Board of Public Health, and Dr. Bull, Director of the Bacteriological Laboratory at the University. The milk examined was reported as sterile and was bottled last September in Western Australia.

Samples of preserved milk were purchased by me in Singapore in July, 1908. It is not known how long before the milk had been bottled in Holland. According to the label "the contents are guaranteed to be pure rich cow's milk, cleansed from all bacteria and disease, free from any kind of preservatives and unadulterated, and keeping good for any length of time and in any climate." On the way down through the Straits of Sunda, and round the north of Java, the milk was carried in a cabin adjoining the boiler room where the temperature was continually about 100 degrees Fahr. for fully a fortnight.

As far as can be gathered the method of preparation consists of nothing more nor less than a high standard of cleanliness and sanitation at the source of production. It is immediately strained to a degree amounting almost to filtration, after which it is subjected to hydraulic pressure for the purpose of subdividing the butter fat globules into minute particles. This renders the fluid more homogeneous, and reduces the buoyancy of the butter fat particles. The tendency to come to the surface is also brought to vanishing point. The milk is then bottled and submitted to intermittent pasteurization until absolute sterilization is achieved. A temperature of 150 degrees for twenty minutes is sufficient to kill all ordinary organisms and some of the spores. By leaving the milk at a favourable temperature for a time, the remaining spores germinated are destroyed by subsequent pasteurization, and the produce will naturally keep for an indefinite period "in any climate" as per the label. It is well to know and be reminded of these points, as it enables one to appreciate the value of cleanliness in dairying operations.

The discovery is not new. There may be in the new process an economic method of applying it, and under that heading a claim may be legitimately made to something original. I remember sterilized bottled milk that would keep indefinitely being prepared at Tooram, near Warrnambool, over twenty years ago.

Dried and Concentrated Milks.

Practical measures have been taken during the past season for the establishment of dried and concentrated milk factories. According to a recent report, the concentrated milk factory at Rosebrook is to take up the manufacture of dried milk. Another company, it is announced, has taken setps to commence operations in the same direction at Glenormiston; whilst there is approaching completion, what is reputed to be, the finest milk condensing building and plant in the whole world—Nestles Limited, at Dennington, near Warrnambool. This factory will embody every requirement and improvement in vogue in their other factories. The whole of the plant was manufactured specially and fitted up before being sent to this country and it is expected to be in operation by next October. This business will form an additional arm to our already extensive dairying industry.

Cheese Exports.

Early last spring it was recognised that a considerable surplus of cheese would be available for shipment on account of the increased attention paid to cheese making. A few factories started in addition to quite a number of dairy farmers. An attempt was made by circular to induce each large cheese-maker to contribute small consignments to one or more of the shipments, but only a couple of tons were offered. Almost without exception, those who were approached agreed that it was an excellent idea to export some of the surplus, that the chance of a payable price on the export market was good, and that it would be the means of keeping the local market in a healthy condition. But some excuse was always offered as to why they particularly should not contribute.

The result is that more matured cheese remains in stock in Victoria than has ever been the case in the history of the State. This has exercised a prejudicial effect on cheese making generally since the beginning of the year which is likely to continue for months. It might have paid the dairymen to sacrifice one or two hundred tons in order to improve the market for the balance, but no such suggestion was made or result likely. Although the export market is a comparatively profitable one each man thought that if others could be persuaded to send sufficient away to relieve the local market he would benefit; and so all suffered.

This continued shyness does not necessarily mean large losses, as nearly all the factories making cheese have dual plants, and divert the milk into butter instead of cheese when there is a congestion of the latter commodity.

The only regret I have is that we cannot establish an export trade in cheese in addition to butter. New Zealand last year exported 22,089 tons of cheese valued at £1,186,708 and 16,103 tons of butter valued at £1,635,373.

SENSIBLE AND PROFITABLE DAIRY FARMING.

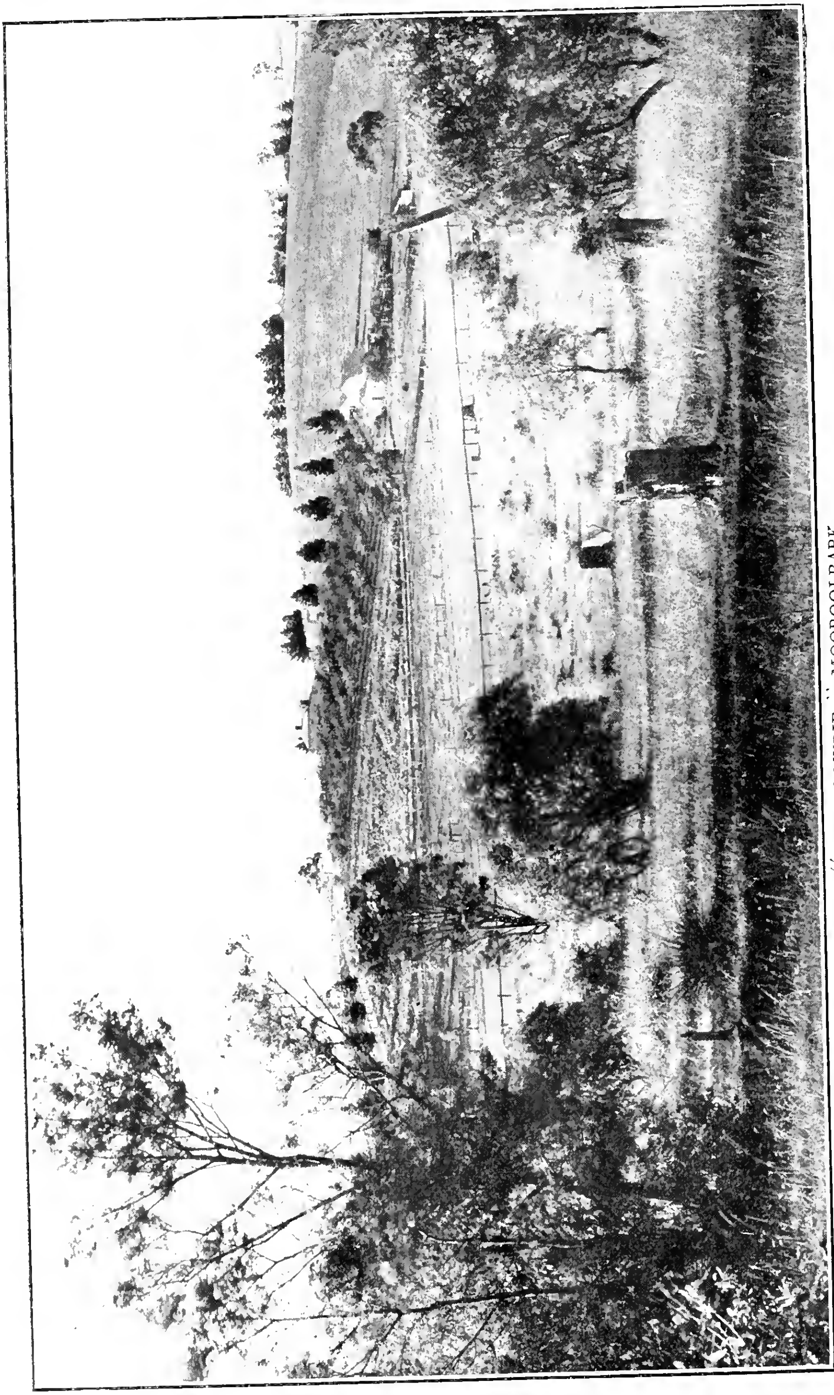
J. S. McFadzean, Dairy Supervisor.

Success in dairy-farming is almost without exception the result of good management. Without method, dairy farm work can easily become both laborious and unprofitable. With systematic breeding, culling, and feeding, a dairy herd may be improved yearly in both appearance and milking quality; but without such attention no advancement can be expected. Throughout the whole State striking instances are to be found of success following on methodical dairy farm practice; and in the same districts others may usually be seen where lack of such system is the drawback to progress. Dairying with poor milking stock is drudgery.

Propositions for the improvement of the dairy herd which involve the recording of each cow's milk production are often put aside on the supposition that they would take too much time to carry out; yet many dairymen will waste double that amount of time each year attending stock sales in the unsuccessful attempt to buy good cows. A considerable percentage of sale-yard cows are cull stock; and every buyer gets his share of them. The dairy farmer who endeavours to maintain a good milking herd solely by purchasing stock soon becomes more or less a cattle-jobber; whereas, those who breed their own stock seldom have need to go off their farms. No farmer can do justice to his work if he wastes much time in the saddle or on sale-yard fences. By keeping a good dairy-bred bull, and raising the heifer calves from the best cows each year, every dairyman can soon place himself in the position that he has no time for such lotteries as stock sales.

Almost every farmer who keeps cows has surplus milk in the spring that can most profitably be utilized in the raising of a few picked calves. On most places a few calves are raised each flush season; but, being bred indiscriminately, these have no special value, and they are sold as vealers or stores, according to their condition, when it is decided to dispose of them. The profits from such calf-raising are comparatively small, and beyond the few shillings resulting from each sale the farmer derives little benefit from his work. On the other hand, each heifer bred from good milking stock, and raised to the profit stage, will probably bring in a substantial return for several years.

Consistent breeding from heavy milking stock will soon even up the quality of the herd as producers; and if by breeding and culling it is possible to increase the average yield of the herd by even a few gallons each year, it will amount to just so much more clear profit. On many dairy-farms in Victoria where good management prevails the milk yield is over 500 gallons per cow; but there are others on which the average yield is less than 300 gallons. It must therefore be possible, with proper management, to increase the milk yield on such farms by fully 200 gallons per cow. A dairy-farmer selling cream would, by doing this, increase his returns by at least £3 per cow, without allowing any value for the extra skim



"BLAIRGOWRIE," MOOROOLBARK.

Winner Lilydale Agricultural Society's Dairy Farm Competition, 1909.

milk; and, if he were selling milk for the city retail trade, his profits would be almost double this amount on account of the higher selling price per gallon.

As 50 gallons of average quality milk will produce approximately 18 lbs. of butter-fat, it is easy to estimate a milk yield from cream returns. Unfortunately, however, the owner of poor milking stock is seldom anxious to know, or say, too much about them. If he cannot conceal their meagre yields, he will make any apology for them; and the locality, the grazing, or the weather, is asked to carry the blame for the unprofitable cow.

The figures used in the above estimate do not by any means present this variation in milk yields at its full limits, for there are farms where the cows average as much as 600 gallons each per year; and that standard is still being raised.

Practical Proof on a Mooroolbark Farm.

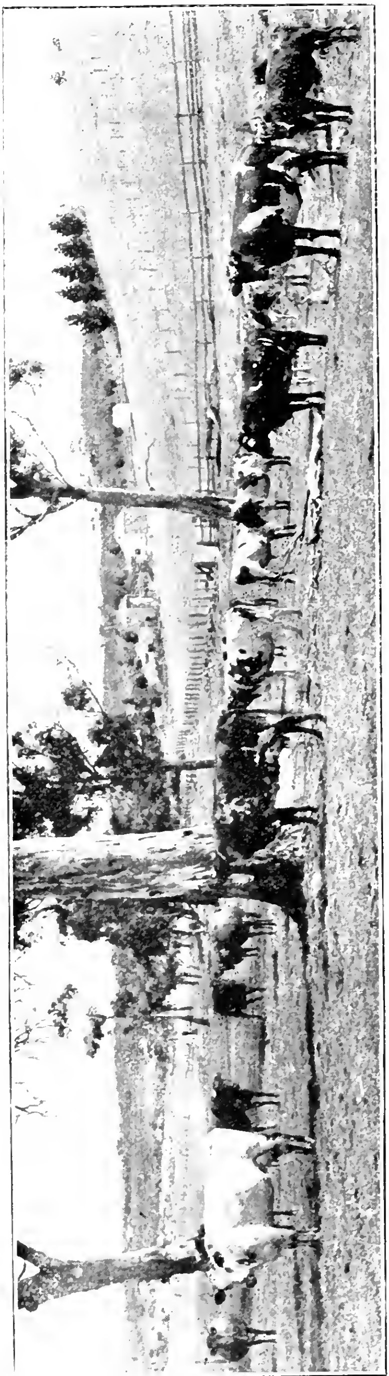
At Mooroolbark, a small siding on the Lilydale line, 21 miles from Melbourne, and about half-a-mile from the station, is the dairy farm of Mr. Robert Blair. Much of the land in this locality has not yet been cleared; but a few of the farms were settled on upwards of 45 years ago, and some of them have a fair proportion of their areas broken up, and sown to grass. Of these, Mr. Blair's farm, "Blairgowrie," is one of the best.

It contains 136 acres, subdivided into 12 paddocks, and about 100 acres of it has been ploughed and sown down at various times. About 20 acres are now cultivated each year, and of this about equal acreage is sown with oats and maize, the bulk of both crops being harvested for silage, and fed to the milking stock as required. The oaten silage, harvested in December, is used till the maize is fit to cut, which is about the end of March or beginning of April. The pits are then filled with the maize, and the supply usually lasts till well into October, when the spring growth of grass needs no further assistance in upholding the milk flow.

The silage accommodation consists of two brick overground pits, that also run a few feet below the ground surface, and their combined capacity is estimated at 110 tons. At the beginning and end of the feeding season the cows take very little silage per day; but in the colder months of autumn and winter the amount eaten is as much as 45 lbs. per cow daily. Oaten chaff and bran are also mixed with the silage when the condition of the cows calls for such extra feed.

The stock now on the farm are principally grade Ayrshires, but some of the older cows have a Shorthorn cross in them. Mr. Blair has been dairying on this farm for some eight years past, and by using Ayrshire bulls from milking strains, and raising a few heifers from his best cows each season, he has rapidly increased the milk production of his herd. In this work of improvement, a long-continued milking period was especially sought for, and in order to qualify for a place in the herd every cow had to keep in profit for at least ten months per year. This standard is now very consistently maintained, there being seldom more than one dry cow in the herd for every eight that are in milk.

The farm buildings are very compactly arranged. The stabling and barn, with engine and chaffcutter, are on the higher ground. A little below the level of these are the silos, which are filled from the cutter by slat elevator. Below the silos the feed and mixing rooms adjoin; and, from the latter, a door opens to a passage-way in front of the milking stalls.



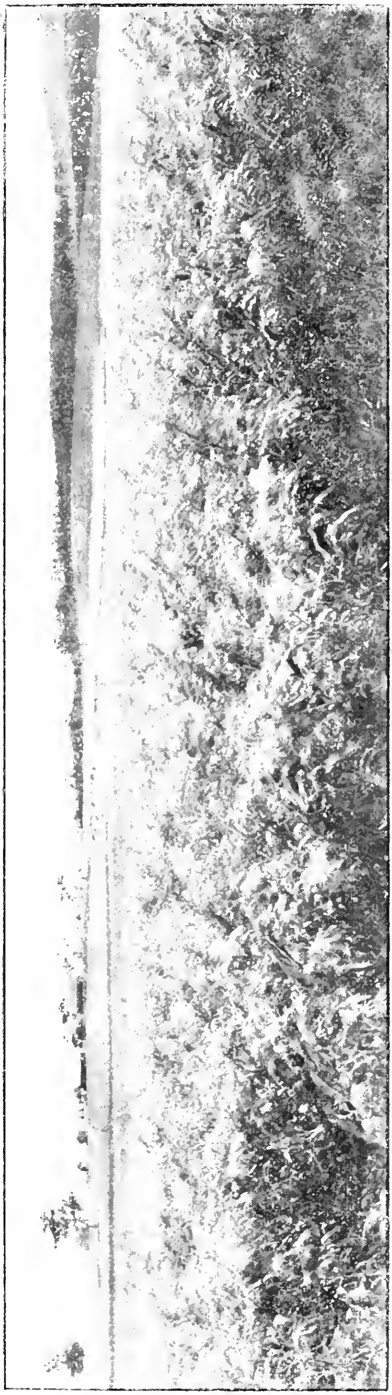
THE "BLAIRGOWRIE" MILKING HERD—600 GALLONS PER COW.

On the further end of the milking shed, and across another passage way, is the can room and wash-up place, and adjoining it is the cooling room. The water for the cooler is piped from a spring in the valley above the steading, the pipes being laid underground to maintain the low temperature. The same source provides a sufficiency for the stock, as well as all other requirements at the shed and dairy. Outside the cooling room door the hillside position allows of the cans being loaded from the platform without any lifting, while below the shedding are the calf pens and paddock in a nicely sheltered position. The stock are kept in good condition; the roads, fences, and gates are in good repair; and the place is being still further improved—the extension of the present milking shed is set down for early attention.

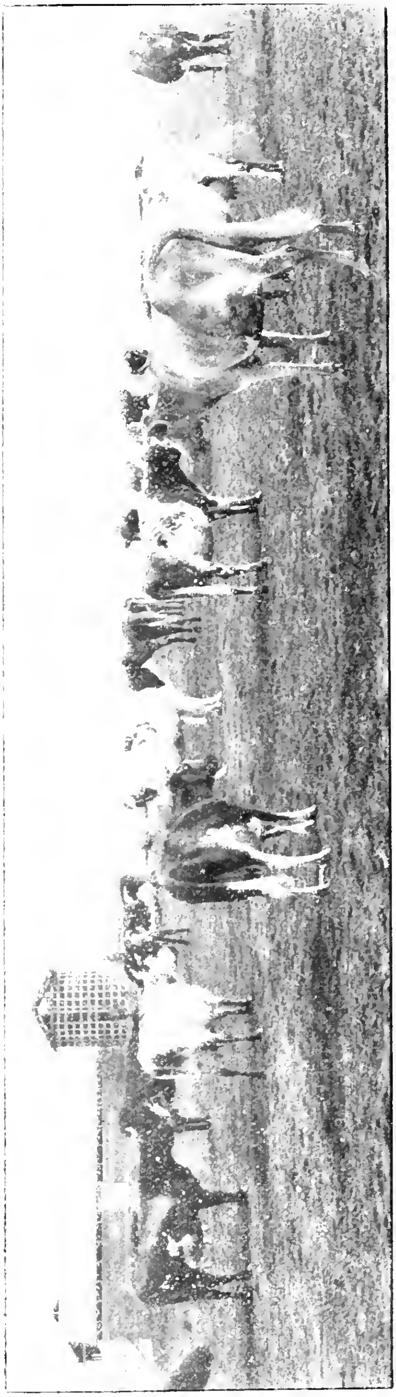
As showing the progress made here by careful dairy farm methods, the milk yields for the past few seasons are interesting. From 1st July, 1906, to end of June, 1907, the total herd of 28 cows averaged 580 gallons of milk each. In the year 1907-8 the same number of cows averaged 588 gallons per head. During 1908-9 the herd was increased to 30 cows, and they averaged 601 gallons each. There are now 32 cows on the farm, and for the nine months ending in March of this year, they had given an average of 476 gallons per head, which is equal to 625 gallons per cow for the full year, and there is every possibility of this being exceeded.

It should be mentioned that this farm was the winner of the dairy farm competition held last year by the Lilydale Agricultural Society. However, the above figures speak for themselves. They will demonstrate to some people what they are losing by indifferent management; and they will show those who are improving their herds what they may expect.

Most men would change their seed or fertilizer if they did not get good crops; they would not keep a sow that had only four or five young at a



AFTER ROUGH WEATHER—MR. GILBERT'S MAIZE CROP



DAIRY STOCK AND BUILDINGS AT MR. GILBERT'S FARM.

litter; they believe in good machinery because it saves time; yet many still allow themselves to be kept poor by the 300-gallon cow.

ANOTHER LILYDALE INSTANCE.

In connexion with the subdivision of the St. Hubert's Estate at Yering early in 1907, mention was made in the March *Journal* of Mr. J. Gilbert's farm. This block of 164 acres, without improvement, was then purchased by him for £20 per acre, and good progress has since been made in turning it into a profitable dairy farm.

Dwelling, shedding, silo, milk-room, barn, &c., have been erected, and over 50 acres brought under cultivation. About 30 acres are sown with oats and 20 acres with maize. As previously mentioned, the oat crop is put in as early as possible, and is kept fed off by the dairy stock till September. It is then allowed to make its full growth, to be used for hay or silage as required.

ON THE YARRA FLATS AT KEW.

As will be seen from the photograph on page 459, the cattle are big-framed stock of Shorthorn-Ayrshire breeding, and they do well on the English grasses and clover that grow profusely in the spring and summer on these rich river flats. Throughout the winter months this pasture is supported by hand-feeding the stock with silage, hay chaff, and bran at each milking.

Thirty-five cows are kept on the farm, and of these 25 is the usual number in profit. During the year 1908 this herd produced rather more than 17,980 gallons of milk, the bulk of which was sold for the Melbourne retail trade at an average price of 8½d. per gallon. This allows for a yield of 513 gallons per cow for the year, and a gross return of £18 3s. 4d. per head.

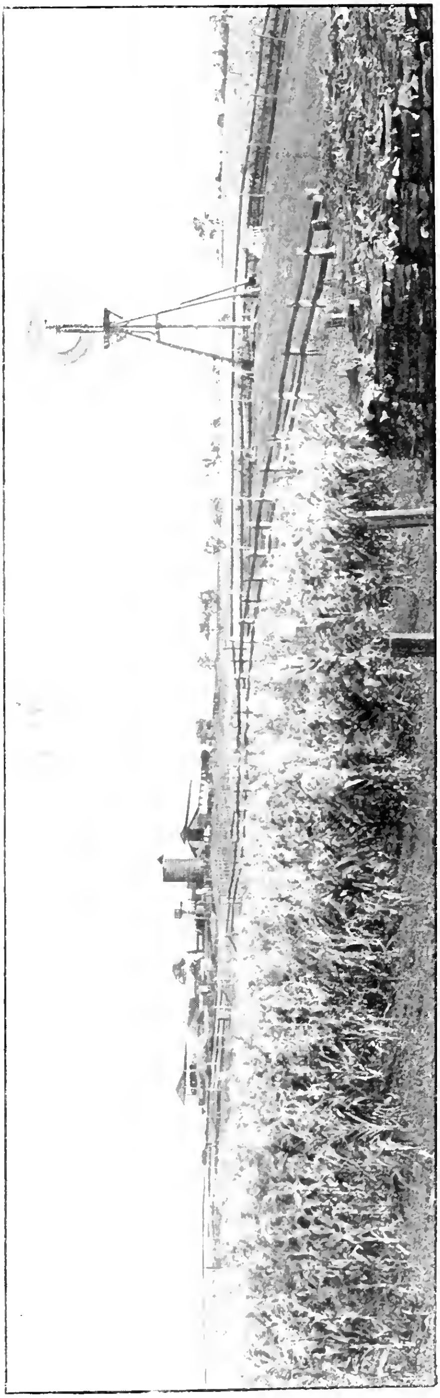
In 1909, the average yield increased to 536 gallons per cow, and during the latter portion of the year the milk was sold to the St. Hubert's cheese factory. The factory price is a little below the Melbourne wholesale rate, but there is a saving both in railway freights and loss of time that is taken in journeying to the station twice daily, the factory being close at hand. On the whole, therefore, the year's work shows very satisfactory progress.

The maize shown in the photograph is a drilled crop that has made very even growth. Some heavy rain and wind the day previous laid it over considerably, which somewhat reduces its apparent height.

A METROPOLITAN DAIRY FARM.

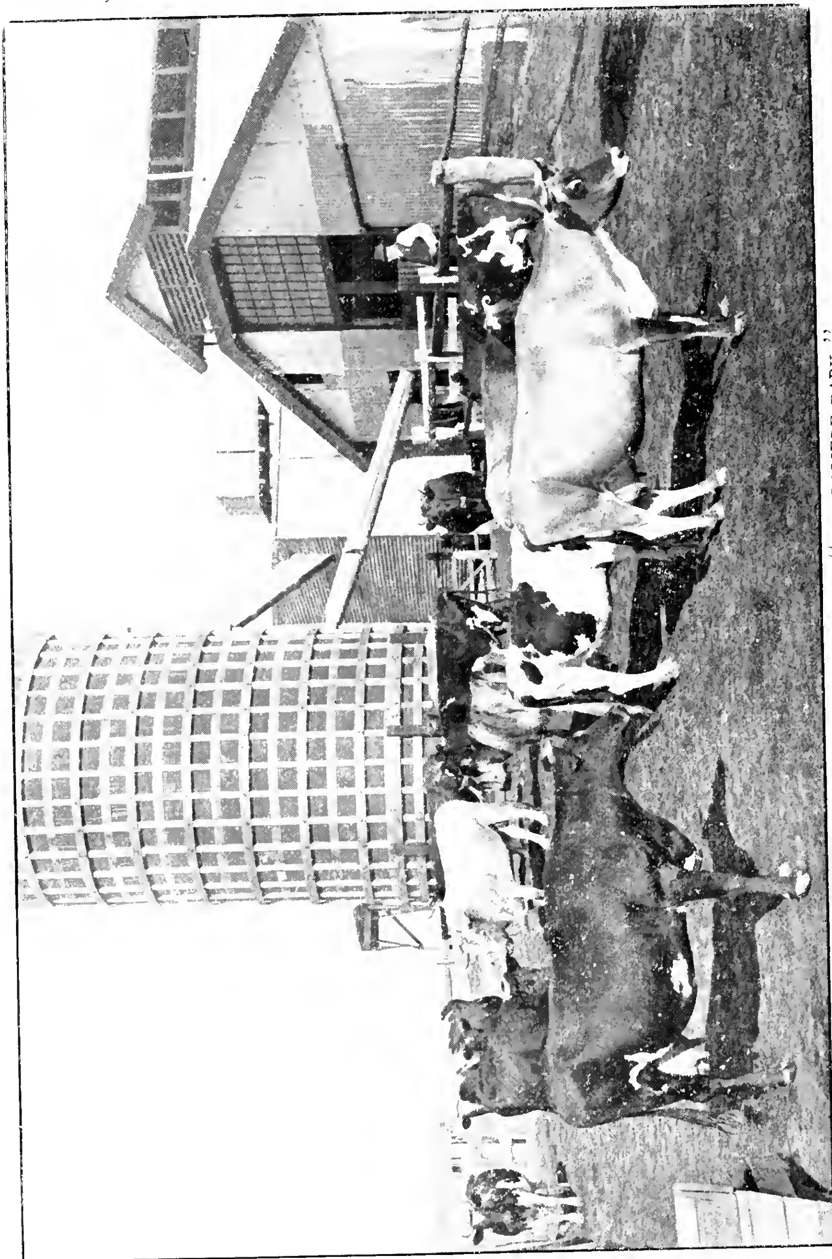
One of the neatest, best situated, and most up-to-date dairy farms in the metropolitan area is that of Mr. C. Rout, of Willsmere Park, Kew. This property comprises 258 acres, and is on a very picturesque bend of the Yarra river, which forms about a third of the boundary. Together with the retail round attached to it, Mr. Rout purchased this farm of 165 acres from Mr. Wills in May, 1908. Since then, an additional 93 acres have been purchased, as well as another milk round, and the milking herd has been increased from 33 to 50 head.

A fair proportion of the farm is river flat land, but this had previously been mainly used for grazing, and much of it was in a rough condition. This is now gradually being broken up, with the intention of sowing it down with lucerne after it has been cropped a few times and cleaned. Some very fine maize has been grown on these flats, as will be seen from the photographs on this and the opposite page. Mangolds and pumpkins are also grown here, and oats and peas on the higher



"WILLSMERE PARK" DAIRY FARM.—5 MILES FROM THE MELBOURNE G.P.O.

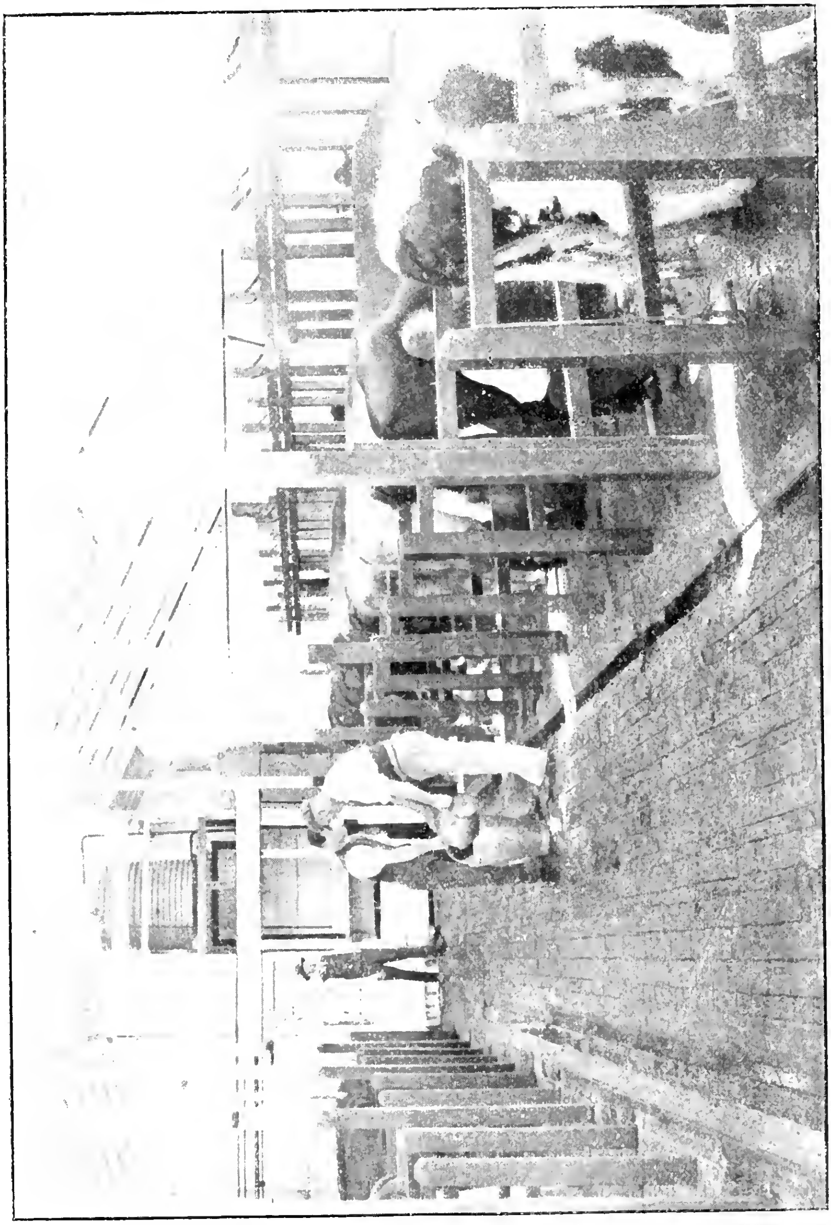
ground. A pumping plant for irrigation has lately been purchased, but it is not yet in use.



AN UP-TO-DATE FARM EQUIPMENT—"WILLSMERE PARK."

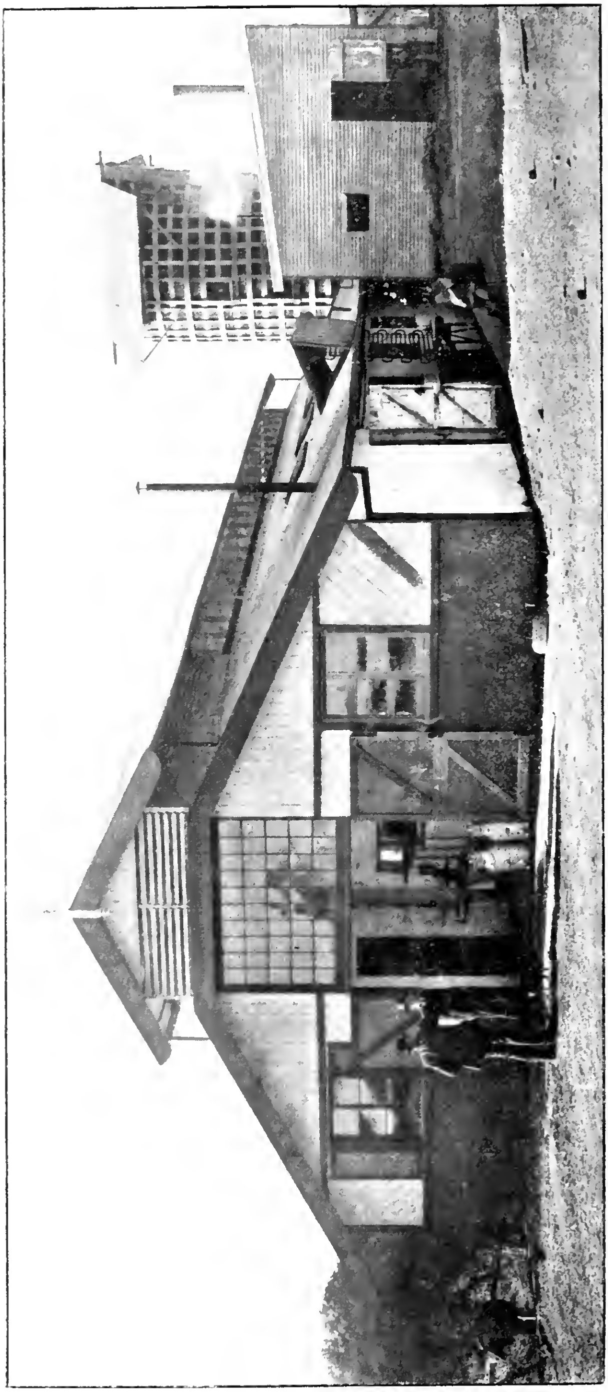
The milking shed and dairy buildings are of galvanized iron, with brick flooring, and the plant is very compactly arranged. A steam boiler, with 7 horse-power engine at one end of the chaff house, driving the cutter.

delivers the chaffed green-stuff by slat elevator to the silo outside at the other end. Below the cutter a sheet delivers to the mixing place, which adjoins the side of this building on a lower level. A sheet from the silo



AFTERNOON MILKING.

also runs to the brick mixing vat, and a pipe from there to the boiler allows of the feed being steamed if required. The 28 bails are in a double row, and, by working a lever in the centre of the shed, the cows on each



"WILLSMERE PARK" DAIRY.

side can be bailed up or released by one movement.

The washing-up-room adjoins the end of the milking shed furthest from the yards. With doors on all sides, it is kept well ventilated and clean, and it is neatly fitted up with galvanized-iron troughs, steam-pipes, and can racks. Off this room, and beside the large outer doorway where the carts take delivery of the milk, is the entrance to the cooling room, with refrigerating chamber, which is kept to the required temperature by a 2-ton Atlas machine.

Rain water for the dairy use is stored in a large underground tank, while water for flushing and general shed work is pumped by windmill from the river to storage tanks above the steading. The drainage and flushing water are carried by piping to a cultivation paddock some distance below the yards. The roadway for the cows, and yard adjacent to the sheds, are pitched with stone, which, combined with the good natural drainage of the site, keeps the place clean and dry.

In all there are 15 paddocks, about six of which are usually under cultivation. One of these, containing 15 acres, has recently been let for market gardening at £2 per week. From the herd of 50 cows an average of 350 quarts of milk is distributed daily to some 230 customers. Two carts are used in this retail work, which is concentrated as far as possible in the adjacent suburb.

From its proximity to the city, the good quality of the land, and its facilities for irrigation, this farm is particularly adapted for the profitable production and distribution af fresh milk. And with well-fed cows, strict cleanliness, the use of the refrigerator, and other up-to-date methods of dairy management, it is an object-lesson in metropolitan dairying.

DAIRYING IN THE WINCHELSEA SHIRE.

Report to the Chief Veterinary Officer.

J. M. Kerr, Dairy Supervisor.

Having now completed the second inspection of Winchelsea Shire I am enabled to furnish some information as to the state of the dairying industry in this district. Hostility to the Act—never very pronounced—has entirely disappeared, and the opinion was frequently expressed that the new order of things must be preferable to the old. The need for fairer collection of fees, and for more effective supervision, was generally recognised and my recommendations were accepted almost invariably in good spirit. This favourable attitude led me to anticipate that necessary structural improvements would be speedily disposed of, but on my second visit I found that, owing to the coal miners' strike making the price of bricks prohibitive, instead of the impervious floors being completed they were only being commenced. However, I am confident that, at the third inspection, there will be very little at fault as far as sanitation is concerned.

The most suitable portion of the shire for dairying extends along the Barwon River from the Ingleby Estate—a few miles below Birregurra—up to Barwon Downs, and it is at the latter place that one sees the best dairy herds. Only a small proportion of the rich Barwon flats is devoted to dairying and the reason is not easily explained, unless it be that land-owners choose to accept smaller returns and escape the more arduous and incessant work which dairying entails. For a couple of miles on either side of the railway line, between Deans Marsh and Barwon Downs, almost every holding is a dairy farm, and many of them are very choice little properties, extremely well adapted naturally for the purpose. On a few of these, summer crops are grown but not in quantities to be conserved. Some good crops of maize were seen, but very wasteful use was made of this valuable fodder; the practice being either to turn the herd on to the crop or to cut portions of it daily and throw it to them whole, in the paddocks.

The only silo I came across was at Pennyroyal, on the property of Mr. Norman. It is square in shape and the walls are of plain galvanized iron. Mr. Norman has been ensiling his crop for some years and his belief in the system has become, yearly, more confirmed. Unfortunately, his farm contains no flat land, in fact, is steep hilly country. Thus handicapped, Mr. Norman finds the growing of sufficient stuff to make the necessary bulk his greatest difficulty, but as the pioneer of the system in that district his enterprise commands commendation. His enthusiasm is remarkable, situated as he is in a community of sceptics, and is in contrast to the distrust which I found prevailing throughout the shire with regard to the economy of silage-making.

Approximately, one-half of Winchelsea shire is mountainous, but this rugged country varies greatly in quality: that in the vicinity of Anglesea River is little better than sand-dunes but the quality improves towards the westward, which portion is very heavily timbered, and fertile to the hill-tops. The road from Forrest to Skene's Creek follows the summit of the range and dairy farms abound along the route. On these holdings, very little clearing is yet done. The milking cows graze among the scrub and timber and, owing to the regular rainfall, are at their best during the summer months. There is a life-time of work ahead of these settlers, in clearing alone, and with them a slower rate of progress in making the improvements is to be expected. At some of the farms, less accessible than others, the owners are unable to get the product from the farm to market except by pack-horse, and this necessitates its being first made into butter; but most of the farmers sell the cream. The local butter factory at Deans Marsh receives a large proportion of the cream from the dairy farmers in the shire, but there are also two cream-receiving depôts at Birregurra—one controlled by the Colac Dairying Co. and the other by Holdenson and Nielson—which receive a fair share of patronage.

There are 230 dairy farms in the shire and the total number of cows milking during my first inspection was slightly over 3000. Very few calves are reared, therefore no importance is attached to the class of bull used. Pigs are kept to consume the skim-milk, the return being more direct than when fed to calves. The dairy cows generally are of shorthorn type, and it is uncommon to find a Jersey or Ayrshire given a place. The preponderance of shorthorn blood is due to the fact that the supply of dairy cows comes principally through the Colac market, in which district the shorthorn was always so popular. Seeing that it has been the practice to allow the cows to forage for themselves the year round, I wonder that the superiority of the Ayrshire under these conditions has not forced itself irresistibly into the notice of dairymen, more especially as much of the country is very steep, necessitating a large expenditure of the cows' energy in climbing twice daily to the milking shed. I could not fail to notice the effect of this on the condition of the heavy-framed shorthorns and it did not require much persuasion to convince their owners of its reducive effect on the milk-yield also. Already they were beginning to see it themselves.

During the course of the inspection I found occasion to temporarily prohibit 35 cows from being milked. At the subsequent examination of these by Veterinary Officer Cother, 16 were branded as being permanently unfit for milking, two had the prohibition extended, and the remaining 17 were not seriously enough affected for Mr. Cother to feel justified in allowing a further continuance of the prohibition. In some cases, however, the ailment, though not detrimental to the milk supply, might become a source of infection to other cows, and where there was a likelihood of this the owner was advised to kill the cow accordingly. Of the 17 permanently prohibited, only one was tubercular, 16 being actinomycotic.

The Winchelsea dairy farmers have been satisfied in the past to depend on the natural pasture alone, and when this fails, to allow the yield to cease; in many instances drying the cows off, that they may the better retain their condition during the scarce season. This is as an alternative to growing and conserving fodder enough to meet their needs during the time when the natural pasture is an almost negligible quantity. Many of the dairy farmers recognise that the latter is a more economical policy, but they also recognise that it needs more application and they excuse themselves by claiming that they are not dairy farmers in the proper sense and cannot see that it is worth the trouble. A large proportion, however, are on the land for all that it will return them, even if extra work is required, and they welcome any suggestion of a practical nature which is likely to increase the monetary return from their cows. I am satisfied that, in most cases, a substantial increase could be brought about, without undue expense, and with the co-operation of a few of the whole-hearted dairymen referred to, I hope for sufficient to be achieved to demonstrate to the many that the complaint, "there is nothing in dairying" is not justified, but is due in a great measure to the half-hearted methods of dairymen themselves. I look forward to an increased interest in dairying, due to the greater comfort and convenience of the improved milking-sheds and dairies which the Act requires.

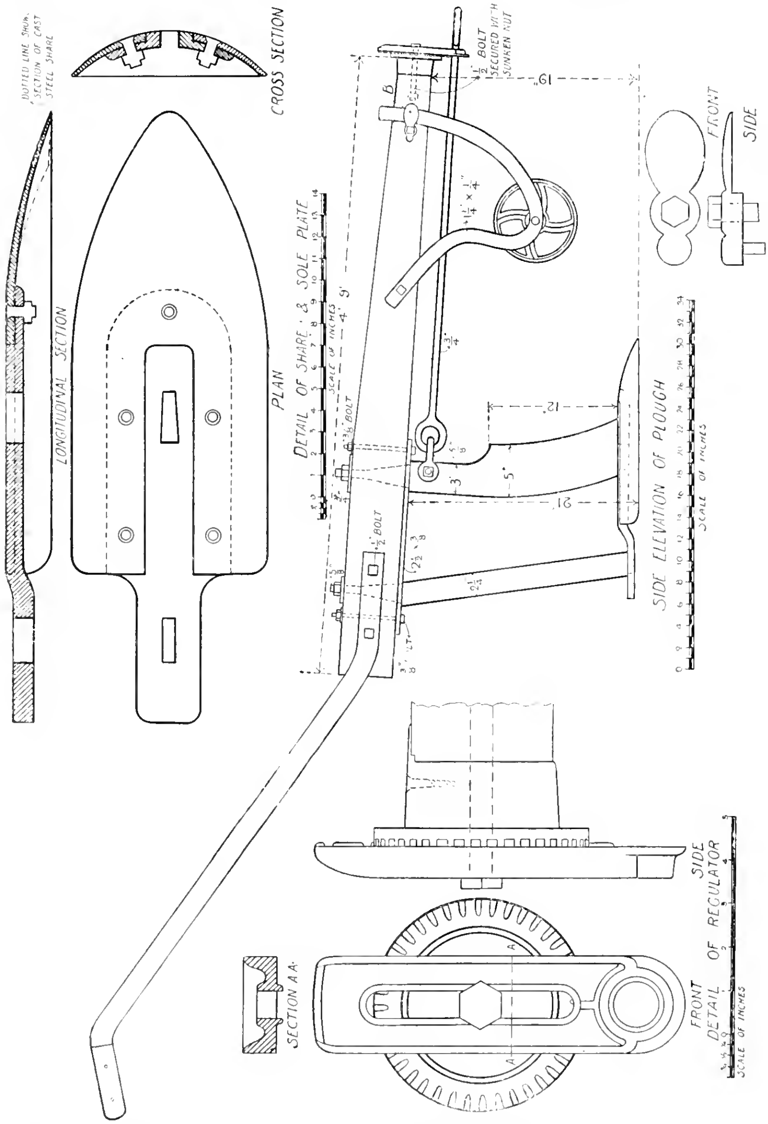
The discomforts of the old system made the work a drudgery, and many of those engaged in the business longed for the day when the dairy herd could be dispensed with, and hay-growing or sheep-farming indulged in instead. Any suggestion towards increasing the profits from the cows was unwelcome, because its adoption would render more unlikely the possibility of a change to the less laborious callings mentioned. Increased profits were right enough, but unless the work could be robbed of some of its unpleasantness they did not appeal much to the dairyman's family. With the improved conveniences the drudgery has at least been reduced, and I have little doubt that the increased returns will follow when the farmer—beginning to suspect that milking cows are not being given a chance on grass alone—engages more in cultivating for fodder crops, adopts a better system of fodder conservation, and, through the agency of the Babcock tester, keeps only those cows in his herd which yield sufficient butter-fat to prove that they have the capacity to turn to the best account this home-grown fodder when fed to them.

SUBSOILING.

A. S. Kenyon, C.E., Engineer for Agriculture.

There is a growing belief that subsoiling our northern plains for wheat growing will be of great benefit, not only by giving a much greater water-holding capacity to the soil but also by unlocking large quantities of plant food which analysis shows occur in the subsoil, practically as abundantly as in the surface. In addition to the naturally stiff and pugged condition of most of our clays, there is, in practically all old cultivation paddocks, a layer of "plough pan" formed by continually ploughing at the same depth. But, apart from the northern areas and their possibilities, there is a large present demand for subsoilers for the sugar beet cultivation.

To meet this demand, the Department has ordered fifteen subsoilers of a well-known American type, but with what are considered to be improve-



AN IMPROVED SUBSOILING PLOUGH.

ments. The original subsoiler imported from America has a solid foot; whereas, in the ones now being made, the foot is in two pieces, a sole plate and a removable share, thus avoiding the trouble of drawing out the foot as it wears, and considerably lengthening the useful life of the implement. The subsoilers are being made in Melbourne, at a cost of

£4 17s. 6d. each. As there are no special difficulties in making these implements, drawings and specifications are published herewith. This subsoiler is of course only used after a single-furrow plough and in suitable soil may be used 12 inches below the bottom of the furrow or, say, 18 inches from the surface. The draught is comparatively light; two horses are sufficient in easy ground, but four are necessary in stiffer soil. For shallower work, under 12 inches total depth, the Kemp subsoil foot, described in the *Journal* for April, 1908, is a useful attachment, especially as it may be used with a multiple furrow plough.

Specification for Subsoiling Plough.

The ploughs are to be of the best material and workmanship throughout, to be of good finish and to be painted in the usual manner.

Beam.—The beam is to be made of 5 in. x $3\frac{1}{2}$ in. dressed blue gum, tapered from coulter to $3\frac{1}{4}$ in. x $3\frac{1}{4}$ in. at the nose.

Coulter and Stay.—The knife coulter is to be of steel 3 in. x $\frac{3}{4}$ in. drawn out to a knife edge making it 5 inches wide for a height of 12 inches above the sole plate and to be 19 inches in length from underside of washer or plate at beam to top of sole plate, and to be of necessary extra lengths to pass through sole plate and to be securely riveted thereto and to pass through beam tapering to $\frac{3}{4}$ in. round screwed for nut and secured by nut and flat 3 in. x $3\frac{1}{2}$ in. washer. A shear steel cutting edge is to be let in and welded to coulter.

The stay is to be steel $2\frac{1}{4}$ in. x. $\frac{1}{2}$ in., 1 ft. $8\frac{1}{2}$ in. length, to be riveted to sole plate at a distance of 7 in. between outsides from knife coulter, to pass through beam tapering to $\frac{3}{8}$ in. round screwed for nut and secured by nut and $2\frac{1}{2}$ in. circular washer. The plate washer 18 in. x $2\frac{1}{2}$ in. x $\frac{3}{8}$ in. on the under side of beam is to be secured to it by two $\frac{3}{8}$ in. bolts.

Foot.—The subsoiling foot is composed of a sole plate and removable share. The sole plate is to be of the dimensions shown, to be of the best annealed crucible cast steel and to have the coulter and stay riveted to it. The share is to be of the dimensions shown, to be of $\frac{3}{8}$ in. shear steel drawn out with a gradual taper to the cutting edge and is to be accurately fitted and secured to the sole plate with five best steel countersunk $\frac{1}{2}$ in. bolts.

Draught.—The draught consists of shackle, drawbar and regulator. The shackle is to be $\frac{5}{8}$ in. iron 4 in. over all and secured to coulter by a $\frac{1}{2}$ in. bolt passing through a hole $1\frac{1}{2}$ inch below shoulder and 1 inch back from front edge of coulter.

The drawbar is to be of $\frac{3}{4}$ in. iron, 3 ft. 5 in. over all and with welded eyes 2 inches internal diameter.

The regulator is to be of malleable cast iron as figured and is secured to nose of beam by a $\frac{1}{2}$ inch bolt secured by sunken nut.

Depth Regulator.—The wheel is to be 8 inches diameter by 2 inches tread and attached to arms of $1\frac{1}{4}$ in. x $\frac{1}{4}$ in. iron of the shape figured which pass through malleable cast adjusting clamps, as figured, secured to beam by $\frac{3}{8}$ in. bolt.

Stilts.—Stilts are to be of iron of ordinary type with wooden half handles and secured to beam in position shown by two $\frac{1}{2}$ in. bolts. The handles should be about 4 feet above the bottom of the foot.

Cast Steel Share.—The cast steel share is to be of similar shape to the wrought steel shares but with a least thickness of $\frac{1}{2}$ inch and thickened out to give 2 inches at the nose of solid metal and to accurately fit sole plate.

THE WINE INDUSTRY IN SOUTHERN FRANCE.

DEPARTMENT OF HÉRAULT.

(*Continued from page 320.*)

F. de Castella, Government Viticulturist.

AMPELOGRAPHICAL NOTES.

Situation, soils and climate having been dealt with in previous issues, the not less important factor of variety, must next be considered.

We have already seen how different is the *Vin Ordinaire* of Hérault from the wines we produce in Victoria. The influence of the varieties of vines grown has a considerable bearing on this difference.

Reconstitution has somewhat complicated the question, and in the vineyards of the present day we have not only to consider the varieties which yield the wine, but also the resistant stocks upon which these must henceforth be grafted.

STOCKS.

The leading stocks in use in the Midi have already been dealt with at length (*Journal* for November, 1907). The vital importance of this phase of the question led me to make it the subject of my first progress report. Before proceeding to consider the scion varieties of the region a few additional notes must here be made concerning resistant stocks.

Shortly before my return to Montpellier, in January, 1908, I received copies of the *Journals* in which my first progress report had appeared. I was thus able to submit it to recognised authorities and obtain an expression of opinion as to the accuracy of the views expressed. The only point to which exception was taken was the manner in which I had summed up the evidence concerning Rupestris du Lot. In the opinion of several leading viticultural men I had been unduly severe on this well-known stock. M. Richter, in particular, was of this opinion. Being one of the leading vine nurserymen of Europe, his opinion is of great value. From orders received, he is in an excellent position to gauge the popularity of the different stocks. The relative proportions of the leading ones ordered from him in 1908 were as follow:—

On Rupestris du Lot	65 per cent.
On Riparia Rupestris hybrids—mainly 3309 ...	18 per cent.
On Riparia Gloire	10 per cent.
On other stocks	7 per cent.

The tendency was for the orders for vines grafted on other stocks to increase, and for those on Riparia Gloire to decrease. This rough analysis of orders received is eloquent testimony to the wonderful popularity of Rupestris du Lot, not only in the neighbourhood of Montpellier, but elsewhere also, for, as has been already stated, the orders received come from all over the world. In soils which suit it, and, judging from its marvellous popularity near Montpellier, the soils of this neighbourhood suit it admirably, it is a stock of undoubted value. Thrifty and doing well in poor soils in which, owing to its great vigour and powerful root system, vines grafted on it can continue to produce sufficient crops for many years with the aid of less abundant manuring than is required by several other stocks. It is an ideal stock for poor soils, provided they are sufficiently penetrable for its root system to become firmly established.

We must not overlook its faults, which are, in rich soils, the frequent non-setting of the fruit, more especially when grafted with scion varieties liable to this defect, and its unsuitability for shallow soils where its root system, intended by nature to dip deeply into the ground, is forced to remain near the surface.

The increasing popularity of the Berlandieri Hybrids must also be recorded :—41B, 34E, 157-11, 420A, and last, but not least, 161-49. The remarkable qualities of the Berlandieri parent, which possesses most of the virtues of V. Riparia without its defects, with the added advantage of a decidedly favourable influence on the quality of the wine yielded by vines grafted on it, is characteristic of these stocks. 161-49, in particular, is in great demand; this is a Riparia × Berlandieri, and not, as are 420A, 34E, and 157-11, a Berlandieri × Riparia. In other words, the Berlandieri was the male or pollen parent, and, as is frequently the case in vine hybrids, the prepotency of the pollen parent is marked.

SCION VARIETIES.

The reconstitution of our Victorian vineyards is entering on its most active stage. It is obviously very desirable that re-plantations should be made with no varieties which are not thoroughly well adapted for the production of the type of wine each vineyard is best suited to produce. In other words, Victorian vinegrowers, like their European colleagues before them, will find it to their undoubted advantage to specialize. Whether this be in the direction of quantity, or of quality, or of any particular type, must depend on the special conditions prevailing in each vineyard.

Among the varieties peculiar to the Midi there are several which possess features well calculated to interest our growers. A few notes concerning the most important of these will therefore prove of interest at the present juncture.

Some of these have long since been introduced to Victoria, but, with few exceptions, we do not know them under their true names, nor are they to be found in our vineyards unmixed with other sorts in the same block. This is the cause which is chiefly responsible for our lack of knowledge of their real value under Victorian conditions.

It is strange that our pioneer vinegrowers should have so generally adopted the sorts of the cooler regions of France—Hermitage, Medoc, Burgundy, &c.—which, in our warmer climate, yield wines of higher alcoholic strength and fuller body than the very light Vin Ordinaire which has, centuries since, become the usual beverage so necessary for the every-day life of the temperate Latin races of Southern Europe. (*Journal*, 10th February, 1910, p. 71). Will Vin Ordinaire ever be in large demand here? Time alone can tell. In a general way, growers will do well to bear in mind the difference between it and the wines for which there is an established demand at the present time, and exercise caution in planting any large area with the heavy-bearing varieties of Hérault. These remarks apply more particularly to red sorts.

It is remarkable that, notwithstanding the extent to which modern scientific viticulture has been brought into practical application during the whole period of reconstitution in Hérault, there has been no marked alteration in the varieties of vines grown, at least in the direction of introduction of new sorts from elsewhere. The varieties adopted after centuries of practical experience, have formed the basis of re-plantation. Nevertheless, without going outside of the district for new varieties, a change is noticeable in connexion with the selection of sorts grown. The tendency during the past twenty or thirty years has been to substitute for the choicer but less prolific kinds formerly popular such heavy-bearing vines as Aramon, Carignane, &c.

The leading varieties may thus be divided into two groups, viz., heavy bearers, and choicer sorts. Such a division cannot be looked upon as absolute—between the extremes of either group are to be found intermediate sorts. Again, the same variety which on rich alluvial soils can yield very heavy crops of light Vin Ordinaire, may, on stony uplands, give a moderate yield of superior wine.

It is worthy of note that what are looked upon as choice varieties near Montpellier, are very different from the choicer sorts of more northern districts which we have so largely adopted in Victoria.

According to Foex, the former group comprises Aramon, Petit Bouschet. Carignane, Brun Fourca, and Calitor for red, and Terret Bourret for white; whilst in the second group we find such red sorts as Cinsaut, Œillade, Aspiran, Piquepoul, and Terret, and for white wine the white and pink varieties of Piquepoul and Aspiran, as well as Clarette, Picardan and White Muscat. A few other sorts are also cultivated which may be considered to occupy an intermediate position between the two groups. These are chiefly Grenache, Espar (or Mataro, as it is better known here), and Morrastel, and Ugni Blanc for white wine. Jacquez, a direct producer of American origin, also deserves mention, though the area planted with it is steadily decreasing.

Complete ampelographical descriptions of each of these varieties cannot be given here. The following notes concerning the most important of them, are limited to the part they play in the viticulture of Hérault and their probable utility under conditions prevailing in this State.

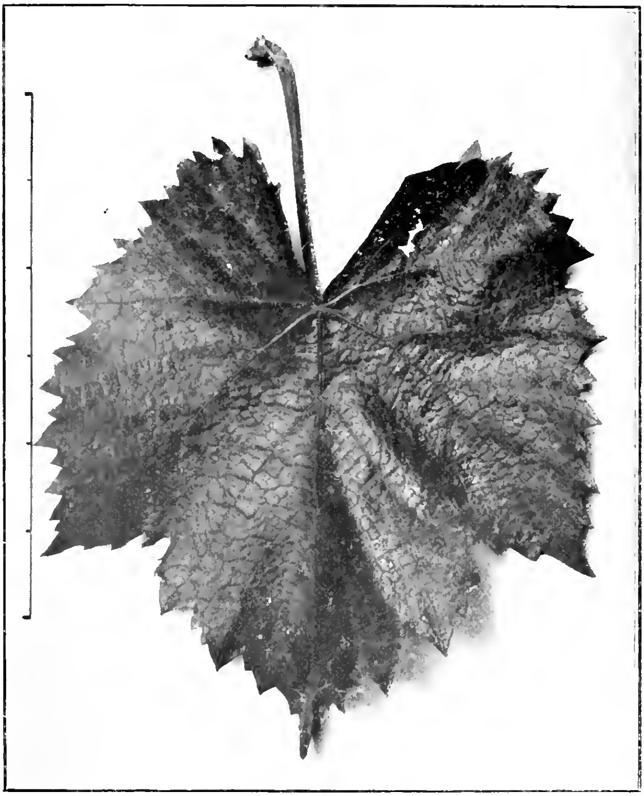
Aramon, syn. *Ugni Noir, Burchardt's Prince, Fontainebleau* (in West Australia), &c.—This remarkable black variety certainly occupies first place among the vines of Hérault. Its main characteristic is its fertility—it can probably claim to be the heaviest bearing variety in the world. In exceptionally rich soils near Montpellier, yields of up to 3,500 gallons per acre have been obtained from it; whilst yields from 2,000 to 3,000 gallons are quite common. The correctness of these yields, which to an Australian appear extraordinary, are proved beyond question. It responds, perhaps, better than any other variety to soil fertility and heavy manuring, and is therefore admirably suited for the production of enormous quantities of the light type of wine so abundantly produced in the Midi. Aramon may, in fact, be looked upon as the basis of Vin Ordinaire.

On stony uplands this variety is also cultivated; the yield diminishes greatly, but quality increases. In spite of its extraordinary fertility the wine made from it is not devoid of quality, and even where the crop is very heavy and the alcoholic strength correspondingly low (14 to 15 per cent. proof), it is always well balanced, brisk, and agreeable; whilst, on poorer soils, it produces light wines of really excellent quality, of course from a Vin Ordinaire standpoint. It would be no use for our present export trade.

The vine is an exceedingly vigorous spreading grower with characteristic large dark green three lobed or entire leaves (see photograph), reminding one a good deal of the Sultana, though darker in colour and less glossy. It can be easily recognised towards vintage time by its long cylindrical bunches, well filled with large berries and supported by a green stalk, the tenderness of which is one of the characteristic features of the variety.

It is, in fact, one of the few sorts which it has been found practicable to vintage without knife or secateur. The large round berries are not unpleasant to eat, though scarcely fit for packing, owing to the facility with which they are crushed. This vine has, in fact, long been known in English vineries under the name of Burchardt's Prince.

Strange to say, Aramon has not, until quite recently, been tried in Victoria. In Western Australia, it is known under the erroneous name of Fontainebleau, and it is said to produce a light red wine of claret type. It has been seen by the writer amongst other vines in several Victorian vineyards, but separate plantations have not yet been made. It is certainly well worthy of careful trial. Though useless for the production of



LEAF OF ARAMON.
(Two-fifths natural size.)

export wines, if ever we are to become a wine drinking people and a demand arise for a light wine at a cheap price, no variety is better qualified to produce it than Aramon. For brandy production, it is also worthy of consideration, though for this purpose the Terret Bourret may be found superior, as we shall see presently. In addition to the black type, a pink or grey variation is known as Aramon Gris, differing chiefly in the colour of the berry and producing a rather more alcoholic wine, for which reason it may be useful for distillation purposes. There is also a white variety.

(To be continued.)

ORCHARD STUDIES.

III.—SHELTER BELTS.

E. E. Pescott, Principal, School of Horticulture, Burnley.

Notwithstanding the fact that the type of fruit tree generally in cultivation in this State is one that has been framed with a low crown, partly with the object of placing the fruit where it would receive protection from winds, there is a necessity in many districts for still further protection; and this necessity can only be met by the planting ot shelter belts. There are also many soils, especially in the level northern areas, and wind-swept plains, where fruit-growing would be impossible but for such plantations. The presence of irrigation channels, intersecting orchards and orchard districts, provides suitable land for planting hedges, in addition to those which may be planted on the outside boundaries of the estate. In some districts, the Osier Willow has been planted on the channel banks for shelter purposes, but in the space of a very few years, the roots become a serious menace to the waterflow.

Shelter belts are of two classes, viz., those planted purely for shelter, and those which, in addition to providing shelter, also are of some profit to the grower, by the producing of a commercial product. Of the latter class are the Almond, the Fig, and the Black Achan Pear.

The most essential point to be considered in planting shelter belts, after their use as shelter has been decided, is the question as to whether the plant or tree selected requires much or little feeding; or, in other words, whether the growth of the shelter belt will reduce the production of the fruit trees adjacent to it. Pepper trees, Pine trees, and the African Box Thorn are undoubtedly excessively gross feeders, and should never be planted in close proximity to the orchard. The roots of these trees and plants will extend and feed at a distance of 30 or 40 feet from their base; and they considerably deplete the soil of large quantities of organic plant foods.

The Sugar Gum (*Eucalyptus corynocalyx*) is a considerably less gross feeder than these, but it is more difficult to manage, and unless topped and thinned in its early growth, it is not clothed with foliage and growth where these are necessary.

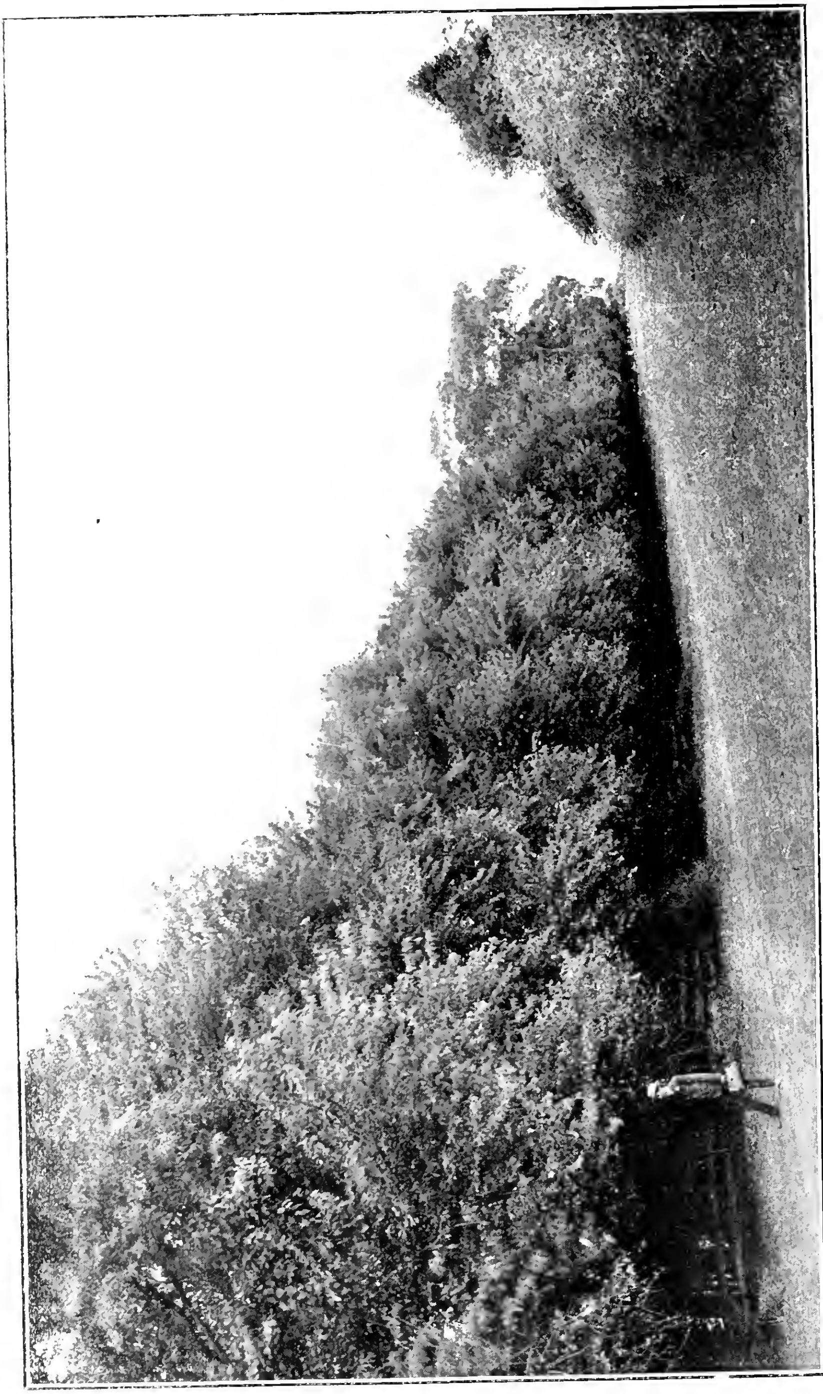
Among the useful plants for hedge and shelter purposes is the Kaffir or Kai Apple. This is a native of South-eastern Africa, and is not at all difficult to grow. It rather requires a small quantity of water, and is not a gross feeder. Unfortunately, it is not always of a quick growth, but it is of a sturdy habit, and is densely covered with long firm thorns; by reason of this feature, it is very valuable as a protection to the orchard. In some localities, it yields a golden-coloured edible fruit.

The Tagasaste, or Tree Lucerne, is also a useful hedge and shelter plant, but it is liable to be destroyed by stock, and this reduces its value as a shelter belt, unless it can be effectively protected.

A most useful plant or tree for shelter and protection purposes is the Osage Orange. This tree is a native of North America. It easily becomes a fine spreading tree up to 60 feet in height; but it may readily be kept at any required height by cutting. When grown as a hedge, the occasional cuttings cause it to produce a very dense, impenetrable growth, the annual growth being sometimes 4 and 5 feet in length. The plant carries very numerous large spines, which add to its value as a hedge. It is not at all exhausting on the soil. At Bacchus Marsh, both apple trees and lucerne grow successfully in close proximity to a wind-break of osage orange which is fully 60 feet in height. It is easily grown from seed; and if grown in seed beds or boxes, may be planted out the first year after sowing.

OSAGE ORANGE AVENUE AT BACCHUS MARSH.

Before planting out any hedge or breakwind it is absolutely necessary to deeply trench and subsoil the land. If this be done, the roots have a freer running space, and are able to penetrate and travel quickly through the soil.



OSAGE ORANGE SHELTER BELT.

Thus the plants will rapidly establish themselves, and will soon put on a sturdy and vigorous growth. After planting, the young trees should receive effective protection from stock, and hence they should be well fenced in.

While growing, the soil surface should be frequently stirred, especially in summer, so that the roots may be kept cool and healthy. Every care possible should be given to each plant in the belt, so that their growth may be rapid and regular; and so that they may quickly establish themselves for the fulfilment of their purpose.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

The month of July is generally one of the busiest months of the year. Winter spraying and winter pruning must be carried out, and where orchard areas are being increased, all the work incidental to the establishing of the young trees must be completed. None of these works will admit of delay, and all require to be finished before the time for spring sprayings comes along.

Among the first works will be the planting of young trees. The ground has already been prepared, and should be now well aired and mellowed, and in a fit condition to receive the young stock. The young trees should not be planted too deeply; and generally they require to be planted at the same depth as they grew in the nursery beds. The roots should be well shortened back, and all broken and bruised roots removed. The soil should be well and firmly packed around the young trees, and where the orchard is at all exposed, the trees may be staked, the stakes having been well driven into the ground previous to the planting.

The selection of varieties is very often a matter of local expediency; care should be taken that varieties subject to bitter pit, and cracking, are not planted in cool or moist climates. Grievous mistakes have been made in past years by planting out such varieties as Munroe's Favourite, Annie Elisabeth, and Cleopatra in unsuitable zones; whereas, when planted in climates suitable to their successful growth, they are most profitable varieties. The Jonathan still holds sway as the most popular apple, and it is at present hard to find a more profitable fruit. Local conditions, and local market requirements, will always be the determining factors in planting out new orchard areas; and new growers will do well to consider these before planting out.

SPRAYING.

The woolly aphis, bryobia mite, and the various scale insects may now be more readily combated than at any other period of the year. So far, the most successful remedies have been the sulphur, lime and salt wash, or one of the oil emulsions. Growers are questioning the wisdom of annual oil washes on trees; the opinion being expressed that frequent coatings of oil may injure the bark or close up some of the pores and cells. For this reason, and also for the reason that a weak emulsion is often as effective as a strong one, red oil need not necessarily be used any stronger than one in 30. With good pressure on the pump, this will be thoroughly effective against most scale and aphis pests.

Peach Aphis.

The life history of peach aphis has never been thoroughly understood in this State. It was always considered that either the insects or their eggs were to be found during winter under or around the roots near the main stem of the tree. To eradicate these, it was at one time thought a satisfactory mode of treatment to mulch well the ground all round the tree with tobacco, or to place in the soil either kainit or muriate of potash. The *rationale* of this treatment was that the soil would become saturated with nicotine or potash salts, whichever material was used, and that this would act in a corrosive manner on the bodies of the insects, and so destroy them as soon as they came into contact with the caustic substance in the soil.

This method of eradication was not found to be definitely a success. Then a suggestion came that possibly the insects laid some eggs on the trees, and that these hatched in early spring.

To determine this, as well as to endeavour to find a successful method of coping with the pest, trials were made last winter in a 35-acre peach orchard at Diamond Creek, belonging to Mr. A. S. Lowe. In the spring of 1908 the whole orchard was severely visited by the peach aphis, and two double hose spray pumps were constantly at work for many weeks, spraying with tobacco and soap sprays. At the end of November, and early in December, the aphis was as prevalent as ever, even with all this spraying.

The whole orchard was sprayed during the following winter, early in July, with a red oil emulsion at a strength of 1 in 25. Some trees were also treated with muriate of potash at the roots, and others with a tobacco mulch. The experiment was varied as much as possible, such as spraying different plots before and after pruning.

The result was that, during the following spring, 1909, comparatively little spraying was necessary. One pump was never used, and the other only on occasional days for a few weeks. The season was a fairly normal one for peach aphis, and in other orchards it was far more prevalent. One year's experiment does not indicate permanent results, and it is intended to further investigate on these lines, under the supervision of the Vegetation Diseases Inspectors.

During the season, many interesting features became prominent, and there is still a great deal to be learned about the habits of peach aphis and also regarding the action of red oil.

On some trees the aphis would appear in small clusters, and after a few days every insect would entirely disappear. The results were quite the reverse of negative, and it is hoped that we are on the verge of a successful method of dealing with the peach aphis trouble. One feature was entirely overlooked in establishing the experiments, and that was the spraying of a plot with red oil as the sole treatment. In each plot, some root treatment as well was adopted. It is intended this season to spray with red oil, without any tobacco or potash treatment of the soil.

Pruning.

Orchardists will now be busy with the most interesting work of the year. The old haphazard methods of pruning are passing away gradually, and growers are beginning to prune, with a knowledge and a reason for every cut made. A model tree will always be light on its topmost leaders, bearing the major portion of the crop in the lower regions of the tree. The main point to be noted is that a heavy wood growth in the upper portion of the tree tends to reduce the bearing capabilities of the tree in its most useful parts.

Mr. Quinn's work, *Pruning of Fruit Trees*, should be in the hands of every fruitgrower. Not the least important feature of it is the number of valuable illustrations, by which the method of education by concrete examples is thoroughly taught.

Prunings should not be allowed to accumulate, nor should they be stacked in heaps on vacant parts of the orchard. The most economical method of dealing with prunings is to destroy them in a burner, which is either specially constructed by a blacksmith, or which may consist of an old square tank on a small truck. This is drawn around the orchard by a horse, the prunings being thrown in and destroyed as the burner is taken up and down the rows.

Vegetable Garden.

A number of vegetables may now be planted for summer use; such as broad beans, a few early potatoes, parsnips, lettuce, radish, leeks, artichokes, &c. Asparagus may still be planted, and also a plentiful sowing of peas. The vacant spots should be kept loose and well worked over, and no weeds should be allowed to accumulate. Onions, leeks, and other seedlings now require to be planted out.

The general crop of tomato seeds will now be sown. These should be sown in boxes, under glass, and in very light loamy soil. As soon as their secondary leaves appear the seedlings may be pricked out into beds in the frames, and allowed to remain there till all danger from frost has disappeared. Care should be taken that frost does not reach them inside the frames, coverings being provided to protect them. They should also not be allowed to be "drawn" by an excess of warmth, and the frames should always be ventilated on sunny and warm days. The beds should now be very deeply dug over and fairly heavily manured, in anticipation of planting out the young plants later on. It is well to let any humic manures well rot and become incorporated with the soil. The useful varieties are Earliana, Large Red, Key's Prolific, and Ponderosa.

Flower Garden.

July is also a busy month in the flower garden. The beds must all be well manured, and dug over, the ground being left in a fairly rough condition so that the soil may become ærated and sweet. New and vacant plots should be manured and trenched; and a good dressing of lime may be given all over the garden. Where slugs or snails are prevalent, a good surface dressing of tobacco dust or stems will be very efficacious.

This is the month for planting roses and also various deciduous shrubs. Before planting, these should mostly all receive a judicious root-trimming, and after planting they may be suitably pruned back. Roses may now be pruned, and the cuttings planted, if this has not already been done. Perennial deciduous shrubs will also need thinning out and pruning. Gladioli, Iris, and other tuberous and bulbous spring and summer flowering plants may now be planted out, while a few late sweet pea seeds may still be sown.

HOUSEHOLD INSECT PESTS.

C. French, jun., Assistant Entomologist

Common House Flies.

The most common of the house flies is the *Musca domestica*, which breeds in manure and any filth or garbage allowed to remain near dwellings. According to Professor Howard, of the United States Department of Agriculture, the periods of development are as follows:—The eggs from deposition to hatching, one third of a day; hatching of larva to first moult, one day; first to second moult, one day; second moult to pupation, three days; pupation to issuing of the adult, five days; total life round, approximately ten days. Thus, in Victoria, we probably have a dozen or more generations every summer. The number of eggs laid by an individual averages about 120.

The house fly is a well known means of spreading such diseases as typhoid, anthrax, tuberculosis, and dysentery. In his recent report on "The Pollution of New York Harbour" Dr. D. D. Jackson pointed out that typhoid and other such diseases were found to be most prevalent in districts where the sewer outlets reach the harbour. In such localities flies in large numbers were found to be carrying germs of diseases. They were also more numerous in infected than in clean areas.

Our civic authorities should take up the question of destroying the breeding grounds of the house fly, now that its habits, and the danger to man from its presence are so well known. United action is necessary.

Remedies.—All bins or other receptacles containing house refuse should be covered over. I have seen a heap of fresh manure bought for gardening purposes simply alive with larvæ of the house fly. Thousands of flies are bred in this way, eventually finding their way into houses. This shows the necessity of covering the manure or treating it frequently with kerosene or chloride of lime. Kerosene sprinkled over the floor in stables, &c., is said to be an excellent remedy. One of the best methods of keeping flies out of the house is by the use of wire gauze windows and doors. Various insecticides and fly papers are also very useful in suppressing flies, and formalin is said by many to be very effective. Mr. Froggatt recommends the following formalin treatment:—

> Take a soup plate and cut a couple of sheets of thick blotting paper to fit into the bottom, and sometimes half-an-inch of clean, damp sand under the blotting paper will help to retain the moisture on a hot day. Saturate the paper with water, and sprinkle it over, first with sugar, then with a quarter of a teaspoonful of formalin (diluted with a spoonful of water so that it will spread all over the exposed surface). Place the plate in a well lighted spot on the floor for preference, and the flies, attracted by the sugar, are quickly affected by the formalin, and usually drop dead on the side of the plate. Formalin, however, evaporates after a time, so it may be necessary on a hot day to renew it at intervals.

Another mixture which has been used with success in America is carbolic and camphor, the recipe for which is as follows:—One pound of carbolic crystals is dissolved in a bottle placed in hot water. While liquid it is poured over one pound of camphor, which is first broken up into small bits. The resultant mixture is a thick yellow liquid, which is securely bottled up, and must not come in contact with the skin. An ounce of this placed in a shallow dish over a spirit lamp will kill all the flies in the room. Three ounces will fumigate a thousand cubic feet.

The Blow Fly is another annoying pest. It breeds in decaying animal matter, depositing on meat either raw or cooked, or even on wounds on living animals. On damp wool on the rumps of sheep, there may be seen great numbers of eggs, known as "fly blows" which will issue as maggots. Cocoons of blow flies have been found in sand in Victoria. A few years ago my brother, Mr. G. French, came across some hundreds of cocoons in a heap of sand. On my placing them in a breeding cage the flies emerged. There was no animal matter of any kind whatever on the sand, and so the question arises as to how the maggots fed.

The remedies suggested for treatment of the house fly may be carried out for this fly also. Meat should be placed in safes, but should also be wrapped in calico or thin papeer. I have seen meat blown in a meat safe when left unwrapped, as the ovipositor of the fly is fairly long and can protrude through the small holes in the wire netting. Sprinkling pepper on the meat is also a preventive; it can easily be washed off before using.

MOSQUITOES.

We have in Victoria a fair number of species of these troublesome insects, principally Culex; also the Malarial Mosquito and Anopheles. The distinction between Culex and Anopheles is that the former has clear wings whilst the latter has dark spotted wings. Fortunately, we have no malaria in this State. It may not generally be known that it is only the female mosquito that bites. The eggs of Culex are laid on stagnant water, and it is estimated that up to 400 are deposited at a time. In warm weather, eggs hatch a few hours after they are laid. They spend usually 6 or 7 days as larvæ, and a couple of days as pupæ, so that their complete life history cycle covers 10 days in all. If the weather is cold, it takes much longer to develop; but in this State, with our mild winter, the mosquitoes no doubt emerge the whole year round.

Remedies.—Undoubtedly, the most satisfactory ways of fighting mosquitoes are those which result in the destruction of the larvæ, or their breeding places. Kerosene, 1 oz. to 15 sq. ft. of water surface, is very effective. It may be undesirable to so treat some places, especially water for domestic purposes, although this has been done without harm where the supply is drawn from the bottom of the tanks. If mosquito larvæ are noticed in still water in tanks, tubs, and the like, it is advisable to agitate the water by stirring; this will destroy the eggs and any larvæ that are being hatched. If this is done regularly it will certainly lessen the increase of these insects. In America, some persons keep their tanks free by putting in a little wheel, which is turned by the windmill and keeps the water constantly agitated. Mosquitoes fortunately have natural enemies; amongst these are the larvæ of the dragon fly, commonly, but erroneously, called "Horse Stingers." The larvæ of water beetles also eat an enormous quantity of mosquito larvæ. Stocking the water with fish (the common goldfish being one of the best) is a valuable means of keeping this pest in check, as the fish destroy great numbers of larvæ.

Our insect eating birds, such as the swallows, reed warblers, fly catchers, and grass birds, play an important part in mosquito prevention, and these birds should be afforded every protection. If mosquitoes invade a bedroom mosquito cones may be used. The fumes from these soon rid a house of them. Various insecticides are also greatly used. Receptacles difficult of removal, such as water tanks and barrels, should be tightly screened to prevent the female insect from reaching the water to deposit her eggs. The water should be drawn off for use from below.

CLOTHES MOTHS.

All of these moths belong to the family *Tineidæ* and most of them to the genus *Tinea*. They embrace such insects as carpet moths, fur moths, and other destructive species. Their larvæ cause considerable damage to clothes of all kinds, the webbed case of the common clothes moth containing the caterpillar and the pupa being only too well known to need description here. Any clothes, furs, woollens, or feathers, left exposed for any length of time are almost sure to be attacked in the warm weather.

Remedies. It is advisable to frequently examine and thoroughly brush all fabrics, especially in the summer, as this will destroy any eggs or larvæ that happen to be on them. If clothes are to be stored it is advisable to put them in a close-fitting box, in which camphor or naphthaline should be placed, and spray some benzine on the clothes three or four times during the summer.

Cloth-covered furniture is often attacked by this moth, but a thorough spraying with benzine will have beneficial results. As benzine is highly inflammable it should be used with great care. Some writers recommend that the furniture should be sponged very carefully with a dilute solution of corrosive sublimate in alcohol, made just strong enough so as not to leave a white stain. If furs are attacked fumigating in airtight boxes with bisulphide of carbon is an excellent remedy; but care must be taken when using this chemical, as it is highly combustible. Cool storage has also been tried with excellent results. Moths can always be attracted by a light at night, and in this way destroyed. Where moths are found infesting warehouses this method might with advantage be adopted.

(*To be continued.*)

ANSWERS TO CORRESPONDENTS.

DESTRUCTION OF COMBS BY WAX MOTH LARVAE.—W.P. writes:—"During the summer a friend of mine noticed the honey escaping from one of his hives. Thinking that it might have been caused by the heat a covering of green boughs was made, and shortly afterwards the dripping ceased. Recently, however, when robbing this particular hive, it was with difficulty separated from the table on which it had been standing. It was found to contain no honey, and between the comb and the table it was simply a net-work of grubs of a dark-grey colour."

Answer.—The grubs are larvæ of the Wax Moth (*Galleria mellonella*), and the comb of bee-hives is their natural food. When the grubs have attained their full size they spin a cocoon, from which, in due course, the perfect insect—the Wax, or Bee, Moth emerges. This moth is about three-quarters of an inch in length, the upper wings are brownish grey, the lower ones light grey. It may be seen on warm summer evenings hovering about the hives ready to enter and deposit eggs in any hive not sufficiently strong in bees to defend the combs against the intruder. Where black bees are kept, particularly when in box hives, Wax Moths sometimes do considerable damage, but, as a rule, colonies which allow them to get a footing are weak or demoralized, queenless, or diseased beforehand. There is no way of preventing them entering hives or of destroying grubs which are already in the combs, because anything likely to prove fatal would also kill the bees and brood. Pure bred Italian bees will not permit Wax Moths to deposit eggs in their hives, and will even tear open the tunnels and remove the grubs if a comb with Wax Moth larvæ from another hive is given them. In apiaries numbering hundreds of colonies of Italian bees, the grubs are never found in the hives. The only way of dealing with this pest is to change from black or common bees to Italian, and from box hives to frame hives.

ERADICATION OF BLACKBERRY.—J.F.S. asks whether sulphate of iron can be used for eradicating Blackberry or Eucalyptus scrub.

Answer.—Sulphate of iron is sometimes used as a spray for weeds (60 lbs. in 40 gallons of water per acre) in place of copper sulphate, being less poisonous. It is, however, only of use for annual weeds like Charlock, &c. It injures beans, peas, or potatoes, and though it retards docks and thistles, it does not destroy them. The spray would be quite useless for Eucalyptus scrub and of very little use for Blackberry. Poisoning is useless for both of these. They can be killed by arsenical poison, but the quantity required is so great as to render the cost prohibitive and to spoil the ground for some years. The easiest way to eradicate Blackberry is to roll it flat in summer time; burn off, taking care the fire does not spread; then knock out the charred stubbs with a mattock, rake them together, pile and burn.

SORREL.—O.P. states that on the cleared portion of his land he has grown potatoes for the past four years. After the third crop several weeds, including a few patches of sorrel, appeared. This year the crop was completely smothered with sorrel.

Answer.—The condition of your land is the result of growing the same crop on it for several years in succession with an exhausting manure like superphosphate. Sorrel denotes exhausted land. With basic slag the exhaustion would not have been so rapid. It will now be necessary to manure with lime, at least two tons per acre, and to keep the soil open and well stirred until the next crop is in. A leafy fodder crop would probably do best now and be most useful, but, in any case, rotation of crops must be practised on small areas that cannot be fallowed.

PLANTS FOR IDENTIFICATION.—D.G. (1 and 2) and T.H.W. (3) forward specimens of plants for identification.

Answer.—(1) Chicory (*Cichorium intybus*, L.). An introduced plant which may become a pest if allowed to spread. It is of some use for grazing, but soon becomes hard on poor dry soils. It is not of much use for fodder, as it is apt to dry black in hay, giving it a bad appearance. When growing wild the roots looses its value as a surrogate for coffee.

(2) Knapweed or Hard-heads (*Centaurea nigra*, L.). An introduced plant often grown in gardens and thence escaping to the adjoining lands. It is not poisonous, but it takes up the place of useful vegetation and should be suppressed.

(3) Subterranean Clover (*Trifolium subterraneum*, L.). It takes 15 to 25 lbs. of seed to sow an acre, but is best used at the rate of 2 to 5 lbs. an acre mixed with other grasses. It can be sown in autumn and spring when the ground is moist and warm. Seed is difficult to obtain.

POTATO CROP.—P.P. inquires as to earliest date for planting potato crop in the Longwarry district. Also desires names of most suitable varieties.

Answer.—Potatoes can be planted as soon as danger from frost is past: a few for early crop in September or early October and the general crop in November. Carman No. 1, Carman No. 3 and Brownell's Beauty are recommended for the early crop and Up-to-Date for the main crop.

PEAS FOR THE MELBOURNE MARKET.—RED GUM wishes to know which varieties are most suitable for the Cohuna irrigation district.

Answer.—First crop, Sherwood; second crop, Day's Sunrise; and then Yorkshire Hero.

PHOSPHORIC ACID.—SUBSCRIBER writes:—"I would like to know the fertilizing value of insoluble phosphoric acid compared with citrate soluble and water soluble phosphoric acid. Also state whether superphosphate will evaporate or lose its strength in any way if sown on dry ground and no rain falls for three or four weeks."

Answer.—Insoluble phosphoric acid is not available as plant food and does not become so for some years. Citrate soluble is moderately soluble, and water soluble is immediately available. The respective commercial values for the year are:—Water soluble, 4s. 6d. per cent.; citrate soluble, 4s. per cent.; insoluble, 2s. 9d. per cent. If superphosphate is allowed to remain in land for some time before the available portion is taken up by the plant, some of the water soluble reverts to a more insoluble form.

CARBIDE.—T.S. asks whether spent carbide has any manurial value.

Answer.—Spent carbide is similar to a crude slaked lime. Before application, it is advisable to spread it over the ground and leave it exposed to the action of the air for some time—say, a month or two—in order that any injurious substance present may be oxidized. It has no actual manurial value, though it improves the physical condition of soil.

Warts on Horse's Nose.—G.M. states that his two-year colt is badly affected with warts about the nose. He has used a mixture of caustic and bluestone without any apparent result.

Answer.—Warts about the nose of young horses usually disappear spontaneously. It is possible that the caustic and bluestone treatment may have been pushed too far. In that case, if the condition appears to be at all grave, it would be advisable to obtain the services of a veterinary surgeon.

Swollen Hock.—J.P. writes:—"I have a colt with a swollen hock, caused through the leg being caught in a wire fence. The wound healed but the hock is getting larger."

Answer.—Three or four weeks should be allowed to elapse after the skin heals and then if the swelling is pronounced give one application of Stevens Blister. It will not be possible to completely reduce the thickening if the injury has been at all extensive.

Rubbing against Stumps, etc.—M.McP. asks what should be done to prevent horses rubbing their hind legs against stumps, &c.

Answer.—Take of Olive oil and water equal parts, and add Carbonate of Potash to form an emulsion. To half-a-pint of emulsion add one dram of dilute Prussic Acid. Dress the legs with this once a day.

Scours in Horse.—C.W. inquires as to treatment recommended for scours.

Answer.—Give a couple of bran mashes and the following morning before feeding give 1 pint if raw linseed oil; gradually return to ordinary food and night and morning add a powder of Sulphate of Iron ½ dram, Sulphate of Copper ½ dram, Bi-carbonate of Soda ½ oz., Ginger and Gentian 2 drams each.

Tank Catchment.—M.W.B. asks if a catchment for a tank can be made by scarifying an area, adding a few bags of lime and rolling.

Answer.—A better way is to clear all scrub and growths off the catchment, graze it well off with sheep and keep it grazed. Put a catch or silt pit in before allowing water to reach tank, which should be roofed to lessen evaporation. One acre of good catchment thus treated should supply 50 cubic yards of water.

Sheep Dips.—F.W.J. asks for instructions how to construct sheep dips.

Answer.—It is proposed to publish in the August number drawings and specifications of several types of sheep dips.

Hay Shed.—J.N. asks if round timber can be used for hay shed to hold 200 or 300 tons of hay.

Answer.—Round timber may be used for the uprights and also for the roof frame if thatching be resorted to. If an iron roof be desired it will probably be cheaper to use sawn timber and certainly more durable. A shed 15 feet in height to the eaves and 20 feet wide would hold 1 ton per foot running. It will be seen that to store anything like the quantity mentioned would mean an enormous shed. It would probably be better to build stacks and thatch them.

Roof Coverings.—R.G. asks if fibro-cement, uralite, poilite, &c., make satisfactory roof coverings with regard to non-inflammability and effect upon water.

Answer.—The class of material referred to is frequently used for roofs; but it gives greater satisfaction if specially compressed for the purpose. Rain water is not affected by it. Corrugated iron is, however, hard to beat for efficiency and cheapness. It can be rendered cooler by underlying with tarred felt, &c., and by ventilating the space between it and the ceiling.

Water Boring.—L.M. dsires to learn of a cheap and effective method of boring for water.

Answer.—A hand plant is effective, even down to depths of 300 feet. Plants cost from £40 to £100, depending upon lengths of rods, ropes, &c., supplied, or they may be hired. Casing would cost 1s. per foot upwards and boring should not, unless much rock be struck, amount to more than 3s. 6d. to 4s. per foot.

Removing Bore Casing.—D.B. wishes to lift 4-inch casing out of a bore 300 feet in depth.

Answer.—Much depends on the circumstances. If the casing has been recently put down and is fairly free, a derrick with blocks and tackle should be sufficient. If not, a clamp attached to the casing and two 10-ton jacks should do the business. If they fail the case will be hopeless. If it be impossible to get jacks, a lever consisting of a tree 30 feet or more in length may be tried.

Wire-netted Boundary Fence.—D.S. asks whether his neighbour, who is about to erect a rabbit-proof boundary fence, can compel him to pay his share of the cost.

Answer.—Yes, he can do so provided he gets a certificate from the Chief Inspector of Vermin Destruction that the vermin-proof fence is necessary. See section 4 of "The Act to amend the Fences Act (No. 2155)."

Agricultural Education in Victoria.

DOOKIE AGRICULTURAL COLLEGE.

H. PYE, Principal.

The College offers every facility to students to become competent agriculturists, vignerons, and dairymen. The work is carried out on a large commercial scale, the ploughing, drilling, manuring, harvesting, threshing, and shearing being done by students under competent instructors. Over 2,000 sheep and lambs, 150 head cattle, 50 horses, including stallion, are on the farm.

FEES—£28 5s. per annum, payable half-yearly.

Sessions begin first week in March and September.

LONGERENONG AGRICULTURAL COLLEGE.

G. A. SINCLAIR, Principal.

One aim of this institution is to fill in the gap between the State School and Dookie, *i.e.*, to take students between the ages of fourteen and sixteen years.

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ol. VIII. THE STUD HORSE INDUSTRY. Part 8.

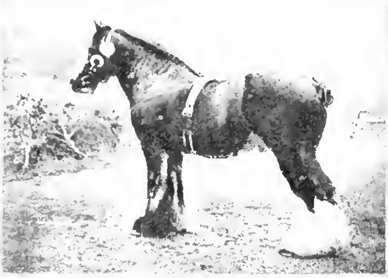
[Registered at the General Post Office, Melbourne, for transmission by Post as a Newspaper.]

The Journal of the Department of Agriculture of Victoria

August, 1910.

THE CONTRAST IN DRAUGHT TYPES.

SHIRE MARE—"EUREKA," CHAMPION 1910.



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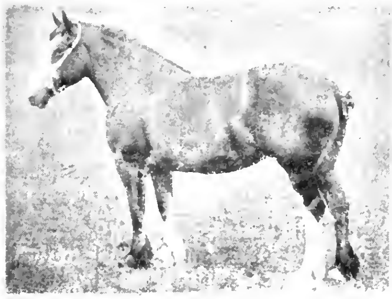

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THE JOURNAL

OF

THE DEPARTMENT OF AGRICULTURE.

A. T. SHARP, Editor.

CONTENTS.—AUGUST, 1910.

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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. VIII. Part 8. 10th August, 1910.

THE STUD HORSE INDUSTRY.*

S. S. Cameron, D.V.Sc., M.R.C.V.S., Chief Veterinary Officer.

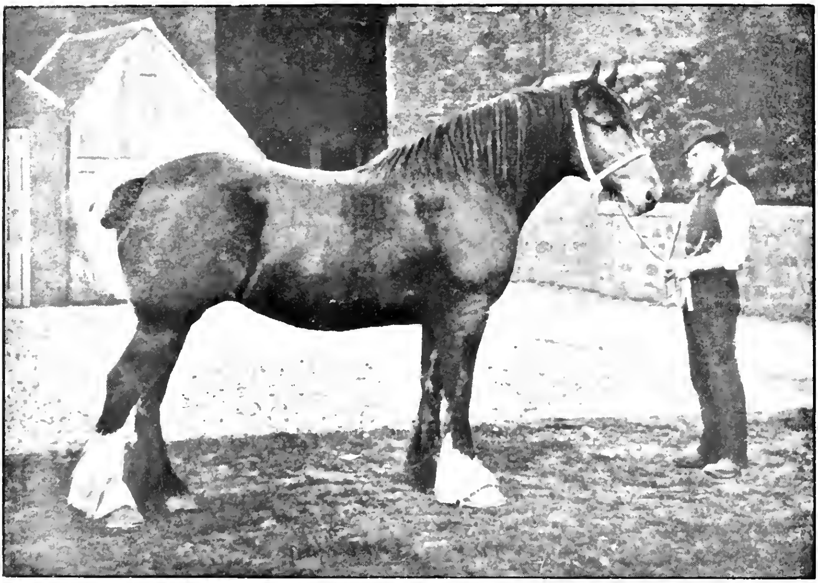
It gave me great pleasure to be again invited by your Council to assist at this Convention. I have previously taken the opportunity of saying how highly I appreciate the honour of being privileged to address the large body of representative agriculturists who assemble at this gathering, where one is certain of an intelligent, keen, and enthusiastic audience, anxious to gather information and capable of bringing sound judgment to bear on the suggestions and problems placed before it. I was also greatly pleased when it was suggested I should speak to you on some horse breeding matter. As most of you are aware, it is a subject on which I have made close observations and which has occupied a good deal of my attention during recent years, and I was glad of the opportunity to place before a body of thinking men certain cogitations on the subject of stud horses which have arisen in my mind through a knowledge of facts which come under my notice officially.

To me, it had often appeared anomalous that this country, with its acknowledged suitability for horse breeding, could not keep itself supplied with sires, and I have been curious to know to what extent the draught horse breeders of Victoria were willing to make payment to horse breeders elsewhere to keep them supplied with what they ought to be in a position to supply themselves. As you know, with the exception of about half-a-dozen draught stallions that are imported every year from Great Britain, practically the whole of the imported stud horses that find so ready a sale in Victoria come from New Zealand. Since I became associated with the Stock Branch of the Agricultural Department, I have had lists kept of such importations, and from these I find that during the last year (1st July, 1909, to 30th June, 1910), no less than 1,343 draught horses have been imported from New Zealand. This total comprises 450 geldings, 747 mares and 146 stallions. Obviously, the geldings

* An address delivered at the Eighth Annual Convention of the Chamber of Agriculture, held at Ballarat, July, 1910.

have been introduced to meet the present heavy demand for workers; and, taking a liberal estimate, it may be assumed that perhaps the same number of the mares brought over are intended as workers also.

The average selling price of these mares and geldings for work, I am assured from a reliable source, will be not less than £48 per head—or a total sum of £43,200, which sum, it may be mentioned incidentally, ought to have gone into the pockets of the Victorian breeders. The remainder of



LAURA LEE.

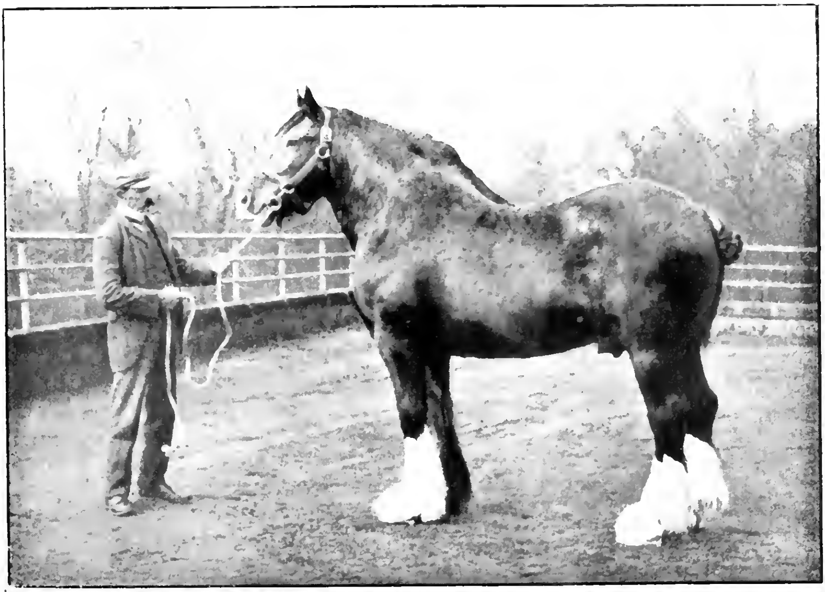
Foaled 1884. Champion Clydesdale Mare, 1886 and 1888.

the mares—297—are imported for stud purposes; and, taking the prices prevailing in previous years, they will realize an average of not less than £80 each, or a total of £23,760. For the 146 stallions the price that will be paid by the buyers here will be, again judging from the figures obtained in previous years, say, £200 each, or a total of £29,200. Adding these totals together:—

Draught—			
Workers (mares and geldings) ...	900 at £48 per head	...	£43,200
Stud Mares	297 at £80 ,,	...	23,760
Stallions	146 at £200 ,,	...	29,200
Total	1,343	...	£96,160

we are face to face with the fact that in the course of the year Victorian farmers are handing over to New Zealand farmers somewhere in the neighbourhood of £100,000. This amount is paid in cash too—not in kind—for the number of draught horses exported hence to New Zealand is practically negligible. In other words—and allowing that the cost of breeding, rearing and transport is 50 per cent. of the selling price—it may be said that Victorian farmers are subsidizing the draught horse industry in New Zealand to the extent of £50,000 per annum; that at a time too when a claim is being voiced for the Victorian industry to be subsidized by the Government by means of premiums to stallions, or some such scheme. Incidentally, it may be speculated that if the premium system were in vogue, the benefit would go largely to New Zealand breeders through the enhanced prices that would be paid for premium horses. The sum which has been expended on freight and insurance of these 1,343 horses, amounting to between £10,000 and £13,000, and which of course the Victorian buyer has to pay, would in itself constitute a handsome subsidy if expended annually on the industry within the State. The impeachment implied by the payment, away outside the State, of this great sum annually is against draught horse breeders solely, for, compared with the 146 draught stallions, only 13 stallions of other breeds have been imported from New Zealand during the year (7 thoroughbreds, 5 trotters, and 1 pony).

However this may be, I think you will agree that the position is sufficiently serious and striking as to warrant some attention being given to it by the thoughtful among you. Presuming on this, and without the slightest intention of dictating to you or forcing my views upon you, I purpose offering suggestions concerning what may be the cause and what the remedy for this continuous dependence on a neighbouring country for the maintenance of a sufficient supply of draught horse sires. I know the explanation that so readily rises to the minds of those who would wish to



SIR EVERARD.
Foaled 1885. Winner of Glasgow Premium for Clydesdale in 1888, 1889 and 1890.

excuse the situation, and who have not had experience of both countries—the explanation that is fostered by the importer dealers, and others interested in the trade, and that is accepted somewhat blindly by the breeders here whose failure to supply the requirements is a reflection on their methods, viz., climate.

It is said the milder climate of Victoria prevents horses growing to the size they do in New Zealand; that when bred here they lose their weight of bone and quantity of hair; that they grow up less vigorous and sappy, and so on. I opine that the Australian native of the first or second, or even third generation, is not going to admit that he is deficient in physique as compared with his New Zealand compatriot. I *know* that the Victorian Shorthorn and Hereford cattle and Victorian long woolled sheep (breeds of sheep and cattle corresponding respectively to the draught horse) have not suffered in weight, frame, or robust characteristics as compared with the same breeds in New Zealand. Furthermore, if there was anything in the argument, it would follow that in the milder climate of England the draught horses would be less weighty and lighter in bone and hair than those bred in the more rigorous climate of Scotland, whereas, in point of fact, it is the lighter-bodied, lighter-boned, and lighter-haired Clydesdale that has its home amongst the snow-clad hills of Scotland, and the weightier, bigger-boned and coarse-haired Shire horse that is bred to such perfection in the low flat lands of the English midlands.

Discarding then climate as the reason, at all events in the sense that it is usually put forward as an excuse, I am inclined to attach much more importance to three factors that do prevail here, and which I will name in inverse order of their importance as bearing on the subject, viz.:—*Disloyal Fashion, Faulty Methods of Rearing, and Haphazard or Unscientific Breeding.*

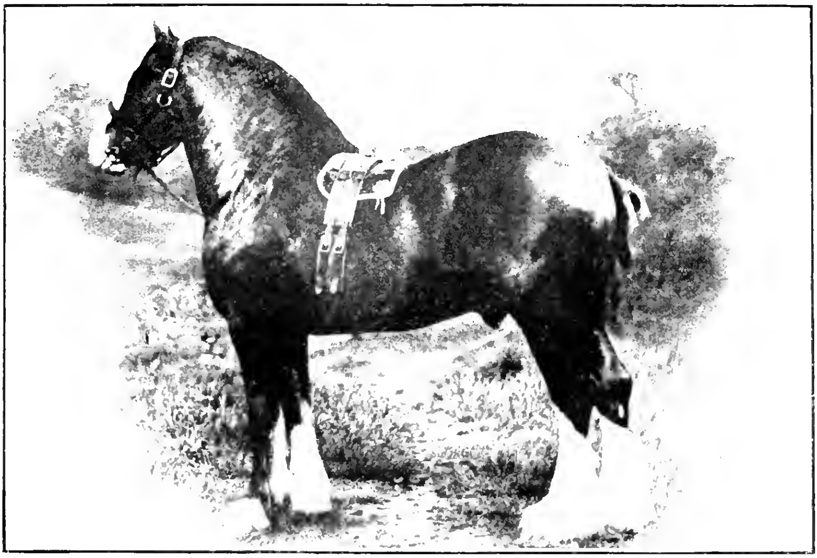
I. Fashion.

Regarding the first of these causes, it is unfortunate that horse breeders do not follow the example so well shown by Australians in respect of Australian products generally. The farmer who pins his faith to Ballarat woollens and who would scorn to wear an imported hat or boots, metaphorically kneels down before the horse that has *IMP.* in brackets after its name. Thoroughbred breeders are as guilty as draught horse men in this regard. At the 1909 Sydney Yearling Sales, over 50 per cent. of the yearlings sold were by imported sires, and that despite the fame of Maltster; also that there is always available for breeders a number of winners of such races as the Melbourne Cup, the winning of which, those same breeders claim, stamps a horse as amongst the world's best. But no! they prefer to patronize the latest importation even though, as recently proclaimed in a leading article in a prominent weekly journal, the only thoroughbreds as a rule that can be bought within the price of the Australian stud master are those rejected by English stud masters because of "roaring" or some such defect:—"Bill of Portland," "Grafton," and "Traquair," are mentioned as instances in the article referred to.

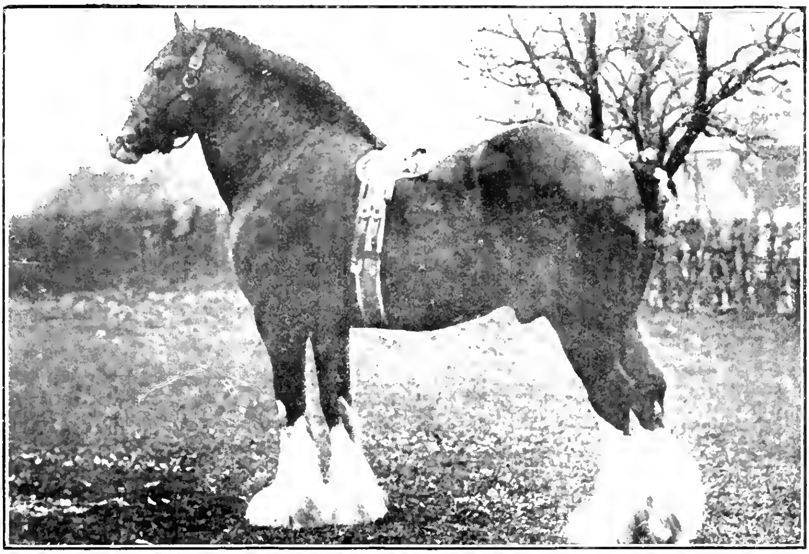
Returning to draught horses—if owners of mares would not so readily succumb to the magic suffix "(Imp.)," but would use their judgment and patronize the often-times superior locally-bred horse, stallion owners, in their turn, would not so readily tumble over one another to give the prices they do for some of the low class New Zealanders. For let it be known far and wide, not all the horses that come from New Zealand are high class: only a percentage of them are better than our own; and some are such as it would not be profitable to pay the freight on were it not for the craze of all and sundry for an imported horse no matter how low the price.

II. Rearing Methods.

I have placed "Faulty Rearing Methods" as the second cause; and after what I have previously said it may be regarded as paradoxical that I should now say that the climate *is* responsible for the fact that draught colts are generally badly reared in this State. But it is not that our mild climate is naturally to blame, or that the more rigorous climate of the South Island of New Zealand is naturally better suited; but it is that our

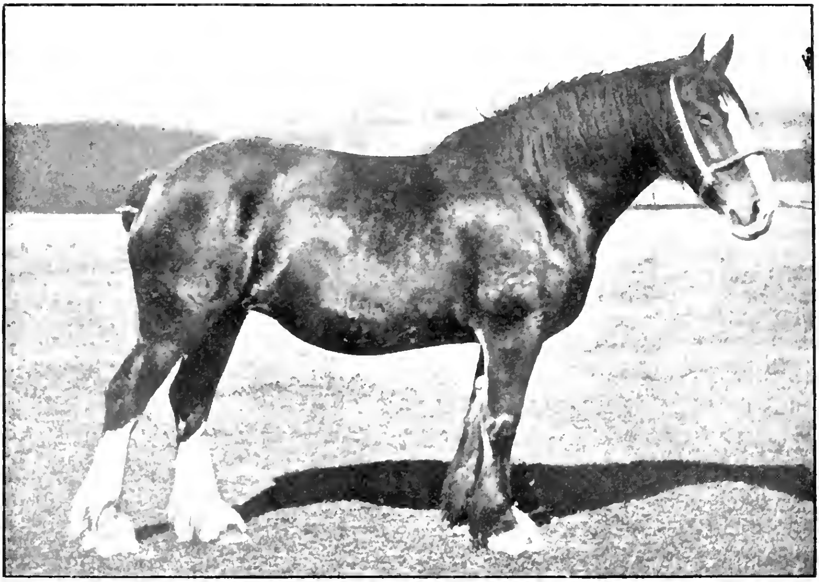


BARON'S PRIDE.
Foaled 1890. Champion Clydesdale, 1894.



HIAWATHA.
Foaled 1892. Champion Clydesdale, 1899. Winner of Cawdor Cup in 1899, 1900, 1901, and 1902.

mild climate encourages breeders to neglect proper methods of rearing while the severe winters in New Zealand forces the adoption of methods better calculated to insure that continuous and quick sappy growth which results in the more forward development that constitutes the main features of difference between Victorian and New Zealand colts. There is too great a tendency in this State, and throughout Australia generally, to depend on what is termed "natural" rearing, *i.e.*, rearing in the paddock the whole year round without any help from hand-feeding, or by housing or the provision of shelter during the winter months. The neglect of hand-feeding may perhaps be excused in the rearing of geldings or workers in certain districts where the country is rich and suitable. These have not necessarily to be at their best until three and four years old, and even then full condition is not essential to effect a quick sale. But in the case of stallions, it is different. Custom decrees that they must be ready for service at three years old. Many are purchased at two years and two and a-half years old; and to command ready sale, they must be well grown, big, forward and sappy at that age. These conditions cannot be produced unless the colt is kept moving in growth and condition from the time

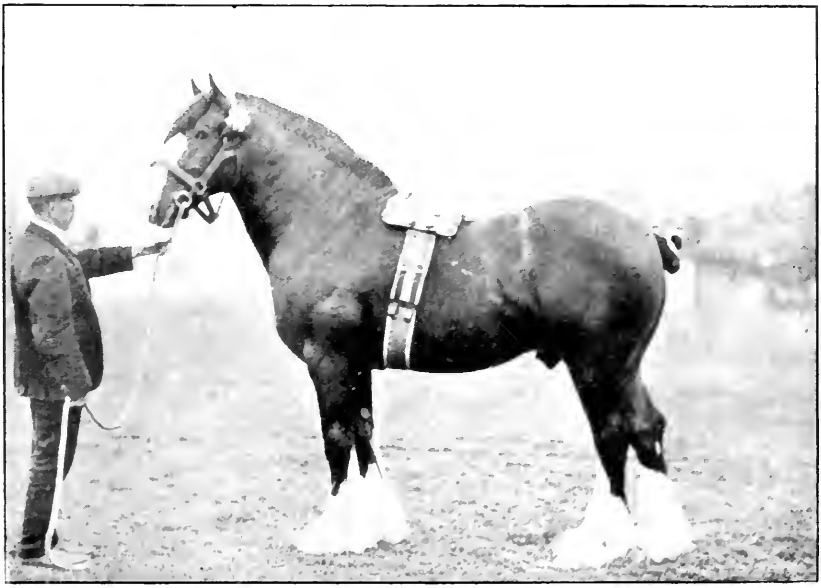


LADY VICTORIA.

Foaled 1896. Champion Clydesdale Mare, 1899. Winner of Cawdor Cup, 1899.

it is weaned; and this cannot be done unless the conditions as regards feed in winter and summer are kept uniform with those prevailing in the spring. Especially is it necessary that the colt should be kept in full, robust condition during the first winter after weaning. This is the period when most colts, suitable as regards breeding, size and otherwise, lose all chance of developing into stallions worthy of the name. Certain it is that any ground lost during the first winter can never be regained, no matter the attention that may be given at a later period. This statement is not only in accord with practical experience, but is capable of physiological proof, and has been frequently demonstrated experimentally at Animal Experimental Stations. It is an old saying that "Half the breeding goes in at the mouth"; and, if by "breeding," in this sense, is meant ultimate excellence as regards size, weight and quality when maturity is reached, the saying has ample foundation in fact. Furthermore, the "breeding" in this sense must go in at the mouth during the first and second years of life —the period when the functions of the body are directed in much greater degree towards its growth and development than they are at any other period of life.

In addition to the help which proper feeding gives towards the growth and robustness of young stock, protection against adverse weather conditions is also a prime necessity. One of the main functions of food is the production of animal heat. The amount of food that has to be devoted to the maintenance of body heat daily is in direct ratio to the daily loss of heat, which in turn is always greater when the external temperature is lowest. So that unless protection is afforded against the low temperature and adverse weather conditions during the winter months, either more food is required to maintain the body heat, or there is a retardation of growth, through the food being devoted to the maintenance of body heat instead of to the development of the tissues. Hence, the necessity for winter



MARCELLUS.

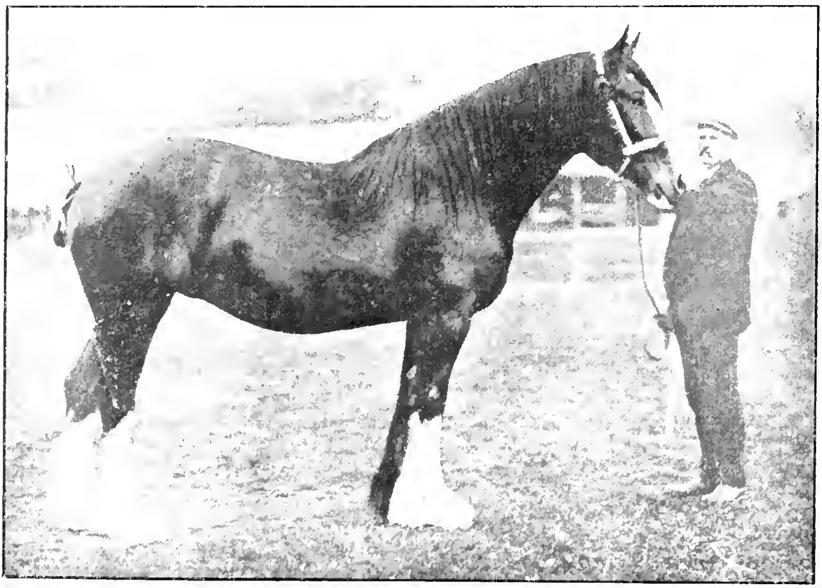
Foaled 1898. Winner of Cawdor Cup, 1903, and of Brydon Shield, 1905.

housing of young stock that it is desired to force along; or at all events, the provision of shelter sheds and fodder racks in the winter paddocks.

Before leaving this aspect of the question I would like to indicate briefly that practical experience in this matter is in complete accord with physiological science: that is, as regards the improvement in size and form, and therefore power, which results from the maintenance of full condition during the growing period. It is well known as a physiological truth that the bones, muscles, ligaments, tendons, and other tissues of young animals are plastic during the period of growth. As regards bones and muscles particularly, they develop in shape and become "set" in such relative position to each other, as they are habitually kept in during the period of growth. Now, the habitual attitude of a young animal that is exposed to inclement weather and kept low in condition, and therefore low in spirits, is the reverse of what is desired in a well-formed horse.

He indulges in little exercise, and therefore fails to develop his muscular system; he stands with his legs together, his head held low, his neck

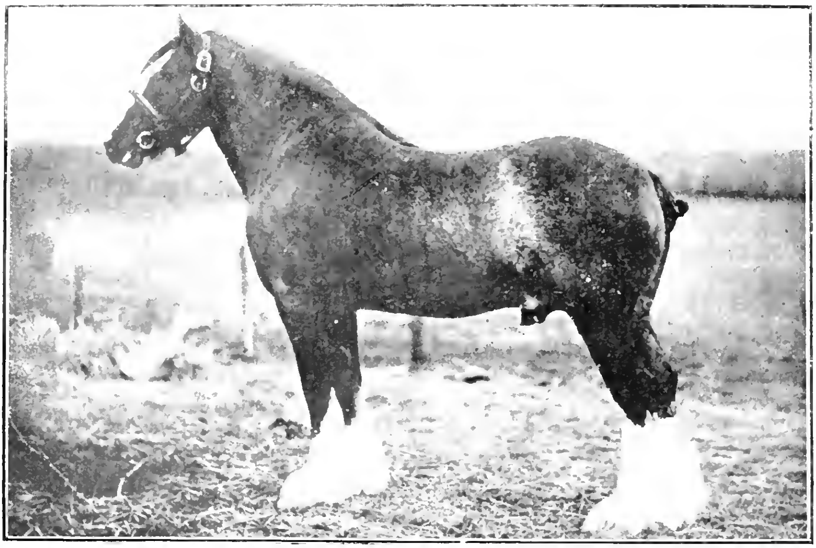
BARON O' BUCKLYVIE.
Foaled 1900. Champion Clydesdale, 1908.



NELLIE.
Foaled 1901. Twice Champion Clydesdale Mare.

swung from upright shoulders, his back arched, his rump sloped and his tail down. A few months of such an habitual attitude, and the weanling's muscles and bones set into such shape and position that he loses all chance of growing into a well-balanced, well-formed horse. On the other hand, the colt that is always kept "above himself" in condition, gallops about and develops his muscles. He stands square and alert, and moves with his head up and tail cocked. His ribs are well sprung out, and his muscles, being well padded or bandaged so to speak, with a layer of fat, are kept in position. So he grows up a well-balanced, properly turned horse, with a beauty of form, an elasticity of gait, and a buoyancy of spirit that give him character and merit as a sire.

Stud masters in the countries in which breeding is most successfully carried on have recognised the immense importance of these two factors I have been speaking of, in the rearing of stud stock—hand feed and shelter—and hence largely their continued supremacy in turning out high class stud stock. In the South Island of New Zealand, from which comes the greatest number of stud horses imported to this State, the rigorous



OYAMA.

Foaled 1904. Winner of Cawdor Cup, 1906, and of Brydon Shield, 1907.

winter weather demands that both these features should be given attention; and the practice there is to both liberally hand-feed and to winter-house or shelter the colts intended for stallions. In my opinion, so long as these practices are neglected in Victoria, so long will we have to depend on outside sources for the up-keep of the size and quality of our draught horse stock.

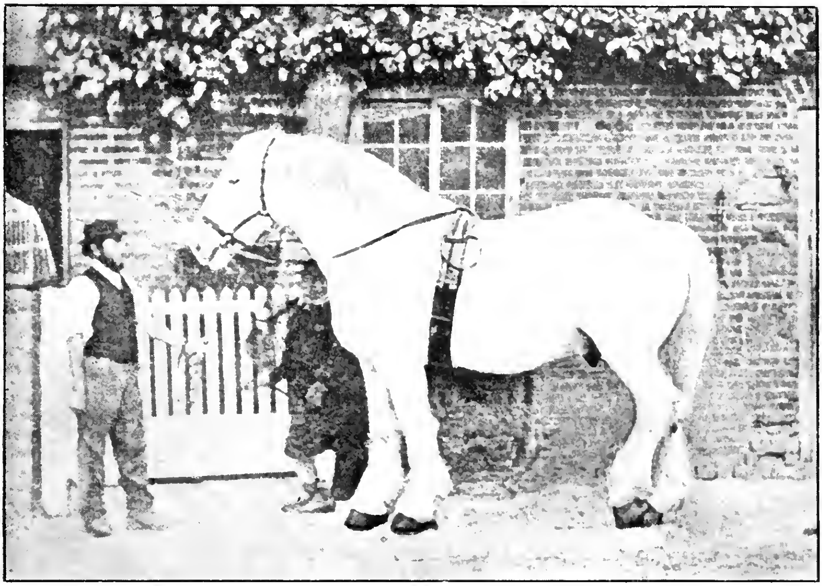
The reform required in this matter would, I feel sure, be greatly hastened by the establishment by Agricultural Societies of Foal Shows or Sires Produce Stakes for yearlings, to be competed for at the Annual Stallion Parades in the early spring. In such competitions the amount of money subscribed is such that the prizes can be made substantial, and a big entry is secured. It follows that the colts eligible for entry are more likely to be well done to during the previous winter, and the likelihood is that a greater number will be kept in the condition necessary to development towards stallionhood than at present. That, I believe, has been the effect in the Nhill district, where a competition of the kind was inaugurated three years ago. There were twenty-four yearling entries at the first competition, and the numbers have increased each spring since. I shall be very much surprised if the season we are just about to enter on does not show an encouraging increase in the number of stallions reared in that district, as a result of the increased attention given to the rearing of young stock through the establishment of the Sires Produce Stakes.

Mr. C. W. Tindall, the noted Shire horse breeder, says that nothing has done more in influencing the advancement of the Shire horse than the Foal Shows, which are now held throughout England each autumn after weaning time.

III. Breeding Methods.

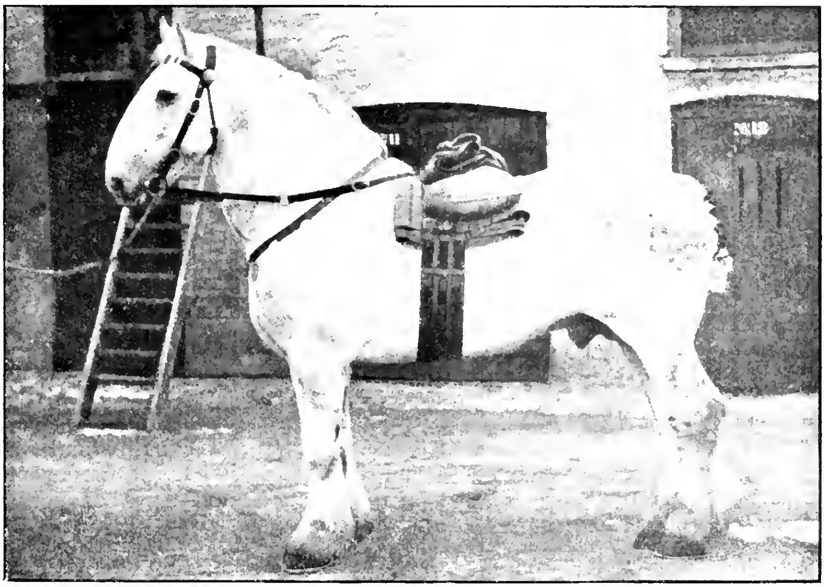
Coming now to the third suggestion I have to make as being a potent factor in the continued inability of this State to maintain the necessary standard of excellence in its stud horses, viz., unscientific breeding methods, I would point out, in the first place, that from time to time the very best blood available in the old country has been imported, particularly in the case of both breeds of draught horses—the Clydesdale and the Shire—and also in the case of thoroughbreds. As regards the latter, by virtue of the English and Australian Stud Books, the breed has been kept pure. Thoroughbred has been mated on to thoroughbred, with the result that there has been a maintenance of all the qualities of the breed, and Australia has been able to send Australian bred thoroughbreds to compete successfully with the parent stock at home, as well as to keep up a wholesome competition with England in the regular supply of sires of the breed to India and other Eastern countries.

With draught horses, however, no such care in maintaining the purity of the breeds has been exercised. There has been throughout an indiscriminate and unenlightened crossing of the two breeds which is indefensible so far as the breeding of horses for stud purposes is concerned—a disregard indeed, of the first principles of scientific breeding, which it is hard to understand except on the supposition that the breeders have failed to thoroughly realize the absolute distinctiveness of the two breeds. Whatever may have been the position thirty years ago, when the Clydesdale Stud Book and the Shire Horse Stud Book were first established, as regards the admission of horses of doubtful breed, there can be no manner of doubt that the breeds have been kept absolutely distinct since then, as I hope to be able to demonstrate with the aid of the accompanying illustrations of the most famous individuals of each breed at the present day and in times gone by. The only loop-hole for the introduction of foreign blood into either breed during the whole thirty years of breeding under Stud Book rules is, that on the dam's side one outcross of foreign blood three generations back does not disqualify for entry; that is, fresh blood may be introduced on the dam's side after three crosses of registered blood have been grafted on it. In other words, an animal with seven-eighths pure blood (registered) and one-eighth foreign blood on the dam's side is eligible for Stud Book entry; but on the sire's side the registered blood must be unbroken back to the formation of the Stud Book. So that the chance of variation in type through this loop-hole is infinitesimal. Indeed, so strongly is purity of breeding—as guaranteed by registration in the Clydesdale Stud Book—insisted on in Scotland, that it is stated authoritatively in the most recent publication on the subject (*Horses of the British Empire*, by Sir Humphrey de Trafford) that "only one draught stallion travelled in Scotland during the season 1906 whose stock is ineligible for registration in the Clydesdale Stud Book, while even this one horse has a Clydesdale sire." Further, the quick-witted American breeders have realized the



STYTCH'S CHAMPION.

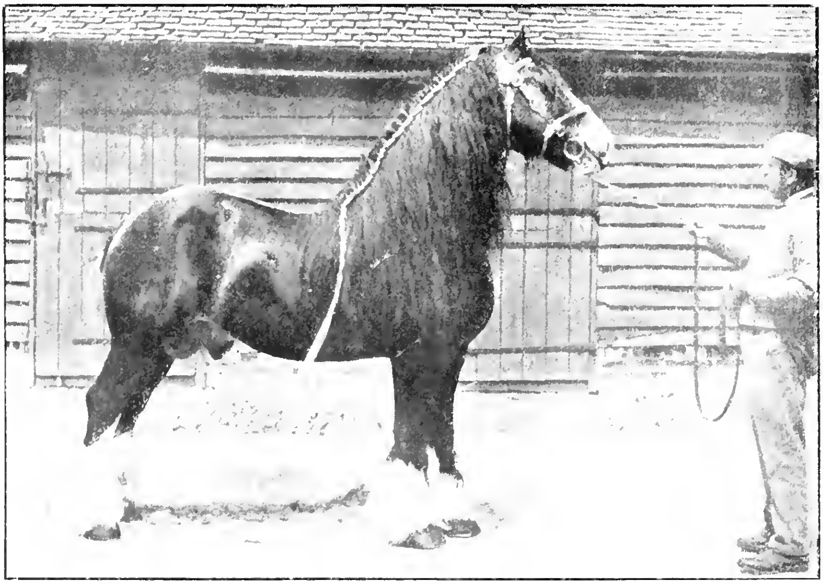
Foaled 1854. A noted Shire "sire," of the fifties," from which many of the best present-day Shire are descended. (The photograph was taken at 20 years old.)



THUMPER.

Foaled 1868. A pre-stud book Shire horse, from which many present-day champions are descended.

advantages of pure blood lines, and there is now legislation in both the United States and Canada prohibiting the importation of any stud horse that is ineligible for entry in the Clydesdale or Shire Stud Books respectively. The Americans were forced to impose this restriction in self-defence against the dumping on their shores of horses that, through faulty breeding, were ineligible for entry in the Stud Book, and therefore comparatively valueless for breeding in their country of origin. It is too much to expect that Australia has not, in the past, shared the same attention as a dumping ground for Stud Book rejects. In point of fact, horses that have been ineligible for entry in the Clydesdale Stud Book have been imported here and advertised widely as "Pure Clydesdales." The evil influences as regards unsoundness of one of such "blown upon" horses is widely existent at the present time, and accounts for a considerable proportion of the percentage of rejects for the Government Certificate of Soundness during the last three years; so that, in the matter of the purity of blood lines, the "breeds" here have not only suffered through crossing of breeds, but also because the original imported blood was oftentimes itself impure.



PRINCE WILLIAM.

Foaled 1883. Champion Shire (London), 1885 and 1886.

On the question of the good effect that the Clydesdale Stud Book has exerted on the breeding by maintaining the standard of quality and increasing the number of good qualified horses, the opinions of prominent breeders whose experience ranges over the whole period may be quoted (from *Horses of the British Empire*):—

Mr. William Montgomery says:—

Clydesdales are very much improved since the Stud Book started; they have all the size of the old-fashioned Clydesdale, and more quality. They have now much less hair on the legs, and are especially improved in the hind legs, hind feet and ankles.

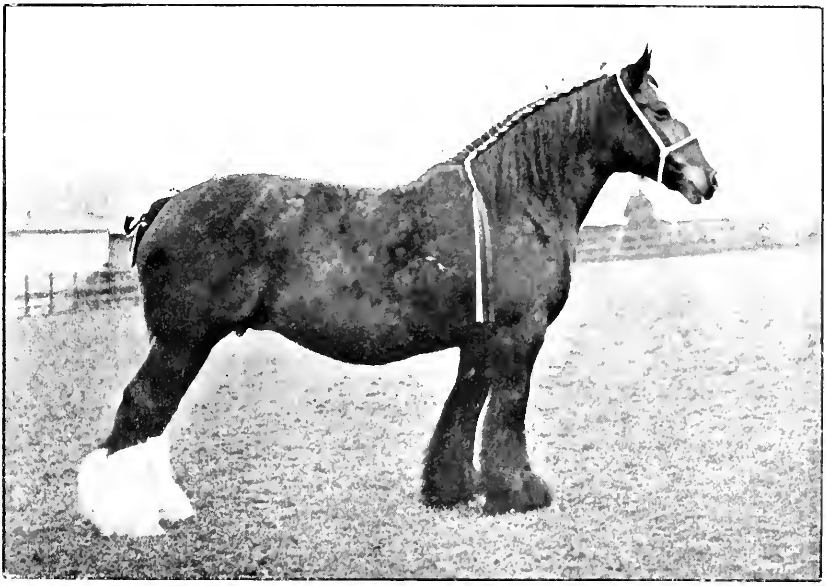
Mr. William Taylor says:—

The proportion of good animals, both male and female, is much greater nowadays. Possibly there might be individual horses 25 years ago as good or even better than now; but putting it moderately, I should say there are five good ones now for every one there was 25 years ago.

Mr. William Renwick thinks:—

There may have been individual horses in his young days as good as any yet seen, but the average quality is much higher now.

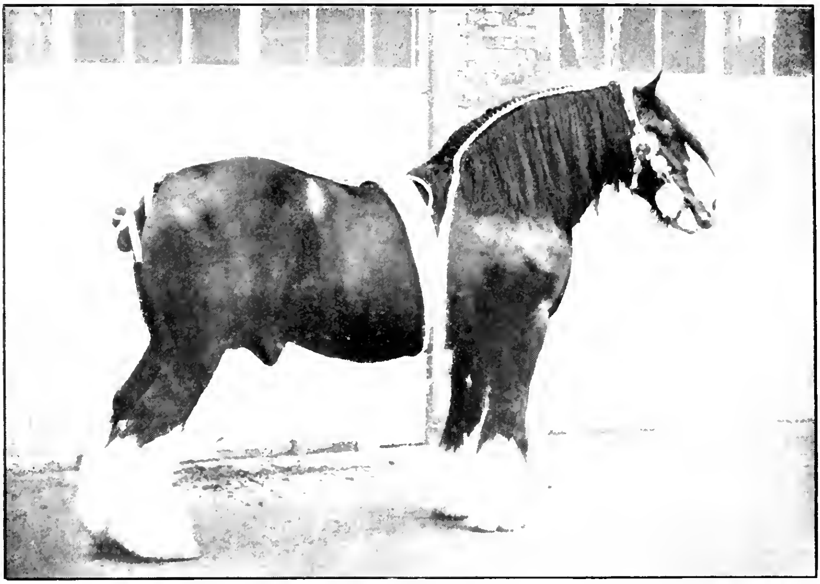
In view of the improvement which is thus generally admitted to have resulted from the establishment of the Clydesdale Stud Book in Scotland, it is not surprising that New Zealand breeders have been able to continuously maintain supremacy over Australian breeders as regards uniformity of type, seeing that they have had the assistance and guidance of a Stud Register ever since 1878.



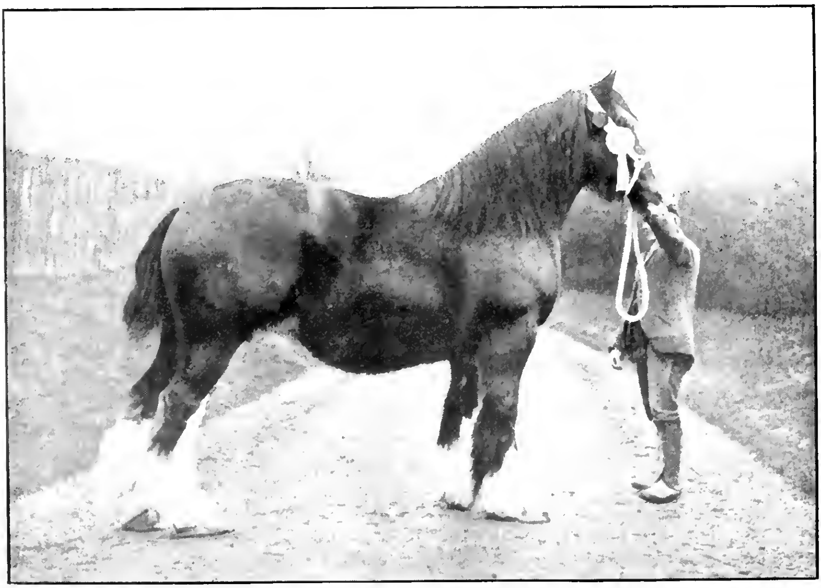
DUNSMORE GLOAMING.

Foaled 1890. Champion Shire Mare (London), 1899 and 1900.

The Shire Horse Stud Book was established in 1880 by the Royal Shire Horse Society, and the conditions of entry are a little more lenient than for the Clydesdale Stud Book inasmuch as an animal having three registered crosses on the sire's side and two on the dam's is eligible. Nevertheless, the breed has been enormously improved during the 30 years that the Stud Book has been in existence. I hope to be able to demonstrate this even more clearly than in the case of the Clydesdale, by the means of the illustrations. They will include representations of the type prevalent before the establishment of the Stud Book; and from these you will be able to make comparison between the magnificent type of present day Shire and representatives of the breed available before the establishment of the Stud Book, but from which the present type has been developed by means of the aid the Stud Book has afforded breeders in mating definite blood lines possessing the characteristics required for improvement. On this matter of the immense benefit of the Stud Book in establishing the breed, I am tempted to quote Mr. C. W. Tindall, of Lincolnshire, whose name



STROXTON TOM.
Foaled 1892. Champion Shire (London), 1902 and 1903.



BLYTHWOOD GUELDER ROSE.
Foaled 1895. Champion Shire Mare.

will be familiar to many as an experienced and successful breeder of Shires, and who was entrusted by Sir Humphrey de Trafford with the writing of the chapters on the Shire breed in "*Horses of the British Empire.*" He says:—

It was not until 1880 that the work of improvement was taken up in earnest, when breeders really began to see what was being lost to them year by year, and what a valuable asset they had at hand which only needed putting on business lines. From this date up to the present time the best Shire horses have continued to increase in value. It is generally admited that no animal for breeding purposes will ever command much more than an ordinary price, except where the owner can give a certified pedigree of the animals he has for sale. This has been more than proved in the case of the Shire horse since the advent of registration.

He also mentions that before the formation of the Stud Book—

It was one of the wonders of the time for a stallion to make over £100, and it was not until after the formation of the Stud Book that prices began to increase.

He adds that—

Quite a sensation was caused one morning when it appeared in the papers that Mr. Walter Gilbey had given the unheard of price of £800 for the future champion Shire horse "Spark." From that day until now the Shire horse has never looked back. Since that time it has not been a very uncommon thing for stallions to make up to 2,000 guineas and mares up to 1,000 guineas."

I may here interpolate that the record was reached last year when the Shire stallion "Tatton Dray King," whose photograph is reproduced on page 502, realized 3,750 guineas. Tindall goes on to say that this increase in prices—

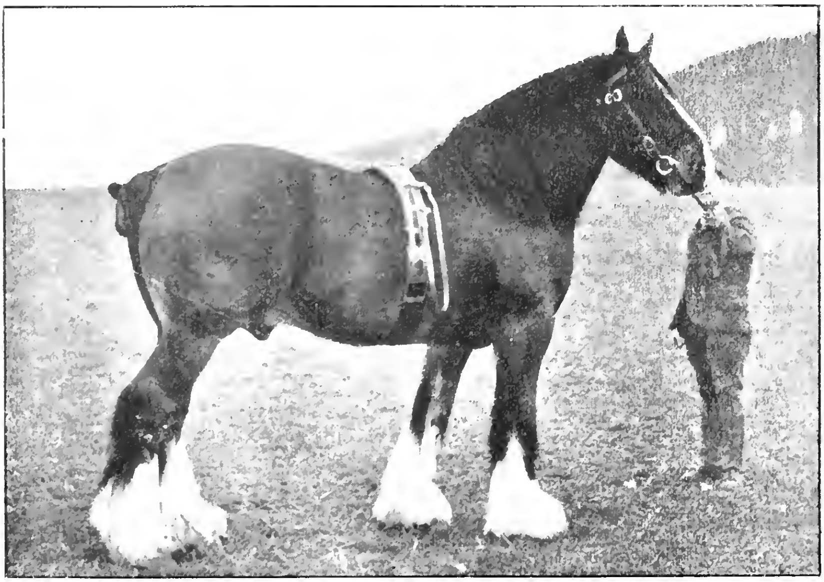
Is due to a very great extent to the fact that registration enables breeders to know which line of blood produces the soundest and best animals, and this could never have been found out with any satisfaction except by the creation of a Stud Book. It may be said you can only have full value when you have perfection in the animal (individual) and pedigree together, that is to say, you cannot have perfection with pedigree alone, or with the animal alone: the two must and do run together. It is only by these means that breeders are enabled to ascertain which animals will reproduce themselves with any degree of certainty. We may confidently assert that as the breeders of Shire horses have now agreed as to what type the Shire should be, the improvement which has taken place in the last 25 years will be as nothing to what will be seen in the years to come. The demand for Shire horses (both stallions and mares) at home and abroad has considerably increased; moreover the value of the Stud Book to breeders has proved to be incalculable, as it causes owners to take more interest in the mating of their animals which, needless to say, is essential to good breeding; while the fact of animals being registered has long since enabled members to know which horses bred sound animals or otherwise.

I have quoted at some length from Tindall on this matter of the beneficial influence of a Stud Book on breeding operations. In the same article he pronounces emphatically on the subject of unsoundness, and, lest there are remaining some amongst the draught horse breeders in this State who are still entertaining doubts as to the wisdom of the policy that has been adopted by the Government with the object of eliminating hereditary unsoundness, I may perhaps be pardoned for taking up a little time in reading to you the published opinion of the man who, as a successful breeder of life-long experience and as an acknowledged authority on the breed, was selected to write the contribution on Shire Horses for the exhaustive and up-to-date treatise on *Horses of the British Empire* (1907), which may be described as the last word on horse lore that has been published. Tindall says:—

One of the first and most important rules that the society decided upon was that no animal should receive a prize without a Certificate of Soundness from a veterinary surgeon, and this has been a most important factor in putting money into the pockets of the breeders of Shire horses, especially tenant farmers. Twenty years ago it was quite common for a very large proportion of horses to be unsound, and as a matter of fact, as the first shows, up to 20 per cent. or more, were disqualified on account of unsoundness in various forms. Of late years, however, in spite of the enormous increase in the number of horses bred and shown, the number of unsound has not amounted to 5 per cent. of the whole. This must, and is, admitted to be a result far exceeding all expectations. Of diseases, the chief from which Shire horses suffer are roaring and sidebones. . . . . Cases of unsoundness, except those owing to roaring and sidebones, are now quite rare, and cases of these two diseases are becoming rarer every day. When I first began to take an interest in Shire horse-breeding (some twenty years ago) I read a short paper to a local association, and amongst other things I ventured to say that most diseases—sidebones in particular—were almost wholly hereditary. Some of my hearers burst into laughter at the idea of sidebones being hereditary, and in the discussion which we had afterwards, several of them said that we always had had sidebones and we always should have, &c., that they were not hereditary, but were caused by the horse being trodden upon when at plough or by the shafts falling upon them and, in fact, were due to any cause except the right one. If the Shire Horse Society had done no other thing than to prove to its members that these diseases are entirely bred, it will have more than paid for all the time and money which have been spent upon it. There is real pleasure in believing that at the present time there is not one farmer or breeder in a hundred who is not perfectly satisfied in his own mind that sidebones and roaring are largely hereditary, and will, in time, be practically bred out. At the same time it would not be reasonable to expect that the superstition and neglect, not to say carelessness, in the matter of breeding which has been in vogue for two centuries or more could be eradicated in the very short space of 25 years.

At the close of the article, after prognosticating great future success for the Shire breed, Tindall concludes as follows:—

There is, however, a real difficulty which breeders have to contend with, and that is—the question of breeding sound animals. Fortunately, not only have the chief breeders now made up their minds that only sound animals should be bred

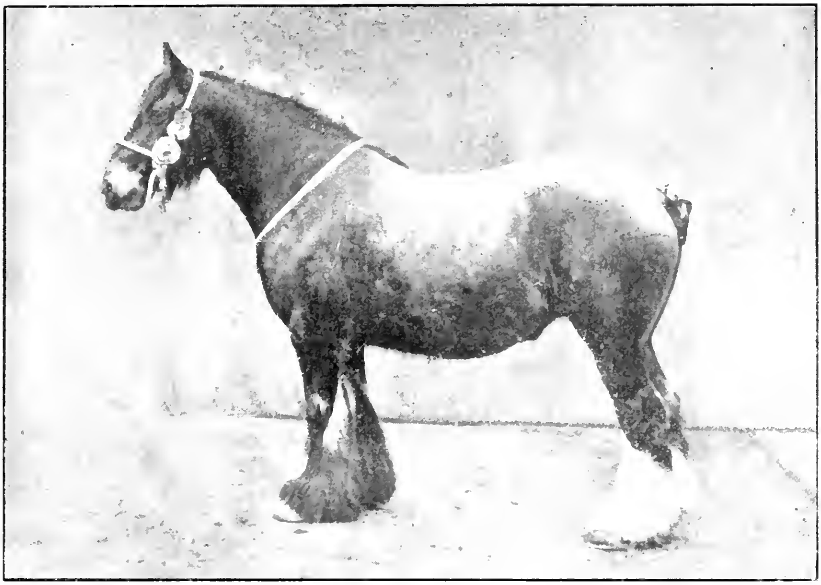


BIRDSALL MENESTREL.

Foaled 1900. Champion Shire (London), 1904 and 1907.

from but (which is of much greater importance) the Government, represented by the Board of Agriculture, are fully alive to this necessity, and are anxious to support breeders in this matter as far as they are able to. I believe, at no very distant date, sires will not be allowed to travel in any district to serve public mares unless they hold a Government Certificate of Soundness. There can be no greater folly than that of breeding from unsound animals. As I have already pointed out, unsoundness is almost, if not entirely, hereditary, and as this is becoming more acknowledged every day, it is not likely that breeders will sit down quietly in the future as they have done in the past and be content to have half-a-dozen unsound horses travelling in a district, upsetting the good which the sound ones are doing. . . . . It is fast becoming an actual necessity that breeders should be protected and the country freed from unsound animals, whatever breed they may represent.

Reverting to the matter of breeding, on the top of all that I have said, your attention may be directed to the almost universal experience as regards the breeding of almost all kinds of high class stock, and to the fact that,



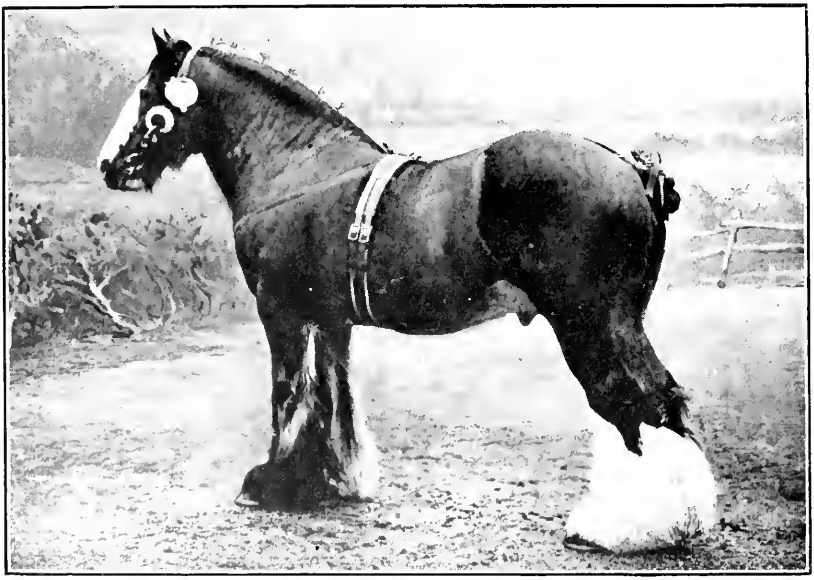
STOLEN DUCHESS.

Foaled 1901. Champion Shire Mare (London), 1907.

with the exception perhaps of Merino sheep, no breed of animal has been brought to a high state of perfection until the breeding operations have had the advantage and guidance of a Stud Book. Witness the prepotency and uniformity of type of such breeds as the Shorthorn, Hereford, Ayrshire, Jersey, and other breeds of cattle; of the British breeds of sheep; of the English hackney horse. Note the improvement for the purposes for which they are bred, of the English thoroughbred, and the American trotter, since these breeds have been controlled by registration. Even in the case of Merino sheep and Australian Shorthorn cattle, although there have been no public Stud Books, nevertheless the breeding of the best flocks and herds has been almost wholly controlled by the private records of each line of blood; which records have been kept as accurately and used as religiously for guidance as the public Stud Books established in respect of other breeds.

It is significant too, and ought to be a lesson to the devotees of the much older pursuit of draught horse breeding, that stock breeders in most of the younger countries seeking to gain eminence in the world's markets, have generally taken advantage of the Stud Books existent in older countries, and have copied their methods. For instance, the Shorthorn Herd Book in the Argentine is as rigid as regards entries as the English Herd Book, and every animal admitted must trace back in pedigree on both the sire's and dam's side to the English Shorthorn Herd Book.

Just as in the case of cattle, it has been as yet found impossible to produce, as a breed, the dual purpose cow combining in the one animal perfection as regards both beef and milk ; and as in the case of sheep, no breed has been developed which combines perfection of both wool and mutton production, so as regards draught horses neither the Clydesdale nor the Shire completely fills the bill as an ideal. The ideal would be the combination of the size, weight and substance of the Shire with the quality, hardness of bone, and activity of the Clydesdale. The greatest prospect of the production of the ideal lies in the direction of evolving it from one or other of the present distinct breeds by either mating together pure Shires that have the Shire qualities of size, weight and substance, but that show a tendency to fine quality of hair and bone and lissomeness of movement ; or by the mating together of the more weighty and solid individuals of pure Clydesdale origin.



TATTON DRAY KING.

Champion Shire (London), 1908. Realized the record price at auction, 3,700 gns., in 1909.

In which of these two ways the end can be attained is for the future to decide. Certain it is, that looked at from either a scientific standpoint or in the light of stern practical experience, it is like following a will-o'-the-wisp to expect to quickly get the combination of good qualities that will breed true by direct crossing. It is true that distinct breeds have been created by the breeding together throughout a long series of generations of the progeny of crosses, but the process has always been of a hit-or-miss character, and has involved long periods of careful control and ruthless cullings. Even the new light that has been thrown on the subject during recent years by experiments under the Mendelian law seems only to unveil the difficulties of the problem rather than to reveal the means of its solution.

Every experienced breeder knows that for utilitarian purposes the progeny of a first cross between two breeds is frequently excellent as an individual, but has no value at all for propagating its own type when bred from. Take the Shorthorn-Ayrshire cross or the Ayrshire-Jersey cross in cattle, or the Merino-Lincoln cross in sheep. The individuals of such crosses are often excellent in themselves, but no stud breeder would use one of them as a sire. Furthermore, if amongst draught horses crossing the Shire and Clydesdale produces the best draught geldings, it is necessary to keep the two breeds pure and distinct so as to always have the essentials for crossing.

Finally, all evidence and experience appear to point to the folly of continuing on the unknown road at present being followed by Victorian breeders, and to indicate that the same course should be followed in draught-horse breeding as has been followed with such conspicuous success in the breeding of other classes of stock, viz., to breed to pure and constant blood lines, insuring such purity and constancy by the keeping of breeding records in the form of a Stud Book, registering the two breeds distinctively. The advantage of the entry to such a Stud Book would prove an effective discouragement to the continuance of the present " lucky bag " practice.

THE OVENS RIVER VALLEY.

REPORT ON ST. JOHN'S WORT, DREDGING, AND THE FOREST FLORA OF THE DISTRICT.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in the Melbourne University.

These three matters are so closely connected that it would be best to discuss them simultaneously. For instance, any measures taken to deal with St. John's Wort must take into account the condition in which the land is left by dredging. Further, the dredging operations require the use of large quantities of timber as firewood, hence the forest resources are of importance. Finally, the only use to which land which cannot be cultivated can be put in districts infested by St. John's Wort, is to grow timber, but such use will only be profitable when the timber is grown under proper forestry conditions and suitable trees selected and planted instead of the matter being left to chance.

ST. JOHN'S WORT.

To the account of this weed given in the *Weeds and Poison Plants of Victoria*, pages 17 and 18, a few additional facts can be added. As previously stated, it is easily suppressed by cultivation and gives little or no trouble so long as the land is kept under crops. It is a common practice, however, to crop the land year after year without manuring until it is exhausted, then allowing it to run wild. On such land, in a year or two, the weed is naturally more vigorous and abundant than anywhere else; but if the land is allowed to lie idle, it might just as well grow St. John's Wort as any other weed. The tiny, black, hard seeds appear to be able to lie dormant in the soil for a few years, the limit being probably eight or ten years. At any rate, twelve year-old seed failed entirely to germinate. Fresh seed can, however, be carried on the feet of stock or other animals to uninfested ground. The seed is not carried by the wind to any extent, and it is doubtful whether birds aid in its spread.

The following special points are worthy of mention:—The weed will not grow under pine trees, especially when planted at the distances usual in forestry. In thin scrub it will grow, but is neither abundant nor luxuriant. In dense scrub it grows little or not at all. Practically the whole of the land affected by St. John's Wort in the Ovens River Valley would grow good Conifer timber.

Stock will apparently eat a certain amount of the weed when it is young, but it is stated locally that it affects the flavour of mutton and that cows and bullocks get a peculiar irritation of the skin when brought on to land affected by St. John's Wort. The skin becomes red and in extreme cases peels off, causing the cattle great agony, especially in summer time, when, mad with pain, they will gallop wildly through the scrub. Curiously enough, the disease mainly affects white animals,* whereas black, brown, or red stock suffer from it hardly at all. In variegated animals, the irritation either begins on the white patches or is confined to them.

This predilection of the disease or irritation for white animals or white patches on the skin, has been confirmed by personal observation, although the cause of it is not easy to grasp. In addition, it is not possible to say definitely in the absence of direct experiments, whether the irritation is really due to the St. John's Wort or is only accidentally connected with its presence. The Hypericum oil was formerly applied externally as a cure for rheumatism, and probably when continually applied would produce an irritation of the skin. A white patch on an animal is the result of the non-formation of pigment and this is presumably associated with the lesser vitality of the skin, as when the hair turns grey in old people. This might explain why the white patches are more easily irritated.

Poisons are quite useless to suppress St. John's Wort when it is deeply rooted, since the doses required to kill it are not only prohibitive in cost, but leave the land useless for growing other vegetation for many years. On several of the poisoned plots near Bright, nothing is growing except a scum of Algæ and Moss. In others, the first plant to appear is the St. John's Wort itself. The only possible use of a poison would be to keep down the weed while cultivated land under crop rotation was temporarily laid down in pasture. For this purpose, a poison is required which is cheap, easily applied and more poisonous to St. John's Wort than to pasture plants. After testing a variety of substances, the only one which fulfilled these conditions was found to be Phenyl. When added to water in the proportion of 1 to 40, this forms a milky liquid readily sprayed over the plants to be tested. This leaves grasses and clover unaffected but causes most of the leaves of the St. John's Wort to turn brown and kills the majority of the young seedlings, if a fine, evenly distributed spray is used. Sorrel and other weeds are practically unaffected, as is also Couch grass. Using a strength of one gallon of phenyl to twenty gallons of water, the St. John's Wort was somewhat more strongly affected though still not entirely killed; Grass and Clover plants had their leaves slightly browned and spotted. Sorrel was unaffected. Couch grass was slightly browned but not permanently affected. The leaves of the Tree Tobacco showed many brown spots, but were not killed. Old, deeply rooted plants of St. John's Wort are merely checked by this treatment since they send up fresh shoots from below.

When infested land has been cultivated and is then laid down in pasture, the St. John's Wort seedlings are at first small and grow with low trailing branches more or less prostrate. If unchecked, within a year or so they will ruin the pasture, but if, while they are young, the pasture is

* Professor Gilruth informs me that white animals are more subject to such diseases as cancer, and also to sun scald. Possibly St. John's Wort may predispose white or variegated animals to sun scald.

finely sprayed with one to two gallons of phenyl to forty gallons of water per acre, they will be sufficiently checked or destroyed to enable the useful pasture plants to get the upper hand. It is for this purpose and in this way only that any poisoning methods will be of the least use for St. John's Wort. The concentration used should not exceed one in twenty or be less than one in forty, and the spraying should be done in warm, dry weather. At 4s. 6d. per gallon of phenyl, the cost of the treatment, including labour charges, should lie between 8s. and 12s. per acre, according to the strength used and the local conditions, since on some soils, 80 gallons per acre might be required for efficient spraying.

The Dredged Flats.

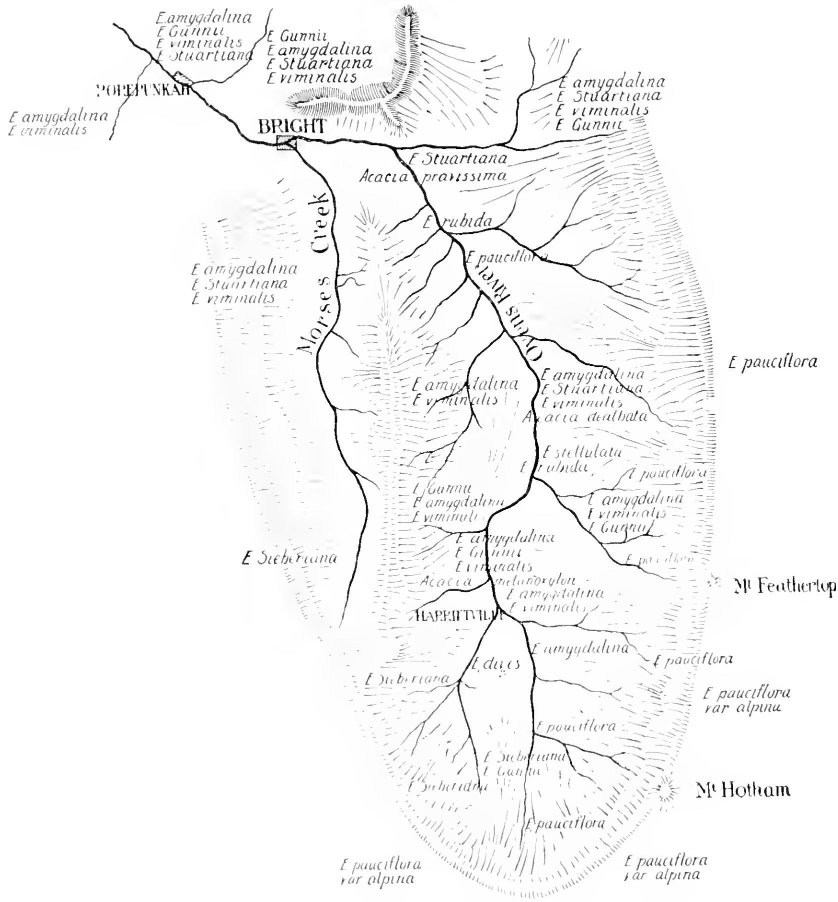
As is well known, in the process of dredging for gold, the whole of the alluvial soil in the valley bottom, down to the bedrock, is drawn up by means of water passed through the sluice boxes and deposited behind the dredge which steadily eats into new ground. The water flows back again into the pond in which the dredge floats and is used over and over again, only a small supply being required to allow for wastage. The modern type of dredge has a short sluice box from which the coarser material falls and a longer one projecting further behind which drops the finer sand and gravel on top of the coarser stones and pebbles. When the dredge is properly worked, a fairly even surface is left, but this is in the condition of the sandy or gravelly bed of a stream and has about the same agricultural value. Where the levelling is badly done, pools of fine mud which bake hard in dry weather are left behind. In other words, the soil is left in the worst possible agricultural condition, its constituents being sorted out in layers of particles of approximately equal size, instead of being mixed together as they should be in a good soil.

Even where care is taken to deposit the fine material on the surface, the land is left in a condition useless either for grazing or cultivation. In the Ovens River Valley, the deeper layers consist of sand, gravel and rounded water worn stones covered, for the most part, by a layer of fine alluvial and humus soil varying in thickness from a few inches to one or more feet. This surface layer is entirely lost in the process of dredging. Hence, without special treatment too costly to be worth consideration, it will not be capable of supporting good pasture plants for generations to come. A few fodder plants, such as Bird's-foot Trefoil and some of the less useful grasses, might gain a precarious foothold, but would ultimately be suppressed by St. John's Wort and other weeds. As the pasture yield would be trifling and cultivation out of the question, it would not pay to keep the weeds down.

Other countries are actively engaged in adding to the agricultural land by reclaiming swamps, bogs, sand-flats, &c., whereas Victoria is dredging away some of her best agricultural land such as is found in the alluvial soil of valley bottoms. It must be remembered, that gold dredging can only be done once, and is a temporary occupation. Agriculture is a permanent occupation.

The only profitable use to which the dredged flats could be put would be to use them for forestry purposes and the Bright district is admirably suited for the growth of coniferous wood. The planting of trees could take place immediately behind dredges while the soil is still moist, loose and watered with what is practically a nutrient solution. There would then be no need for clearing or cutting weeds around the young trees, and as soon as their roots have penetrated to any depth, the trees would do as well as in soil apparently ten times more promising. Far more unpromising soil has been successfully and profitably afforested in the Black country of England and in some of the mountainous districts of Scotland and France.

The timber used by the dredges is causing the sides of the valley to be rapidly depleted of their native timber, with the result that, before long, the mountain sides will be denuded of their soil and landslips of soil and loose rocks into the valley below will become of common occurrence until



DISTRIBUTION OF ACACIAS AND EUCALYPTS IN THE OVENS VALLEY.

the hillsides are practically bare. One difficulty in the way of profitable tree planting would lie in the distance from an open market, but it would be an easy matter to construct a water flume down the whole length of the Ovens River Valley so that sawn timber could be easily conveyed to the rail head at Bright. In any case, the tree planting would not be for the present but for the next generation, and would provide an occupation for a portion of the population, when all the profitable ground has been dredged. The only part where any large area of big timber exists at present is at the extreme head of the Ovens River Valley beyond Harrietville, and this timber will probably be used before any new plantations come into active bearing.

The re-afforestation is only likely to be carried out on proper permanent lines if it is entrusted to the Forests Department, for forestry from its very nature is more essentially a State function than almost any other. Where the land is not on lease, but has been sold outright, there might be some difficulty as to tenure. Dredging is a modern occupation with ill-defined legal obligations. The social aspect of the question is a simple one. Land sold for dredging purposes is, when dredged, useless for any other purpose than forestry in the Ovens River Valley. Forestry is a State function and when land sold for dredging has been rendered unfit for any other use it should revert to the State. It would be a simple matter by enforcing the *Thistle Act* to bring about a voluntary relinquishment of the land, since it would not pay to keep land idle and at the same time free from weeds.

On some of the older dredged flats, the commencement of a natural process of re-afforestation can be seen, some of the older tailings heaps being abundantly self-sown with the Silver Wattle mixed with occasional Gum Trees. It has, in fact, been suggested that the land might be used to grow wattles for wattle bark. Unfortunately, the more valuable Blackwood, although it grows in the district, does not appear to thrive, and profitable forestry cannot be left to chance but depends mainly upon systematic planting and the selection of suitable trees.

Forest Flora.

The trees of the district are comparatively limited in number, and are mainly confined to nine species of Eucalypt and three species of Acacia. A few other shrubs or small trees are present, but do not attain sufficient size to be of value for timber. A list of these, together with the other non-economic plants of the district, will be published elsewhere. The list of the Acacias and Eucalypts is given beneath :—

Acacias.

Acacia dealbata, Link, "Silver Wattle."
Acacia melanoxylon, R. Br., "Blackwood."
Acacia pravissima, F.v.M., "Alpine Wattle."

Eucalypts.

Eucalyptus amygdalina, Labill, "Peppermint Gum."
Eucalyptus Gunnii, Hook. f., "Swamp Gum."
Eucalyptus Stuartiana, F.v.M., "Apple Gum."
Eucalyptus pauciflora, Sieber, *var. alpina*, "Weeping Gum."
Eucalyptus Sieberiana, F.v.M., "Mountain Ash."
Eucalyptus viminalis, Labill, "Manna Gum."
Eucalyptus stellulata, Sieber, "Black Sally."
Eucalyptus dives, Schau, "Dwarf Messmate."
Eucalyptus rubida, Maiden and Deane, "Candle Bark."
*Eucalyptus elæophora**, F.v.M., (*E. Cambagei*, Maiden and Deane).

On the sides of the valley of the Ovens, most of the good timber has been cut away and used as fuel, leaving a thin covering mainly of poor, irregular, dwarfed, twisted or diseased trees useless for timber. In a forest kept under proper control, the reverse should be the case. The first thinnings,

* This species grows near Bright, and becomes more abundant towards the Buffalo Mountains.

mainly of use for firewood only, should remove all crooked, diseased, dwarfed or spindled timber leaving only the strong, straight trees to attain maturity. As these are harvested, fresh plantings should be made between the old stumps, so that once it has matured, a forest should yield a continual supply of timber for an indefinite length of time. To leave a forest which has been cut over to re-establish itself naturally is a long and wasteful process, and in many cases, the forest will never return to its original condition, since the useless trees left standing may largely prevent the development of strong, new saplings.

In the Ovens Valley, many of the older and weaker trees are infested by an injurious lichen (*Usnea barbata*). The Hanging Mistletoe (*Loranthus pendulus*) is abundantly present on *Eucalyptus Stuartiana*. *L. celastroides* also occurs on both Acacias and Eucalypts, but is less abundant. In a properly maintained forest, badly infested trees are the first to be removed, whereas in a forest left to re-establish itself naturally, the old diseased trees left standing transmit these parasites to the new timber.

For the most part, the good timber is confined to the margin of the district. A particularly fine forest, principally of Mountain Ash (*E. Sieberiana*), occurs to the west and south of Harrietville, and extends throughout the greater part of the ascent from Harrietville to the Mount St. Bernard Hospice. It consists chiefly of young, erect trees of from 80 to 130 feet in height, some of the diameter of 3 feet at the base. Well up in the ranges, diameters of 5 feet were found. A saw mill is at work in the district and seems likely, before long, to exhaust the better timber. A certain amount of *E. pauciflora* and *E. Gunnii* is also present. The alpine variety known as the Snow Gum extends to very high elevations but is then much dwarfed. The detailed distribution is given on the accompanying plan, which gives the predominant species in a particular district.

THE POTATO EEL-WORM.

(*Continued from page* 90.)

W. Laidlaw, B.Sc., Micro-Biologist.

In a preliminary article on the Potato Eel-worm in the February number of this *Journal* I endeavoured to point out some of the differences between it and the Onion worm. A more extended study of this nematode, and others affecting plants and found free in the soil, has convinced me of the need there is, both from the standpoint of scientific interest and from the standpoint of practical economy, for continued observations. There are many problems connected with these almost microscopic worms that, in the present state of our knowledge, we are unable to solve. Comparatively few species have been studied and named and a much smaller number can be identified. Little is as yet known concerning their distribution or the part they play in the economy of nature, or of their requirements in the form of food, climate, moisture and temperature for multiplication and growth. Their powers of endurance, their relations to one another, their relations to plants and the fertility of soils are all points requiring further research.

To show the practical importance to the farmer and, indeed, to the whole community of the Nematoda, it is only necessary to refer to one or two cases. Crisp estimates that *Syngamus trachealis* (the cause of gapes) is responsible for the death of half-a-million pullets in England every year. Megnin states that in a single pheasantry 1,200 victims died daily. The loss of one-third of the crop of sugar beet is by no means uncommon when it is affected by *Heterodera schachtii*; again it is no uncommon thing in certain districts of Victoria to lose the bulk of the onion crop by the ravages of *Tylenchus devastatrix*, and many bags of potatoes are condemned every year on account of their being affected by another species of these small worms. These cases show the practical importance of what, at first sight, seem quite insignificant animals and the necessity for the minutest observations; for only when we are fully acquainted with the life history of a parasite are we in a position to successfully combat it.

Since time immemorial, crops of various kinds have died suddenly; so suddenly, Dr. Cobb remarks, "as to justify the expression 'struck by lightning.' The unknown cause in some such cases has probably been the gall worm. Many an agricultural or horticultural failure attributed to the use of improper fertiliser, to poor soil, or wrong cultivation, has been due to this insidious foe attacking the very fountain head of vegetation. Were it possible in pounds, shillings, and pence, to sum up the damage done by eel-worms, the total would probably amount to a fortune for a nation. How little we know of the microscopic enemies and friends of vegetation that ply their vocation in the vicinity of those important organs, the root hairs."

Characters common to the Nematoda.

Before going further it will be well to point out a few characteristics common to the Nematoda. Von Linstow says that the only law that can be derived inductively from the study of the life history of nematodes is "that those which live in animals never pass through all their stages of development in the same organ." While this cannot be said of those parasitic on plants, still we often find something analogous; for instance, *Tylenchus tritici* migrates from the stem and leaves up the plant to its flower.

We do not find the degenerations so commonly associated with parasitism in the nematodes affecting plants, there is no degeneration of the various organs necessary for a free life, nor is there any multiplication and development of the organs of adhesion. The reproductive powers do not seem to be increased; thus we do not find the enormous numbers of eggs commonly seen in some of the classes of parasitic worms—they never reproduce, so far as is yet known, a-sexually by budding, or fission, or parthenogetically. The nematodes show less difference between the free living and parasitic members of the group than obtains in any other class. With few exceptions the parasitic forms have undergone little degeneration. It is true they have no eyes such as some of the free forms possess, but in other respects they do not show any marked retrogression; further, the mouth armature is developed in many of the free forms and is not confined to the parasites.

With one or two exceptions the nematoda are bi-sexual, and although the males are as a rule smaller than the females, they show no trace of degeneracy.

There is a certain polymorphism amongst the males, especially in size and form; smaller forms with mature reproductive organs exist. This may be due to defective nutrition. In some worms (Gordius) this polymorphism is due to the parasitic stage lasting longer in some than in others.

Effect of Changes in the Food Supply.

Like many of the lower forms of life, nematodes tend to become vegetative when the supply of food is restricted. As was pointed out in the article on the Onion Eel-worm in the March number of this *Journal*, all the group are to a certain extent restricted in their choice of food, and, when their natural nutriment is withheld and something else substituted, they become sluggish, for a time at least, reproduction may entirely cease and many of the weaker forms die. They all become more attenuated in form, the cuticle thinner and more transparent, and in many little node-like swellings composed of rounded cells arranged in clumps make their appearance here and there throughout the entire length of the worm; after the appearance of these swellings, death very soon ensues.

Many of the embryos never become fully developed sexually at all; they become quite as long, indeed longer, than the fully developed worm, but they remain much thinner. The length of the potato worm was incorrectly given in the previous article as one-fiftieth of an inch. The sentence ought to have read "the embryos are one-fiftieth of an inch in length, while the adults are one-twentieth of an inch." The length, of course, depends a good deal on the quantity and quality of the food supply. The non-sexual forms, so often seen when food is restricted, frequently reach one-fifteenth of an inch or more in length; they are always, however, more attenuated in form.

Advantages of Rotation.

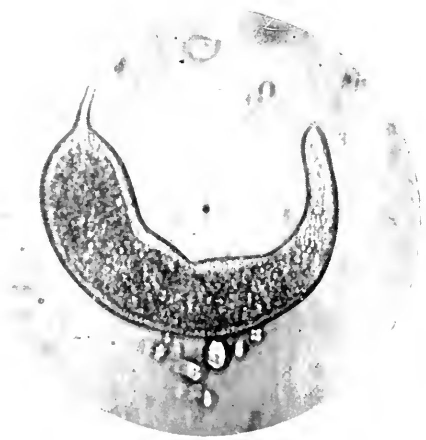
The great death rate, the sluggishness of the survivors, the cessation of reproduction, and the fact that many of the embryos never develop sexually, all point to the great advantages to be derived from changes in the food supply, such as takes place when rotation of crops is practised. I sowed onion seed in soil badly infested with potato eel-worm; it germinated freely, and the plants were not attacked at the end of two months. The clean potatoes grown in the experimental plots at Bellarine showed the same freedom from attack by the onion eel-worm, though the ground in the neighbourhood of the plots was so badly infested that all the onion plants were carried off by disease.

Life History.

The statements, that "The larvæ only live in the earth where the females shed their skin, make their way into the tubers and then become citron shaped." "The males undergo a change, and after a period of rest seek out the females," are quite erroneous, for worms of all ages are found in the soil. Copulation takes place there and then the impregnated females bore their way into the tubers where, by the maturation of the eggs, the uterus becomes greatly distended, the worm finally becoming a rounded sac, full of eggs. The accompanying micro-photograph shows a female worm taken from a recently dug potato. It is interesting, showing, as it does, the commencement of the distention of the worm by the maturing of the eggs in the uterus. I have seldom found a sexually mature male in the tissues of a potato.

The usual life cycle of the potato worm is therefore quite simple. A potato is planted with the female in the cystic or rounded form; the death of the worm occurs, the eggs and embryos becoming free in the decaying "set"; the eggs hatch out and the young worms find their way into the soil, where they live till they are sexually mature; conjunction of the sexes takes place and the females bore their way into the young potatoes of the new crop, there to encyst themselves again. It must be borne in mind, however, that this worm can pass through its whole life cycle without becoming encysted in a tuber, as it is able to live on the decaying vegetable matter in the soil. In this case, the female does not become distended with eggs, fewer being produced.

To obtain a pure culture of potato worms an affected potato was carefully washed and planted in sterilized soil. After a time, the worms were collected from the soil and the decayed "set," care having been taken during the period of growth to water with nematode free water. By feeding them on small pieces of boiled potato and onion, I was able to keep the worms alive and healthy; they went through their whole life cycle while in the free state, and slowly increased in numbers. The females did not become citron shaped and were quite as active as the males. There were never any "non-motile" larvæ seen; here again my observations are at variance with the usually accepted views.



FEMALE WORM AT THE COMMENCEMENT OF THE CYSTIC STAGE × 160.

CONCLUSIONS.

As no experiments that we have yet tried have been successful in killing the eggs and embryos, the life of the growing plant at the same time being preserved, I can only recommend rotation of crops and pure seed as a means of minimizing the ravages of this worm. No doubt, a time will come when we can successfully cope with this disease, but until that happy consummation of our labours is accomplished, and until we see the results of the experiments at present being carried out, the above advice will keep the pest in check. For not only is it good agriculture, but as the worms can only change very slowly from one variety of plant food to another, many of them dying in the process and many failing to become sexually mature, and as the females produce far fewer eggs when deprived of their natural food and habitat (this applies to many of the nematodes), it follows that by means of a suitable rotation and pure seed we will modify considerably this serious problem.

It must always be borne in mind that organic substances in the form of farmyard manure are favourable to the development and spread of eel-worms.

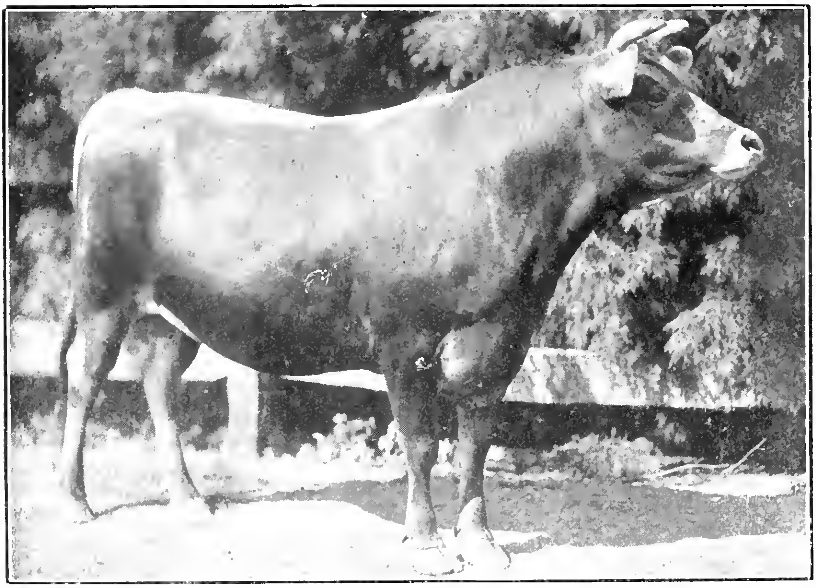
To give a detailed description of the many varieties of eel-worm (numbers of them new to science) found in the samples of soil and vegetation submitted to me from time to time would lengthen this article unduly; a full account will therefore have to be deferred to a future occasion.

A SUCCESSFUL DAIRY FARMER.

J. M. B. Connor, Agricultural Superintendent.

The improved methods of modern agriculture, marked by the economy and the production of feed materials, mean increased profits; but keenness of competition establishes the price at which the farmer must market his produce, whether farm products or milk. Milk production for consumption in the metropolitan area is an important industry, and I know of no farm where better conditions for a clean, and wholesome milk supply prevail than those existing at Mr. William Woodmason's Melrose Dairy Farm, Malvern-road, East Malvern.

One of the principal object lessons to be learnt from the successful working of Mr. Woodmason's small and intensely cultured farm and system of rotation of fodder crops, is that no great success can be attained



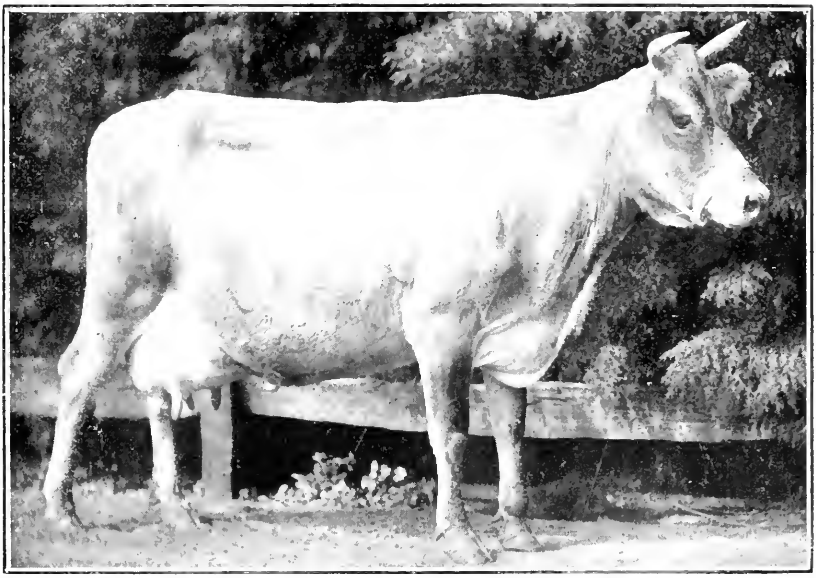
THE SIRE, "LADY SUPERIOR'S PROGRESS."

in this line of business without constant, unremitting, arduous work. To look back at the conditions prevailing on this farm some five years ago, and contrast them with those of to-day, is sufficient evidence of hard work. The modern sanitary dairy, the refrigerating chambers, milking shed, and magnificent herd of 70 Jersey cows, all testify to the close and incessant personal attention to detail which has been shown. This attention is absolutely necessary in the important industry of retailing milk.

Mr. Woodmason's life-long connexion with the Jersey breed, and his practical knowledge of cattle breeds generally, have justly won for him the honour of frequently adjudicating in the show ring of the Agricultural Societies throughout the States.

THE HERD.

The Jersey herd is a striking illustration of what one man can accomplish in the way of developing cows possessing the characteristics of the show-yard animal, combined with the necessary rich and deep-milking qualifications of the profitable dairy cow. The Melrose herd was founded by the purchase of a choice collection of pure bred animals, procured at the sale of the present owner's late father's herd in 1892. The first sire introduced was the celebrated Jersey bull, "Progress 3rd." (imp., 1575, H.B.), and the cows "Graceful Duchess," "Wilful Beauty," "Neat Lass," "Neat Girl," and "Queen of the Jerseys," all afterwards notable prize takers at the Royal, and principal shows throughout the State, for their general symmetry, and pure Jersey characteristics, combined with their milking qualifications. "Lady Superior's Progress," a son of "Progress 3rd," has proved himself to have been one of the most satisfactory introductions into this herd, as his stock have all turned out to be true to type and acquisitions to this beautiful herd of cows.

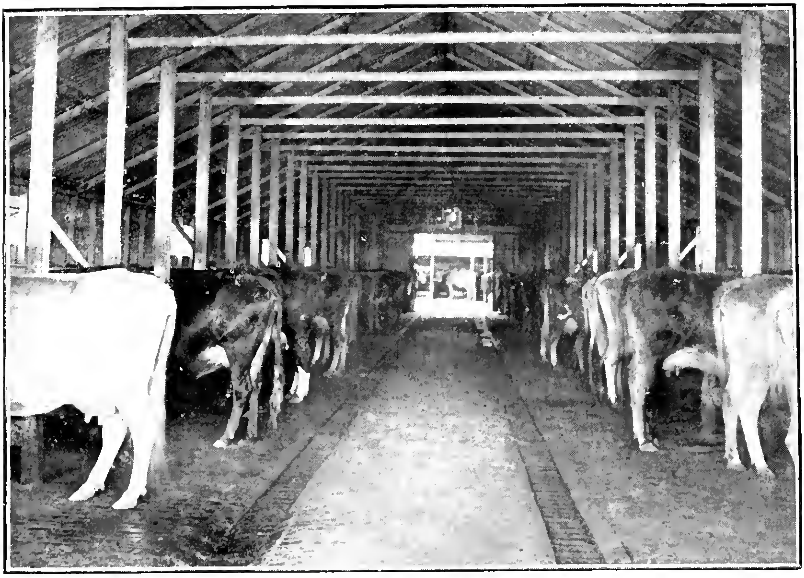


"WILFUL BEAUTY," A NOTED PRIZE WINNER.

In building up his present herd, Mr. Woodmason has adopted the sound principle of only saving for future use, the heifer calves from cows that have proved their sterling worth at the pail.

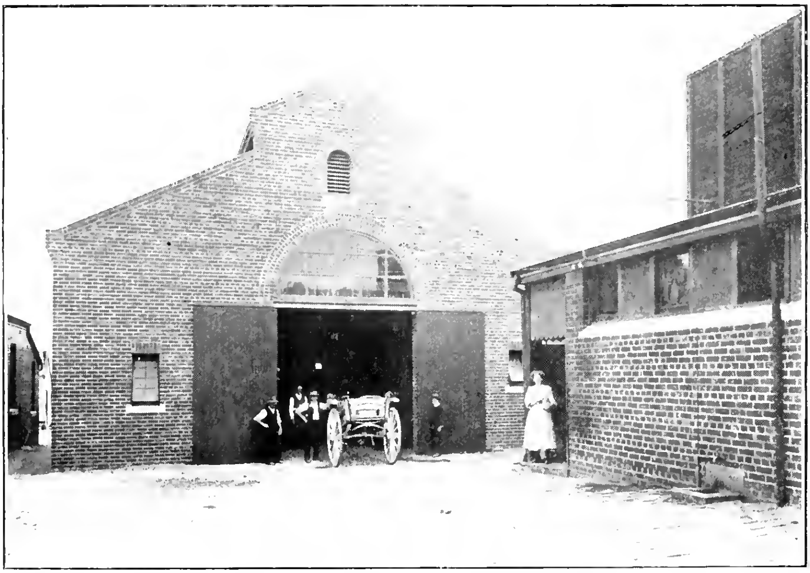
MILKING AND SHELTER SHED.

The cow byre is arranged with a view to cleanliness, perfect drainage, abundance of light and air, and comfort of the cows. It is of the utmost importance that proper shelter should be provided for the dairy herd whilst being fed and milked. Warmth economises food, a matter of great importance at all times, but especially when food stuffs are dear. Experience has incontestably proved that animals exposed to the cold without a



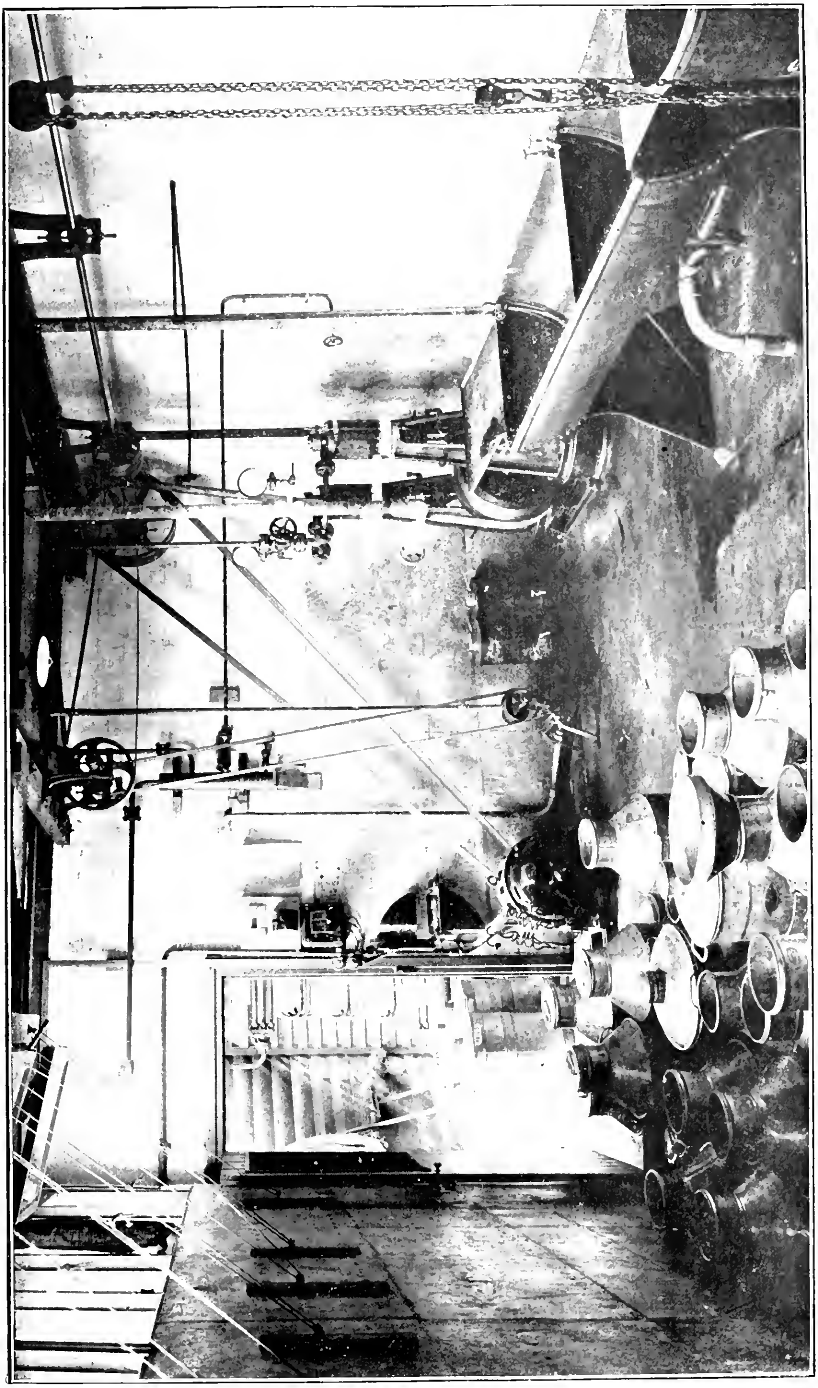
A SANITARY MILKING AND SHELTER SHED.

proper warm shelter shed, require much more feed to maintain them in a thriving condition than others provided with shelter and warmth. The



PORTION OF THE DAIRY AND STABLING.

milk-producing capacity may be reduced quite 50 per cent. during the milking season owing to neglect to provide suitable shelter for the cows during the winter months.



WASHING-UP AND EMPTY CAN STORAGE ROOM.

The Dairy.

The new brick dairy is modelled on the most modern lines, every possible provision being made for cleanliness and economical working, and the admission of sunlight and fresh air. The refrigerating plant and cool storage rooms have proved their value during the summer months. Incidentally, it may be stated that it is not possible to successfully carry on such a big business as is done by this dairy, without adequate provision for cool storage of the milk.

Milking operations are carried out under the owner's personal supervision. The udders and teats of the cows are washed and dried before milking, the milker's hands are washed at regular intervals and the milk is taken away in protected vessels to the refrigerating chamber until ready for delivery to customers.

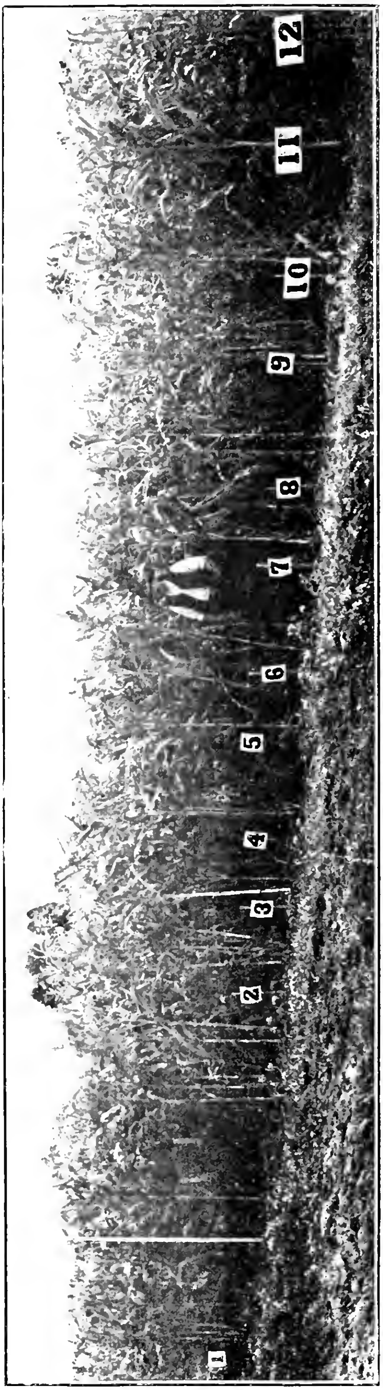
Fodder for the Herd.

The 70 Jersey cows are practically hand fed all the year round, the area of their exercise paddock being only 10 acres, situated about half-a-

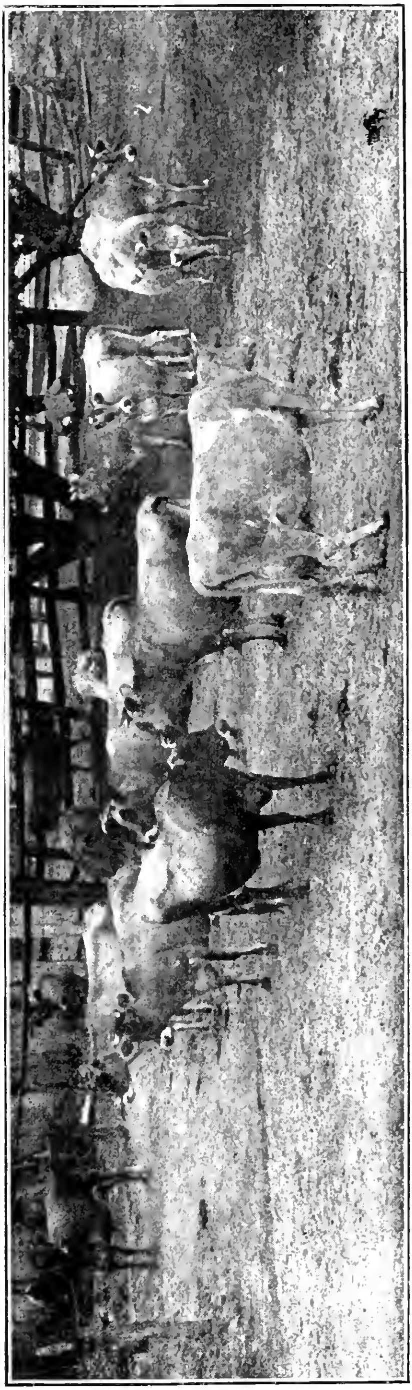
PUMPKINS, 24 TONS TO THE ACRE.

mile from the homestead, where they are fed daily with green fodders, in season. Mr. Woodmason grows the bulk of his crops on a 15-acre paddock known as "Coolgardie," situated about 1 mile further out on the Malvern-road. There is no small area of land around Melbourne that is worked to better advantage than this paddock. Mr. Woodmason secures from each acre, 5 crops of green fodders every two years, by judicious manuring, cultivation and irrigation.

On 5th January of this year there was a splended 5-acre crop of Stout White oats being fed as green fodder, 5 acres of maize which would yield over 30 tons to the acre, 3 acres of pumpkins which would average 20 tons per acre, and 2 acres of mangolds which should average over 20 tons per acre. Maize is usually sown during October, and fed to the dairy herd in January; the same land is manured with 32 loads of stable manure to the



EXPERIMENTAL MAIZE PLOT.



A GROUP OF STUD COWS.

acre and resown with maize, which is fed to the cows in April; then it is again manured with 8 cwt. of bonedust to the acre and sown with Stout White oats for early spring feeding. The owner states that the first cutting of maize usually goes over 30 tons to the acre of green fodder, the second cutting 15 tons, and the third cutting of oats over 15 tons of green stuff. By this system of intense culture, over 60 tons of green succulent fodders are taken off each acre of land. Pumpkins and mangolds, which both yield at the rate of over 20 tons to the acre, are grown yearly in the rotation of crops and are found to give excellent results in the production of milk.

Dairy farming is becoming intensive rather than extensive in our metropolitan areas. It is not uncommon now to hear of persons raising profitable crops from apparently poor land, while other people receive no return at all from land of a similar texture. The value of the manure made from good feeding is more and more appreciated by the farmer who uses it to renovate his depleted soil, robbed of both its humus and its nitrogen by continued cropping. This loss can be avoided by raising more fodder crops as Mr. Woodmason is doing, by keeping more cows, thereby making and conserving more manure. Care must, however, be taken to provide a sufficiently rapid rotation of crops to insure good soil texture. It is also advisable to follow Mr. Woodmason's example and select or build up a pure bred herd of dairy cows, either of the Jersey, Ayrshire, Guernsey, or Holstein strains of proved milking qualities, and not be led astray by the dual purpose cow craze.

Returns.

The returns from the cows in milk during my inspection (January, 1910) were:—

	£	s.	d.	
70 Jersey cows producing a daily return of 500 quarts, retailed at 4d. per quart, giving a return of £8 6s. 8d. per day, or ...	£58	6	8	weekly
40 pure-bred Jersey heifers averaging £7 7s. per head, giving a return for the year of £294, or an average of	5	13	0	"
Total weekly returns	£63	19	8	

Expenses.

The cost of concentrated foods and chaff, purchased outside of what is grown on the farm, fed to the herd at the time of inspection, was:—

	£	s.	d.	
12 cwt. chaff per day at 2s. 6d. per cwt.	£10	10	0	weekly
20 bushels of bran per day at 1s. per bushel	7	0	0	"
Salt, 3d. per day...	0	1	9	"
Cost of purchased feed	£17	11	9	"
Wages, &c.				
3 milkers and 1 feeder	£5	0	0	weekly
1 farm hand	2	0	0	"
2 drivers for delivery carts	3	10	0	"
Horse feed	2	10	0	"
Manure	0	15	0	"
Sundries	0	5	0	"
Water	1	3	0	"
Total expenses	£32	14	9	"

It will be seen from the above return that a weekly profit of over £30 is being secured.

Artificial Manures Acts.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACTS.

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Phosphoric Acid.								Estimated Value of the Manure per Ton.
				Water Soluble.		Citrate Soluble.		Insoluble.		Total.		
			Found.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
			%	%	%	%	%	%	%	%	%	£ s. d.
701	Superphosphate, Federal ..	Aust. Chemical and Explosives Co., Melbourne	8·42	17·67	17·00	1·07	1·00	1·59	2·00	20·33	20·00	4 8 2
722	,, ,, ..	,, ,, ,,	9·51	17·88	17·00	1·05	1·00	1·41	2·00	20·34	20·00	4 8 5
726	,, ,, ..	,, ,, ,,	6·24	17·67	17·00	0·71	1·00	1·97	2·00	20·35	20·00	4 7 9
706	Superphosphate, Florida ..	Cuming, Smith, and Co., Melbourne	8·19	17·87	17·00	0·73	1·00	4·36	2·00	22·96	20·00	4 15 4
720	,, ,, ..	,, ,, ,,	9·28	16·95	17·00	1·24	1·00	3·23	2·00	21·42	20·00	4 10 1
734	,, ,, ..	,, ,, ,,	10·70	17·33	17·00	0·96	1·00	2·68	2·00	20·97	20·00	4 9 2
743	,, ,, ..	,, ,, ,,	9·54	16·92	17·00	0·51	1·00	4·81	2·00	22·24	20·00	4 11 5
705	Superphosphate, Hasell's ..	A. H. Hasell, Melbourne	13·07	17·78	18·00	0·77	1·00	0·15	1·00	18·70	20·00	4 3 6
708	,, ,, ..	,, ,, ...	13·79	17·55	18·00	0·50	1·00	0·07	1·00	18·12	20·00	4 1 2
700	,, ,, ..	,, ,, ...	13·72	17·41	18·00	0·93	1·00	..	1·00	18·34	20·00	4 2 0
732	,, ,, ..	,, ,, ...	11·67	17·15	18·00	1·57	1·00	0·07	1·00	18·79	20·00	4 3 7
731	Superphosphate, No. 1 ..	Mt. Lyell M. and R. Co., Melbourne	8·87	18·20	17·00	0·88	1·00	2·89	2·00	21·97	20·00	4 13 4
740	,, ,, ..	,, ,, ,,	9·76	15·68	17·00	1·81	1·00	2·72	2·00	20·21	20·00	4 5 3
710	Superphosphate	P. Rohs, Bendigo	13·11	15·70	16·50	1·31	1·60	0·39	..	17·40	18·10	3 16 11
749	,, ...	,, ,, ...	13·34	15·00	16·50	1·91	1·60	0·44	..	17·35	18·10	3 16 4
713	Superphosphate, No. 1 ..	Wischer and Co., Melbourne ..	4·81	17·25	17·00	1·27	1·00	2·58	2·00	21·10	20·00	4 9 9
715	,, ,, ..	,, ,, ..	5·57	16·25	17·00	1·05	1·00	3·20	2·00	20·50	20·00	4 6 0
745	,, ,, ..	,, ,, ..	8·85	17·35	17·00	0·53	1·00	2·60	2·00	20·48	20·00	4 7 5

Government Laboratory,
Melbourne, 22nd July, 1910.

P. RANKIN SCOTT,
Chemist for Agriculture.

THE FRUIT EXPORT TRADE TO THE UNITED KINGDOM AND EUROPE.

Review of Season 1910.

Ernest Meeking, Inspector under the Commerce Act, and R. T. Booth.

The season under notice has been, from many points of view, the most satisfactory since the inception of the trade. The quantity exported was, with the exception of 1909, the heaviest on record. The average prices have been the highest yet realized, and the fruit arrived, generally, in better condition than ever before.

These results are particularly gratifying, coming as they do after the rather unsatisfactory returns of the past two seasons and especially so to those who have been wise enough to stick to the business in spite of discouragement. These have realized that in this, as in most other lines of business, the bad must be taken with the good and that the man who perseveres is the one who usually comes out on top. It behoves all who are interested in the fruit export trade to discover, if possible, the reason or reasons why the returns this season should have been so much better than those of preceding years, in order to maintain a continuance of this desirable state of affairs throughout future seasons.

It would appear that the success attained has been chiefly brought about by more careful attention to the following:—

Harvesting and packing.
The elimination of undesirable varieties.
Handling and transportation.

In addition, there has been a marked diminution of "Bitter Pit," the quantities shipped have been more judiciously distributed throughout the season than has been the case formerly, and the fruit has appeared to be of unusually good keeping quality.

Harvesting, Packing and Grading.—Evidence of improvement in these respects has been afforded the Departmental Inspectors, during their examination at Port Melbourne and Williamstown, by the absence of "slack" cases; the uniform grade of the fruit in the various packages; and by the small percentage of over-ripe, under-ripe, bruised or otherwise damaged fruit which has come under notice. Even in the selection of wrapping paper and the manner in which the fruit has been wrapped, evidence of the display of greater care has been abundant. The paper has generally been of better quality and the wrapping has been more neatly executed. These show that the importance of attention to matters of detail is becoming more widely appreciated among the exporters.

The Elimination of Undesirable Varieties.—This is shown by a glance at the varieties set out in the list below. It is well that the exporters are realizing the necessity of shipping only the more profitable and proved varieties, as sending varieties unknown to the consumer at the other end is, at best, only an experiment and one which, moreover, is often not worth the labour and expense involved. The profitable varieties do not number more than half-a-dozen at most.

The manner in which the Jonathan variety has more than upheld its high reputation is a noticeable feature of the season. This old favourite so far surpasses all others in its consistent profitableness that it stands in a class by itself. It brings equally good prices both in the British and Continental markets and is, moreover, one of the best cold storage apples. As an apple for local sale and Inter-State trade, also, it stands without a rival and may, therefore, be considered the best apple yet grown, both from a grower's, exporter's and local salesman's point of view. Though not generally known, it is also not only one of the best dessert, but one of the best culinary apples. In localities suitable for its culture, no intending grower who planted all his orchard with Jonathans, and grew a few other varieties merely for the purpose of cross-fertilization, could go far wrong. Cleopatra, Prince Bismarck and Munroe's Favourite are varieties which stand out prominently on account of the high prices which they have realized. Cleopatra and Munroe's Favourite should only be grown north of the Dividing Range.

The trade badly needs a good early export variety which would be available for first shipment about the middle of January. We cannot extend our seasons any further towards their close, as our fruits would then come into competition with the soft fruit crops of the Northern Hemisphere. We could, however, with decided advantage, commence our shipments some three or four weeks *earlier* than we do, as the American apples and European oranges have usually been disposed of some weeks before our first shipments arrive. The chief drawback to this is the want of a good variety which would be available at the required time. Several varieties have been mentioned in this connexion, but their claims remain to be proved.

The export of pears has not been quite so profitable as during former years, but the prices obtained quite justify a continuance of the export of this fruit.

Handling and Transportation.—These are now receiving more careful attention on the part of the Railway Commissioners and the Shipping Companies. The old time-honoured practice of dispatching fruit from country stations in tarpaulin-covered "I" trucks, was happily less in evidence this year; the fruit as a consequence arrived at the inspection sheds in better condition. There still remains much room for improvement; as the rail transportation can never be considered perfect until the present style of truck is replaced by refrigeration cars. In fact, if the present movement towards the provision of cool storage accommodation in the various fruit-growing centres rapidly spreads (and there is every prospect that it will), the refrigeration car transport of fruit will become pressingly urgent, as one is the corollary of the other. The ocean transport, too, judging by the results, has received more careful attention than formerly. The average temperature at which the fruit is carried is, however, still higher than those which experiment has proved most suitable. It is pleasing to note that the question of installing "telltale" thermometers on the fruit-carrying steamers, which has been advocated in this *Journal* for the past three seasons, is now being taken up by the leading Fruit Growers' Associations.

Bitter Pit.—The absence of this enemy of the exporter is difficult to account for; but it is maintained in many quarters that altered methods of pruning, whereby lateral growth is not unduly interfered with and a more even distribution of the sap is obtained throughout the tree, is largely responsible. Whether this is so or not is an open question, but it is certain that many growers, who during recent years have pruned their trees in such a manner as to induce the growth of long straight spurs, have now altered their methods.

Cases.—The quantity of hardwood cases used for the export of fruit is still on the increase and bids fair to supersede the softwood case entirely in the near future. This is a matter for congratulation, as the hardwood case, being a local production, provides more employment for our own people than does the softwood case.

An indication of the rapid increase in the use of the hardwood case is shown by a comparison of the figures for the two seasons 1909 and 1910 as follows:—

1909	Hardwood cases	... ...	71,550
	Softwood ,,	...	115,020
1910	Hardwood ,,	... ...	101,750
	Softwood ,,	... ...	41,140

Grapes.—As far back as 1902, 801 cases of grapes were exported from this State and averaged varying prices throughout. Some few lines were sold at 27s. 6d. per case (between 25 lbs. and 30 lbs. of grapes); but the others were in such poor condition that the results did not justify a continuance of the experiment through lack of suitable varieties for export. As the outcome of his recent mission to Spain, the Government Viticulturist (Mr. F. de Castella) strongly advocates the planting of the Ohanez variety, and, as his advice is being largely acted upon by growers, Victoria should soon be in a position to export grapes to the London market.

Citrus Fruits.—The raising of citrus fruits for export is a matter to which fruit-growers and intending fruit-growers could profitably turn their attention. These remarks apply particularly to citrus growing in the Northern portions of the State, especially in the irrigable areas bordering the River Murray and its tributaries. Here citrus fruit rivalling those raised in any part of the world may be grown in profusion, and the earlier varieties of orange (Early Valencia, St. Michael, etc.) could easily be grown in time to catch the British and European markets at a period when they are practically depleted of stocks. A commencement has been made in this direction in the Cohuna district, where some thousands of citrus trees have recently been planted.

With careful handling and packing, and the maintenance of uniform temperature during transit, the risks attendant on the shipment of citrus fruits are very small. California is a striking example of what can be done. Starting with 300 boxes some 30 years ago, the State mentioned now annually exports citrus fruits valued at about £6,250,000.

The following returns are representative of the shipments made at different periods of the season:—

Variety of Fruit.	No. of Cases.	Prices Realized. Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
Per *Osterley* (London), sailed 23rd February, 1910. (Arrived in excellent condition, only 3 cases affected with Bitter Pit. Temperature, 37 to 40 degrees.)							
Apples.							
Adam's Pearmain ..	19	10	6	10	0	10	3
Alfriston ..	8	6	0	6	0	6	0
Cleopatra ..	492	12	0	8	0	10	5
Cock Pit	3	6	6	6	6	6	6
Cox's Orange Pippin	128	20	0	8	0	11	5
Dumelow's Seedling	193	14	6	7	0	9	8
Green Up Pippin ..	9	8	0	8	0	8	0
Harcourt Pippin ..	3	8	9	8	9	8	9
Hoover	18	8	0	8	0	8	0
Jonathan ..	261	15	0	7	6	10	0
Apples—*con*							
Lady Daly ..	75	9	3	8	9	9	2
Lord Wolseley ..	7	8	6	8	6	8	6
Luscombe's Seedling	25	6	6	6	6	6	6
Munroe's Favourite	818	15	6	7	6	9	8
Prince of Pippins ..	52	7	6	6	6	7	1
Purity	19	9	6	9	0	9	3
Reinette de Canada	204	8	9	6	0	8	0
Ribston	33	7	6	6	0	6	6
Rome Beauty ..	200	8	0	7	3	7	6
Various	56	10	6	4	9	8	9
Pears (Trays).							
Napoleon ..	27	5	6	4	0	5	0
Beurré d' Anjou ..	2	5	9	5	9	5	9
Various	2	6	0	6	0	6	0

Per *Bremen* (Hamburg), sailed 9th March, 1910.
(Delivered in good condition. No record of temperature.)

Variety of Fruit.	No. of Cases.	Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
Cleopatra	69	12	9	10	0	11	8
Five Crown	122	10	6	8	6	9	9
Jonathan	392	18	3	8	6	13	9
McLean's Favourite	10	9	6	9	6	9	6
Munroe's Favourite	111	18	3	11	0	14	9
Reinette de Canada	177	9	6	6	0	8	3
Rome Beauty	47	8	0	7	6	7	9
Wellington Pippin	2	11	0	11	0	11	0
Prince Bismarck	10	12	3	12	3	12	3
Various	22	8	6	7	6	7	10

Per *Orontes* (London), sailed 9th March, 1910.
(Fruit arrived in good condition. No record of temperature.)

Variety of Fruit.	No. of Cases.	Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Adam's Pearmain	32	8	3	7	6	8	0
Cleopatra	190	11	6	8	3	10	2
Cox's Orange Pippin	8	15	6	15	6	15	6
Dunne's Seedling	5	9	3	9	3	9	3
Dumelow's Seedling	56	13	6	9	0	9	10
Esopus Spitzenberg	105	9	6	6	6	8	1
Five Crown	40	8	0	7	9	7	11
Jonathan	505	11	6	9	0	10	8
Munroe's Favourite	25	9	3	8	9	8	11
Reinette de Canada	30	7	6	6	3	6	11
Rome Beauty	239	8	9	8	3	8	5
Rymer	20	8	6	8	6	8	6
Statesman	10	7	0	7	0	7	0
Sturmer Pippin	30	8	9	8	9	8	9
Various	39	9	9	6	6	7	8
PEARS (TRAYS).							
Beurré Capiaumont	26	7	3	6	3	6	4
Eyewood	2	5	6	5	6	5	6
Madam Cole	2	7	3	7	3	7	3
Vicar of Winkfield	221	8	3	6	0	7	6
Winter Nelis	2	8	6	8	6	8	6

Per *Schwaben* (Hamburg), sailed 12th March, 1910.
(Condition and quality were satisfactory; best fruit, however, was rather scarce. No record of temperature.)

Variety of Fruit.	No. of Cases.	Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Alfriston	3	9	0	9	0	9	0
Cleopatra	37	12	9	10	6	11	10
Esopus Spitzenberg	11	12	0	9	6	9	11
Jonathan	671	15	0	9	5	12	3
London Pippin	42	12	6	10	9	11	5
McLean's Favourite	10	7	6	7	6	7	6
Munroe's Favourite	102	15	0	9	6	12	11
Reinette de Canada	297	11	6	8	6	10	2
Rymer	5	9	6	9	6	9	6
Shepherd's Perfection	37	12	0	8	3	9	10
Sturmer Pippin	14	9	6	9	0	9	3
Prince Bismarck	9	11	9	11	9	11	9
PEARS (TRAYS).							
Vicar of Winkfield	42	7	3	6	9	7	0

Per *Moldavia* (London), sailed 15th March, 1910.
(Fruit was delivered in hard, dry, and clean condition, and was generally satisfactory. Temperature, 36 to 38 degrees.)

Variety of Fruit.	No. of Cases.	Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Adam's Pearmain	1	8	0	8	0	8	0
Cleopatra	264	10	6	8	0	9	5
Dumelow's Seedling	71	11	6	10	6	11	2
Esopus Spitzenberg	43	10	6	7	0	8	3
Five Crown	224	9	0	7	0	7	9
Jonathan	800	12	6	8	0	10	0
Kentish Codlin	23	7	0	6	6	6	9
Munroe's Favourite	141	11	0	8	0	9	3
Newtown Pippin	31	10	0	8	3	9	3
Prince Bismarck	3	8	0	8	0	8	0
Reinette de Canada	158	7	9	6	3	7	0
Rome Beauty	37	8	3	7	9	8	2
Sturmer Pippin	76	8	6	7	3	7	7
Various	205	8	6	6	6	7	3

Per *Koenigin Luise* (Hamburg), sailed 29th March, 1910.
(The condition left much to be desired; many lots showed signs of decay.)

Variety of Fruit.	No. of Cases.	Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Adam's Pearmain	10	12	3	12	3	12	3
Cleopatra	23	12	0	11	0	11	7
Dunne's Seedling	6	11	3	11	3	11	3
Jonathan	243	13	9	5	6	9	11
London Pippin	174	10	9	8	9	9	10
Munroe's Favourite	123	10	0	6	3	9	9
Newtown Pippin	8	10	3	10	3	10	3
Reinette de Canada	9	10	0	10	0	10	0
Stone Pippin	110	14	0	7	0	9	11
Sturmer	54	11	0	7	9	9	11
Stewart's Seedling	17	10	0	10	0	10	0

Per *Marmora* (London), sailed 12th April, 1910.
(With the exception of a few boxes, fruit was delivered in a dry, clean, hard condition.)

Variety of Fruit.	No. of Cases.	Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Baldwin	32	8	3	8	3	8	3
Ben Davis	33	7	0	7	0	7	0
Bismarck	7	8	3	8	3	8	3
Buncombe	7	8	3	8	3	8	3
Cleopatra	58	9	6	8	9	8	11
Chandler	15	9	9	9	0	9	6
Dunne's Seedling	37	8	9	8	6	8	8
Esopus Spitzenberg	22	10	0	8	6	9	10
Five Crown	181	9	0	7	6	8	5
Hoover	25	8	0	7	6	7	9
King of Pippins	5	8	9	8	9	8	9
Jonathan	163	10	0	8	0	9	9
Munroe's Favourite	35	9	3	8	6	9	0
Nickajack	93	8	0	7	9	8	10
Northern Spy	11	9	3	9	3	9	3
Rome Beauty	806	9	9	7	9	8	10
Reinette de Canada	14	8	3	8	3	8	3
Rushock Pearmain	3	8	3	8	3	8	3
Rymer	31	8	3	8	3	8	3
Stone Pippin	99	8	9	8	3	8	6
Various	37	8	9	8	6	8	8
PEARS (TRAYS).							
Winter Nelis	66	9	0	3	0	4	10

On the whole, the season may be considered the most satisfactory to date, and engenders the hope that in the near future the export of fruit may take its place as one of the leading industries of our State.

The prospects for a good market next season are very bright, as reports just received show that the blossoms of the incoming American crop have been, to a large extent, destroyed by some late frosts. Therefore, should the local crop be prolific, the next season should prove even better than the one just ended.

THE WOOL INDUSTRY.

The flocks in Australia and New Zealand have increased during the year by 6,179,614 head, the total being now 115,525,581 head, a higher number than at any period during the past 16 years, and approaching the record of the year 1891, when the figures reached 124,991,920.

Not only have numbers increased, but the sheep continue to improve, as is shown by the fact that though there were more sheep to shear 16 to 20 years ago, the past clip has easily exceeded all previous records. The actual oversea shipments of wool during the twelve months have amounted to 1,921,705 bales from Australia, and 512,938 bales from New Zealand, a total of no less than 2,434,643 bales, or 816,861,665 lbs., valued at £33,128,496, an increase of 146,539 bales, or 60,271,502 lbs., and in money value of £7,177,584, as compared with the record clip of the previous, 1908-9, season. This result is all the more striking when it is realized that the 2,000,000 bales limit was reached for the first time in the year 1906-7, and that the past year's figures are nearly double those of the year 1903-4. There could be no better proof of the marvellous recuperative powers of this country, from which the exports of other products have increased in almost like manner. Buyers should be in good heart to lift the coming clip, and Australasia will put a good one before them.

The outstanding features of the buying for 1909-10 were undoubtedly—

1. Support accorded to crossbreds.
2. Scope of the American demand.
3. Concentration of the world's buying power in these markets.

It is believed that every manufacturer of wool throughout the world now realizes that—

1. Australasia has attained the position of the principal wool producing country of the world.
2. The selection of wool submitted to public auction at the colonial centres is greater and better than in any other market, no less than 77 per cent. of the total production having been sold locally during the past season; and that
3. To secure a satisfactory share of the Australasian clip he must be represented by some buyer on this side.

He is also aware of the Australasian facilities for inspecting, purchasing and shipping wool, which it is claimed are more up-to-date than at any other centre.

While it is advisable to warn our flockmasters that they must go on improving their flocks, because to stand still is to go back, woolgrowers can still congratulate themselves upon Australasia producing a greater quantity of wool than any other country, and, further, that for all round excellence and value per lb. the production of Australia and New Zealand is as yet not approached by any other country.

It is also flattering to know that other countries are endeavouring to emulate Australian and New Zealand methods. Argentine breeders are now good buyers of stud sheep, mostly British breeds, from New Zealand, while Uruguay and South Africa have come to Australia for merinos. Wool warehouses on the colonial plan are being built in America, and an attempt is being made there to sell wool on Australian methods, instead of on "sheep's back" or country railway platforms. Wool manufacturers are continually advising growers in other countries to class their clips as is done in Australasia, not to tie the fleece with string, &c.

Considering how far Australasia is ahead of all other countries in the preparation of wool for market, the flood of literature from Great Britain which has been poured in here in reference to jute fibre in wool, tar brands, &c., is surprising, for it is doubtful whether wool is shorn, classed, baled and sold in a less primitive manner in Great Britain to-day as compared with a hundred years ago. The handling of Australasian wool at the London docks leaves much to be desired, for it is there that most of the jute fibre trouble is caused, owing to the manner in which the packs are torn by hooks and then ruthlessly hacked about when being opened for inspection on the show-floors.

A great many growers with comparatively small clips do their own classing, and in a highly satisfactory manner, as is proved, year after year, by the high prices obtained for their clips.

As we have previously pointed out, when it comes to returns per head the flockmaster who dips and feeds his sheep and skirts his fleeces carefully, not necessarily heavily, invariably outdistances his neighbour who does not do these things. Overclassing of wool is almost as bad as not classing at all; nor is heavy skirting of the majority of fleeces necessary. It is advisable when the wool permits to make the lots as large as possible, while woolrollers should be made to use some judgment as to the skirting of fleeces, and not be allowed, as is too often the case, to tear the wool off whenever it happens to be hanging over the table. The rolling of the fleece is also most important, and it is desirable not to tie same even by twisting up the neck wool, while tying the fleece with any kind of twine is of course unpardonable, and, we are glad to say, now practically unheard of in Australasia.

It is frequently argued by growers that their neighbours who do not skirt their wool at all get equally high prices per lb. This may, and does occasionally, occur, but it must be remembered that the man who does not class his wool as a rule does not attend to his flocks. They are frequently underfed, and consequently produce hunger-fine, light-conditioned wool, which may bring an even higher price per lb. than that from well-attended sheep; but the price per lb. is not the test of merit. It is the average return per sheep.

Taken collectively, the Victorian clip was a splendid one, the outstanding features being good length and body, with softness of handle. As compared with the previous season's wool, it was not so fine in quality.

The Western District, which produces year after year wool which is incomparably superior to any grown elsewhere, on this occasion supplied rather a patchy clip; while some wools were faultless, those from the wetter areas were not so well grown as usual, on account of excessive winter rains.

Western Wimmera wools are second only to those grown in the Western District proper, whilst the Eastern Wimmera clip was well grown, sound and cleaner than usual; in fact, this great cereal and fat lamb district produced a much better clip than usual.

The North-East is now so closely settled that most of the clips from that district are small, but with care really good wool is produced.

Wools from the Central District were quite up to the average, whilst the Gippsland clips have not been so good for years, those from the north and east of this district having been particularly dry in condition. It is a great pity that so many of the Gippsland wools are ticky, but now that dipping is compulsory in Victoria, there should be a marked improvement in this respect in future.—*Dalgety's Annual Wool Review for Australasia*, 1909-10.

BUILDING HINTS FOR SETTLERS.

The series of articles under the heading of "Building Hints for Settlers" has proved, by the numerous letters received, of considerable interest. There are, however, many farmers and intending farmers who are not quite up to all the details of the work necessary for building, generally. A series of articles dealing with tools and their uses in the various branches of construction has been arranged, and the first of these, on Plumbing, appears below.—EDITOR.

IX.—FARM PLUMBING—SELECTION OF TOOLS.

C. H. Wright, Instructor in Plumbing, Eastern Suburbs Technical College.

On a modern farm, improvements and breakdowns in connexion with water supply and general plumbing work are of such frequent occurrence that the farmer has often to fall back on his own resources and effect the necessary repairs himself. It is surprising how the call for this work increases, and such being the case he must realize the fact that certain tools are necessary, and a little trouble taken in the selection and care of these will amply repay him.

Good tools not only do better work than inferior ones, but reduce the time taken on it. Remember, that just as a farmer must attend to his stock so should he give at least a little attention to his plant and tools; for even good ones, if neglected, have a habit of falling into a state of rust and decay. It is also most important that he should be able to place his hand directly on the tool he requires, and not interrupt his job to look for it. That being so, have a place for tools and try to keep them in their places. To this we will refer later.

Water pipes and fittings play such an important part in modern farming that we will give the selection of water tools first consideration.

Vices.—A pipe vice that is strong, light and reliable, will be wanted. To select a heavy cast metal article is to go back thirty years, for there are several modern vices that fill these requirements.

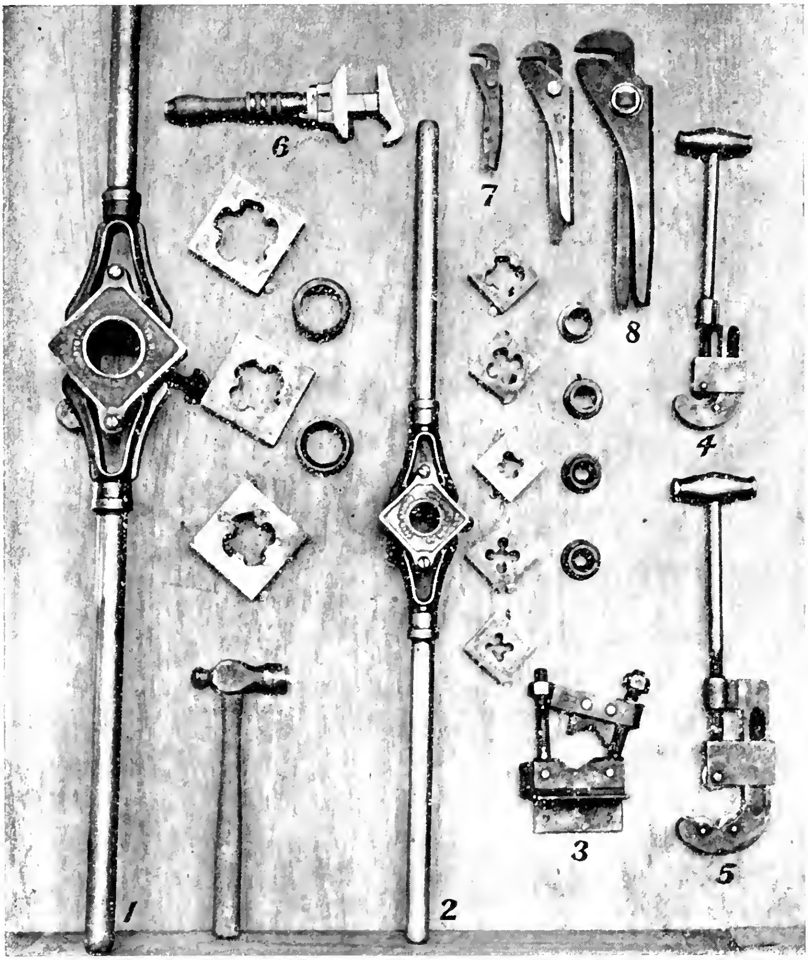
The Chain Pipe Vice, costing 15s., is the latest idea, and is very quick in action. The Footprint vice made by the same firm as the well-known Footprint pipe wrench, made entirely of wrought iron and steel, takes up to 3-inch pipe and costs 17s. 6d. A popular vice is the Sectional Jaw pipe vice. It is made in three sizes, quick in action, and the teeth have four cutting edges. When these are worn they can easily be removed from the body and ground straight again. These vices are all light and reliable and can readily be carried along with other tools.

Stocks and Dies.—There is a fairly large variety of stocks and dies, both solid and adjustable, on the market. The latter are very useful tools in the hands of experts, but for several reasons the solid die is the type that the farmer should select.

The Walworth stocks and dies are light and strong, have a good cutting edge and are capable of doing a large amount of work. The handles can be unscrewed, and most important, the price is low, 27s. 6d. for the largest make, which screws from $1\frac{1}{4}$-in. to 2-in. pipe. The Chatwin solid die, for smaller work, screwing up to 1 inch, costs 47s. 6d.

The Oster adjustable stocks and dies are useful tools in the hands of an expert, and are in fact the best threading tools obtainable, but might only add to a farmer's worries; for parts easily get lost, and rough handling may put it out of order. However, to any one who cares to give it fair play, it reduces the labour in threading pipes, especially in 2-inch and upwards. Different sizes screw from $\frac{1}{4}$-in. to 4-in. pipe, and the prices range from 50s. to £8 5s.

Cutters.—Pipe cutters are necessary and may consist of either one wheel or three wheels. The advantage of three wheels over a single wheel is that one can cut a fixed pipe in an awkward corner, which is impossible with the single wheel. The Barnes cutters, in three sizes, cutting from $\frac{1}{8}$ in. to 3 in. cost from 14s. to 27s. 6d. each.

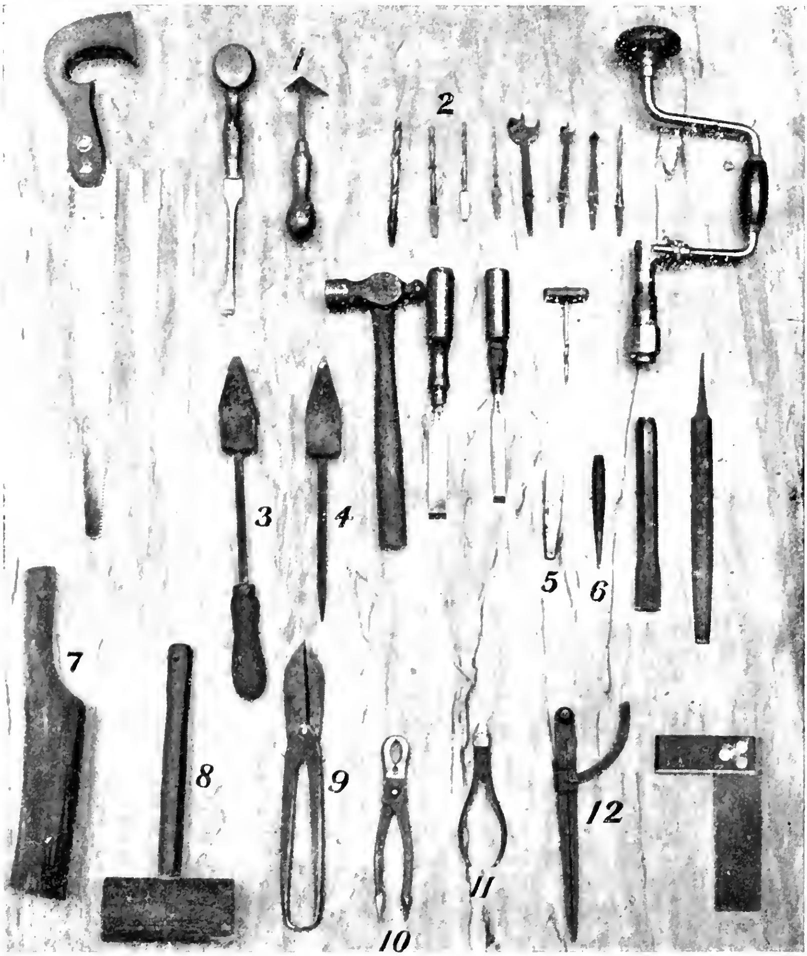


1. SET OF TOOLS FOR PIPE WORK UP TO 2 INCHES.

1. Walworth stocks and dies $1\frac{1}{2}$-in. to 2-in. 2. Walworth stocks and dies, $\frac{1}{4}$-in. to 1 in. 3. Footprint pipe vice. 4, 5. Barnes pipe cutters. 6. Combination wrench. 7. Footprint pipe wrench. 8. Governor pipe wrench.

Wrenches.—The Footprint is the universal wrench of to-day, but it has one disadvantage—the screw easily gets lost. An improved style is the Governor pipe wrench, which has an adjustable nut to take the place of the easily lost screw. Footprints are made in six sizes taking from 1/16-in. to 4-in. pipe. Prices run from 1s. 3d. to 9s. 6d. The Governor, 9 inches long, grips up to $2\frac{1}{2}$ inches, and costs 3s. 6d.

The combination wrench is a strong serviceable wrench, combining all the qualities of a pipe wrench with the requisite combinations of a regular nut wrench, and a most useful tool for farm work. It grips up to $2\frac{1}{4}$-in. pipe, and costs 11s.

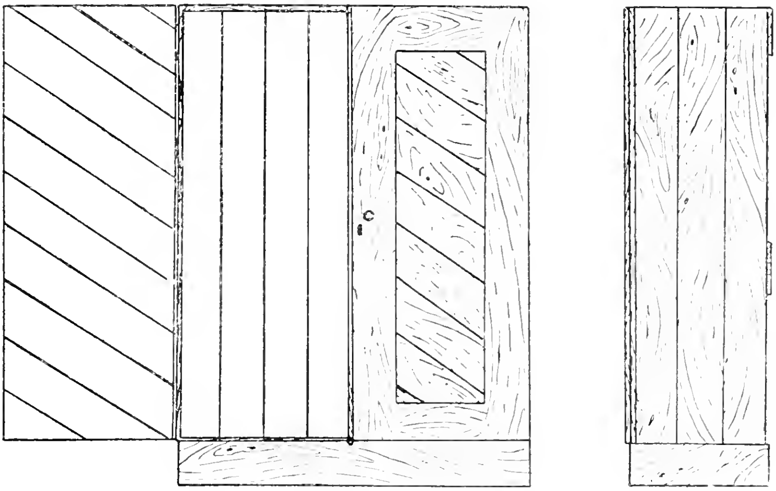


2. GENERAL PLUMBING TOOLS.

1. Shavehook, used for cleaning old work, scraping solder, &c. 2. Twist drills, $\frac{1}{4}$-in., 3/16-in., and $\frac{1}{8}$-in. 3, 4. Soldering irons. 5. Rivet set. 6. Prick punch for piercing sheet iron. 7. Dresser, for turning sheet iron. 8. Mallet. 9. Snips. 10. Gas pliers, 8 inches long. 11. Bell pliers for wire work. 12. Compass.

There is a host of other pipe tongs, wrenches, &c., but a description of more of them is liable to confuse a beginner. It, however, must be understood that for pipe work it is necessary to have, at least, two pipe wrenches—one pair to hold the fitting and another to screw up the pipe. When screwing up large pipe, say from 3 to 4 inches, a pair of chain tongs gives the best grip and purchase; or a short piece of $1\frac{1}{4}$-in. to $1\frac{1}{2}$-in. pipe may be slipped over the handle of the ordinary pipe grips. The latter will give a good leverage and make the work much easier. The accompanying illustration shows a set of tools capable of doing pipe work up to 2 inches.

General Plumbing Tools.—Next come the tools required for general plumbing and odd job work. It is surprising what a large amount of work can be done with a few plumber's tools. It will be noticed that several of those illustrated (p. 528) are required for carpentering as well. The actual number of special plumber's tools is about a dozen. Those that are not generally known are numbered and brief mention made of their use.



3. TOOL CUPBOARD.

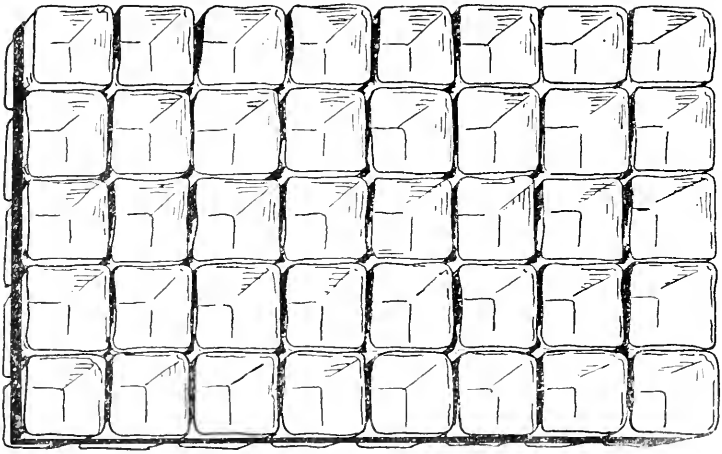
Care of Tools.—Now we come to an important item, the care of tools. To save time and annoyance each must have a place. A good method is to have representations of them painted on the wall where they hang, and have them arranged as shown in the illustrations on pages 527 and 528. A glance now and again will enable a constant check on them to be kept. We all know how easy it is to leave a tool behind after doing a job; how a tool may be lent to a neighbour and forgotten until wanted in a hurry, and then when sent for, the neighbour has likewise forgotten it. He cannot find it, in fact he says he does not remember borrowing it; and so you manage with the next best thing you have, to the detriment of your work. Do not wait until this takes place. Keep your eye occasionally on the tool board and directly one is missed trace when and where it was last used.

A still better plan is to make a cupboard out of $\frac{7}{8}$-in. T. & G. flooring, as shown in Fig. 3. Here, the water pipe tools can be arranged inside similarly to method illustrated on page 527, whilst the tools for general work can be hung on the doors. A cupboard of this description will keep the tools clean and under better control, as you can see the tool you require at a glance and obtain it quickly without turning over a host of others to get at it.

If it is not convenient to have a cupboard, fix a board of some sort, as large as possible, on the wall; and any little time or trouble taken in arranging the tools will be amply repaid.

A word about the care of tools. The best plan is to oil them, not over the dirt—wipe that off first, and don't "spare the oil and spoil the tool," especially if they are rusty.

All sorts of small material accumulate on a farm or in any workshop; and a few hints on storing it may be useful. A good and cheap plan is to obtain some kerosene cases, place a partition in each and arrange them



4. BINS, MADE OF KEROSENE TINS, FOR SMALLER ARTICLES.

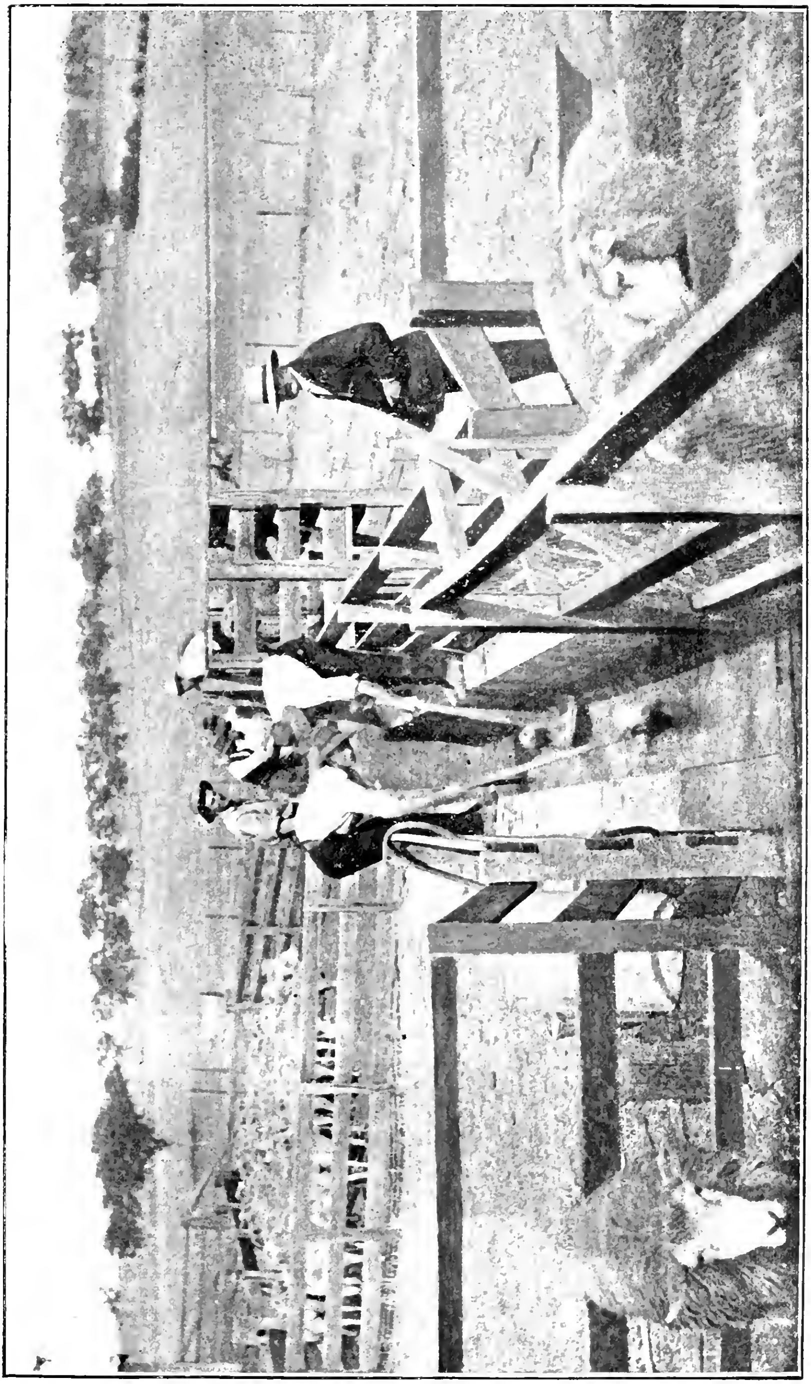
like a cluster of pigeon holes. Cheaper still are kerosene tins; cut one end out, turn cut edges inside and dress them down. Then arrange as in Fig. 4, and bind them together with 6-in. x 1-in. flooring.

X.—SHEEP DIPS.

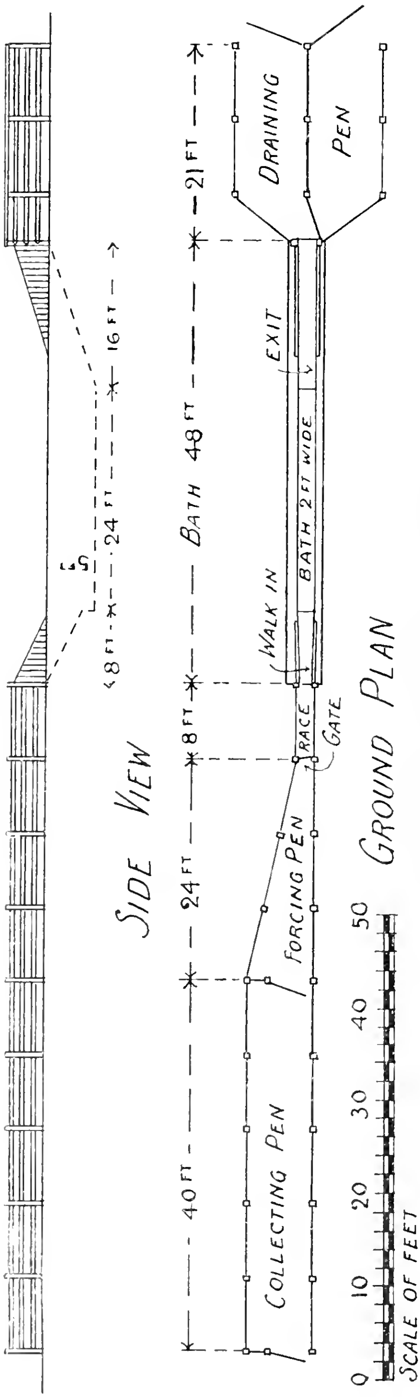
A. S. Kenyon, C.E., Engineer for Agriculture.

The coming into force of the *Sheep Dipping Act* will render advisable, in many cases, the construction of dips. The accompanying illustrations show a variety of baths and yard arrangements, each of which has its good points and may prove suitable to the special requirements of the case. Few detail drawings are given, as the arrangements shown may be varied to suit individuals. Many useful pamphlets on the subject are issued by the proprietors of the various dips on the market and some details have been borrowed from them.

Except when it is desired to have a portable dip, it is advisable in practically all cases to make the swim or bath of concrete, and better still, of reinforced concrete. Concrete, although simply made and very effective, is only so when careful attention is paid to the details. The proportions of the various materials (metal or gravel, sand and Portland cement, depend upon the air voids or spaces in the metal or gravel, and upon the strength of concrete required. The mortar or "compo" of sand and cement should be sufficient in bulk to fill all the voids in the metal, preferably somewhat in excess. The voids can be found by filling a kerosene tin with the metal or gravel, which makes a bulk of four gallons; the whole is then weighed. Water is poured in until flush with the surface and the whole is again weighed. The difference in the two weights will give the void spaces in



DIPPING SHEEP AT DOOKIE AGRICULTURAL COLLEGE.



1. LONG SWIM DIP WITH WALK-IN ENTRANCE.

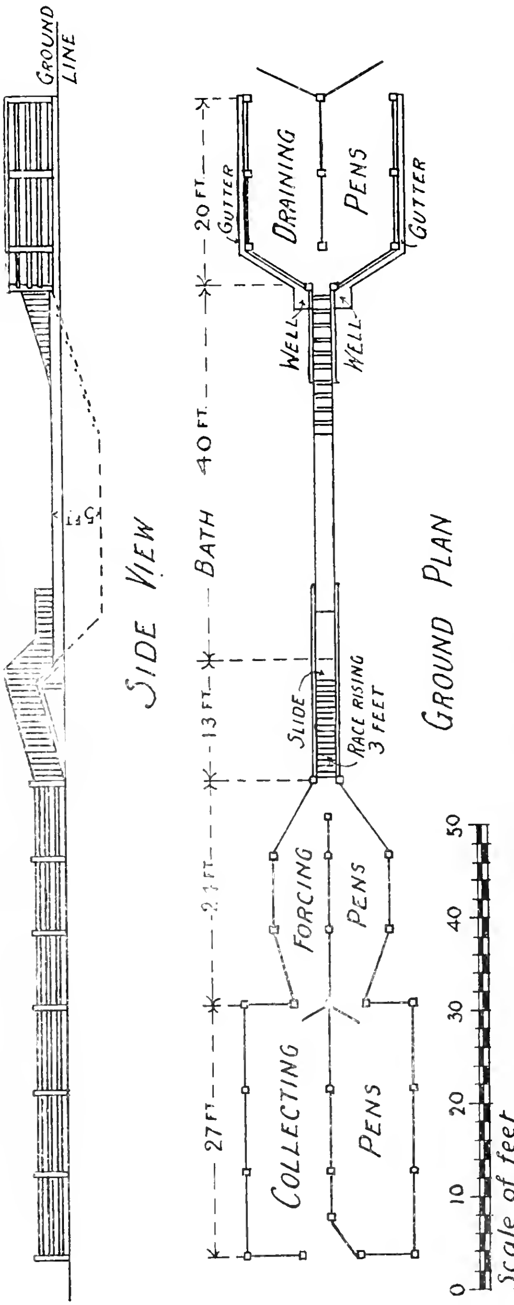
lbs.; as a gallon of water weighs 10 lbs., the proportionate bulk of void spaces is thus arrived at.

Great care should be taken in the selection of materials. The metal or gravel should be fairly strong, soft sandstones and limestones being avoided. The sand should be clean, sharp and coarse. Clay and loam intermixed are serious drawbacks. Most brands of locally-made cement are reliable. A cask of cement contains slightly more than four cubic feet. As a rough and ready rule, one barrel of cement goes to the cubic yard of concrete. It must be borne in mind that practically one cubic yard of gravel or metal is required for one cubic yard of concrete, the cement and sand serving only to fill up the voids. For mixing, a platform or smooth space is required. The sand, which should be dry, is first put on the mixing board and then the cement is added. The two are thoroughly mixed by being turned over with shovels. The metal is then added. Mixing by shovelling is thoroughly done, after which water is added; a watering can with a rose is best for the latter purpose. Shovelling is continued until the whole mass is sufficiently wetted, that is, when it is in a pasty condition, but not enough so as to run or be sloppy.

Concrete must be used immediately it is mixed. Care should be taken in ramming not to keep it up longer than the commencement of setting, a matter of a few minutes only. Any old work, including that finished the previous day, should be well wetted before adding fresh concrete. Except in very moist weather, the concrete should be kept damp by wetted bags or other means for a few days to allow the setting action to proceed properly. With the exception of the floor of exit slope, the concrete should have a smooth surface. To obtain this it may be necessary to use a mixture composed of two parts of sand to one of cement, filling in any voids and spreading the plaster evenly over the surface. This should be done as soon as possible after the concrete is laid, first wetting the surface.

Concrete may be greatly strengthened, and consequently thinner walls may be used, if it be reinforced with iron or steel. One row of No. 8-gauge black fencing wire placed every 6 inches in height, and vertical wires about one foot apart, are all that is necessary. Walls thus strengthened need not be thicker than 3 inches. Double this thickness would be necessary without the wire reinforcement. Boards must be used for forming the walls. Where boards are plentiful, a wall should be built in one day, adding board after board as the concrete is filled in to the top of each. The boards can be removed the following day and used for wall on opposite side. The top 6 inches of wall should be made about 9 inches wide to form a kerbing round bath, and the top of this should be at least 3 inches above the surrounding ground level.

Of course, when circumstances preclude, or sand and gravel are unobtainable except at prohibitive cost, timber framing and lining of good



2. LONG SWIM DIP WITH SLIDE ENTRANCE.

thickness may be used, but it is perishable and may give trouble. A better plan is to use iron of 16-gauge or thereabouts on a timber or iron frame with tarred felt joints. As to the form of bath the general opinion seems to favour a narrow swim, forcing the sheep to move in single file. For small flocks, however, there is much in favour of the circular bath; anyhow, whatever shape the bath there should be no corners. The circular bath is difficult to build and the one with curved sides is particularly so. The short iron bath of riveted iron, which is portable, is very simple, but requires care in its use to insure complete dipping of the sheep. Too much stress cannot be laid upon the importance of the sheep being an adequate length of time in the dip. It is also well to bear in mind when constructing that most dips require stirring up at intervals; whatever design of bath is adopted should permit of this being done easily.

No. 1 drawing is the plan of a long swim bath with "walk in" entrance. This bath is suitable for a large flock. The race, which is level with the ground and connected with the "walk in," is 8 feet long by 16 inches wide. The "walk in" has a fall of one in two, ending in a drop 12 inches above bottom of bath. Its width, where connected with race, is same as race, 16 inches, and this gradually widens to 24 inches.

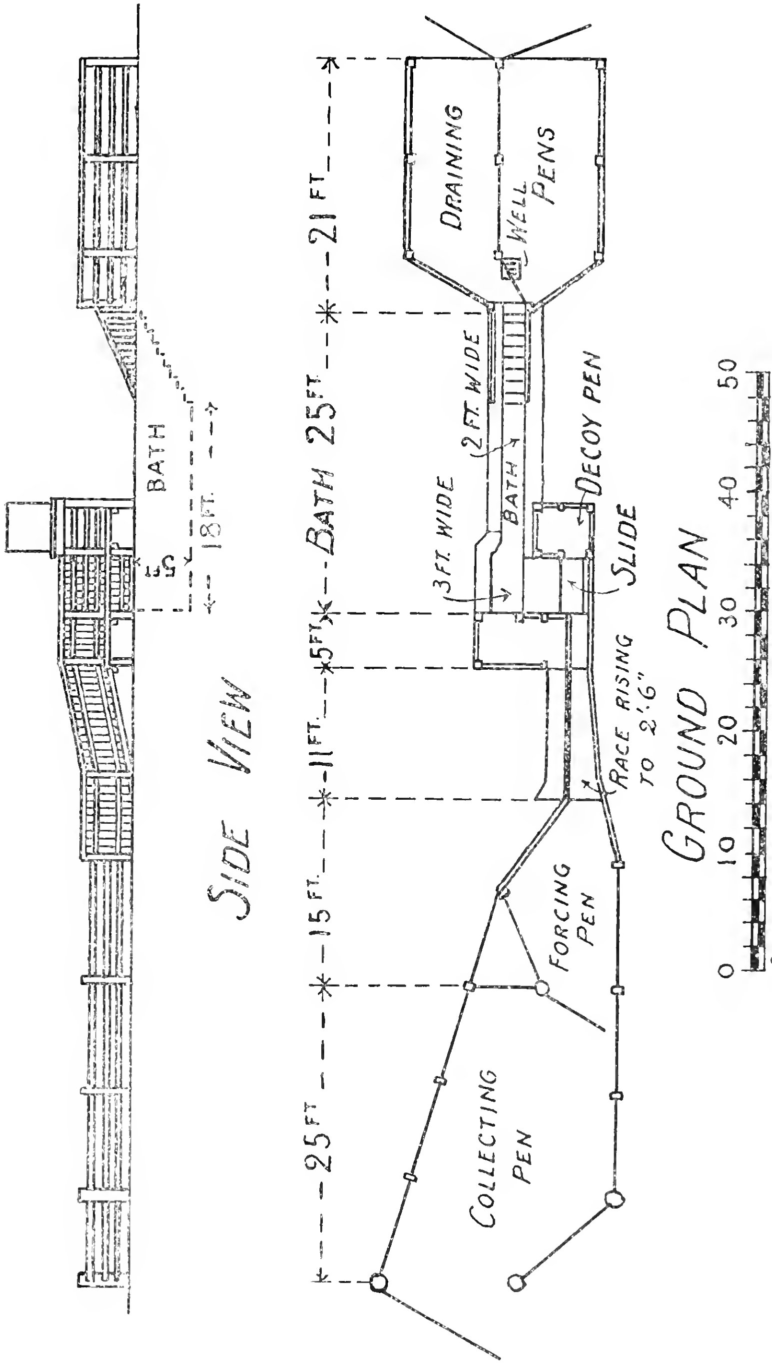
No. 2 is a "long swim" bath with a slide entrance; the race, starting from ground level and rising to a height of 3 feet, is 10 feet long. This ends in a slope having a fall of one in one, down which the sheep, being unable to obtain a foothold, slide gently into the bath. The end of bath being a continuation of this slope enables the sheep to slide down to the water-level without undue shock, whatever quantity of liquid may be in the bath. A curtain should be hung across the entrance to the bath, so as to prevent the sheep from seeing the liquid.

No. 3 is a long swim bath with slide entrance and decoy pen. The race rises in a similar manner to No. 2, but is continued for a few feet on the level and leads to a slide at right angles to race with a decoy pen on the opposite side. The decoy pen, being filled with sheep, induces the other sheep to come forward, and in trying to pass to the decoy pen they slide backward into the bath. The bath in this case is not in the same line as the race, and the width at the entrance is made somewhat larger to give more room for the entrance of the sheep.

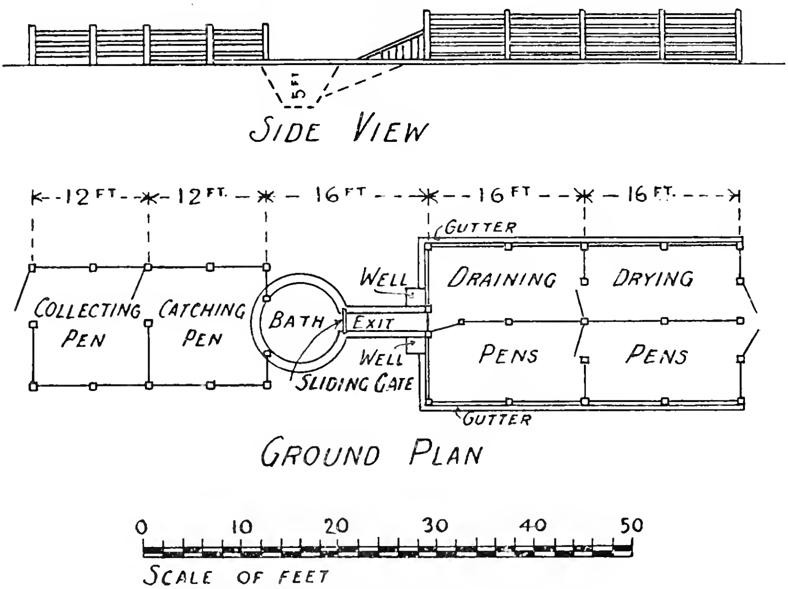
No. 4 is a circular bath. This is very suitable for small flocks and can be worked by one man. The floor of catching pen should be laid with battens having a slight slope to bath; this will assist the operator in gently pulling the sheep into the bath. The sheep are kept in bath until thoroughly dipped, when a sliding gate at exit is pulled up and the sheep escape into the draining pens.

No. 5 is a circular bath with a centre pillar. This is suitable for a large flock. The approaches to it are similar in all respects to those described in No. 3. The advantages claimed for this type of bath are that the sheep, not being able to see the exit, do not make a wild rush to get out. Also, if the sheep has not been sufficiently dipped by the time it reaches the exit, the gate can be kept closed and the sheep sent round again.

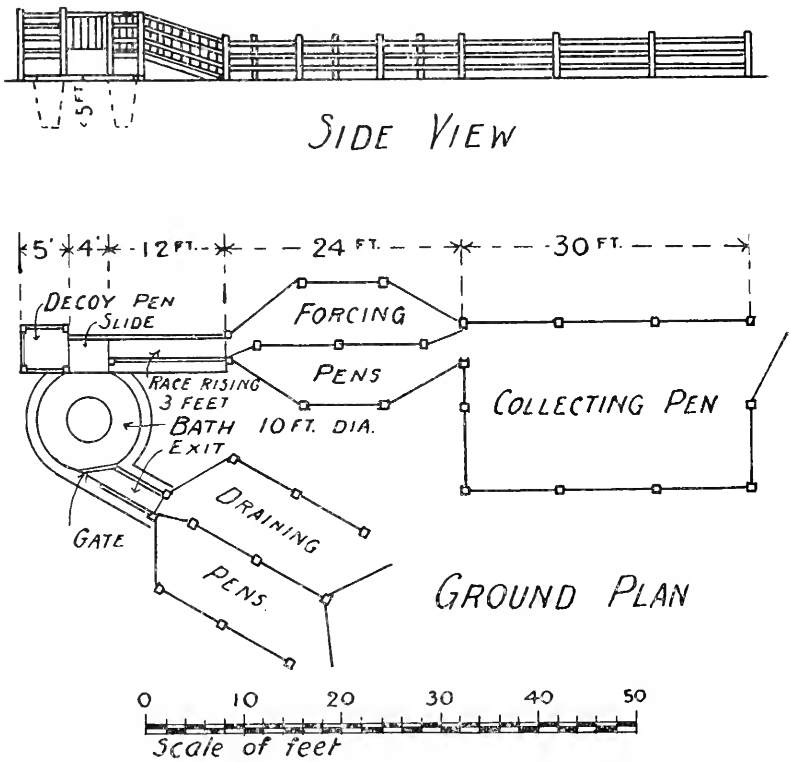
No. 6 is a portable bath, suitable for the smallest flock, but capable of dipping a large number of sheep with a small amount of labour. It is constructed of 14-gauge galvanized iron; the joints are double soldered and riveted, $1\frac{1}{2}$-in. angle iron is riveted around the top to stiffen it, and 3-in. x 1-in. battens are bolted to the exit slope to give a foothold to the sheep.



3. LONG SWIM DIP WITH SLIDE ENTRANCE AND DECOY PEN.



4. CIRCULAR BATH FOR SMALL FLOCK.



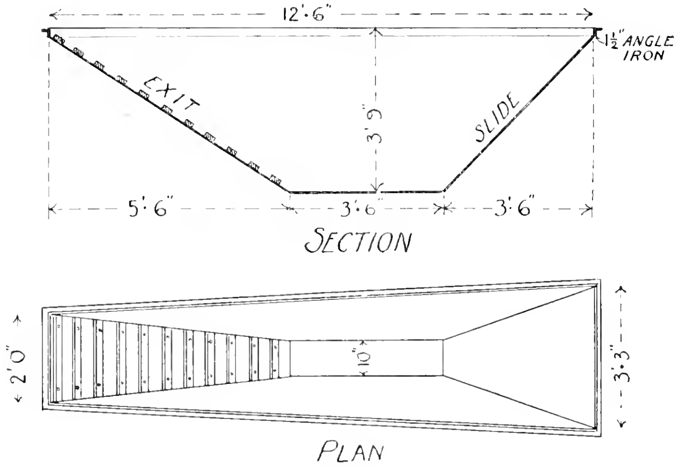
5. CIRCULAR BATH WITH CENTRE PILLAR.

This bath should be tarred inside and out to preserve the iron. The entrance end is steep enough to prevent the sheep from getting a foothold, yet allows them to slide in gently when pushed backwards and is wide enough for the sheep to turn round and swim out after ineffectually trying to get out at that end. When dipping only a small number of sheep the draining wells may be dispensed with, and the floor of draining pen made of solid board laid with a slope towards bath.

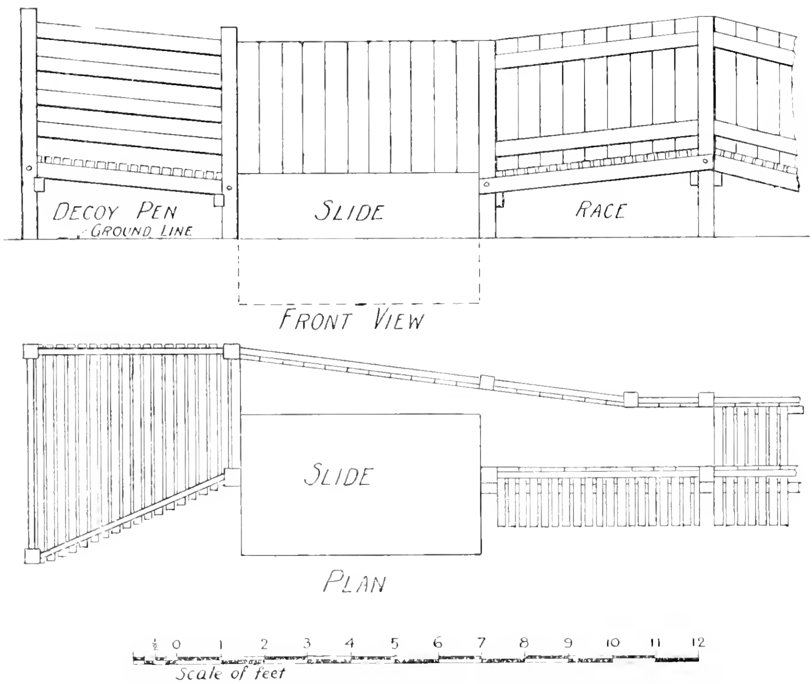
No. 7 is a detail drawing of a slide and decoy pen. This is said to have worked very satisfactorily with the minimum amount of handling. The race, 16 inches wide with battened floor, rises to a height of 2 feet; it then has a slight downward tendency for about 5 feet, and the floor is covered with galvanized iron. About 2 feet before it reaches the slide, the race gradually becomes wider till it reaches the slide, which is at right angles to the race. The race is continued by a narrow footway at top of slide, starting with a width of 6 inches and widening to 15 inches as it reaches the decoy pen, which is on the opposite side of slide; this footway and the slide are covered with galvanized iron. The sheep are prevented from seeing the liquid by a curtain hanging across the slide. It is not advisable to make the curtain out of material that will flap about in the wind, as this is often the cause of the sheep becoming frightened. The best way is to make a door of ½-in. lining boards and hang it from a horizontal beam fixed at one end to race wall and continued in same line to decoy pen. This door can be easily pushed aside, as the sheep slides into the bath, and immediately comes back into position when the sheep has passed by. It is claimed for this slide that the sheep will move forward in the race without trouble and in attempting to get with the sheep already in the decoy pen will slide back into the bath. The narrow footway at top of slide seems to give confidence to the sheep and to work more satisfactorily than when the slide is continued right up to the back wall. The slide should be carried down as close to the lowest dipping level as possible.

Draining pens are absolutely essential to every dipping bath. There should be two so that when one is full it can be closed and the other one worked. If it is intended to make a permanent floor, it should be of concrete raised about 3 inches above surrounding ground level, its surface sloping from the centre line to the gutters formed on the outside of the pens. It is not advisable to have the floors very smooth, as the rough surface will prevent much of the droppings from being carried into the gutters and choking them. The gutters discharge into a well about 2 feet square, having a strong perforated zinc strainer fixed diagonally across it to intercept any droppings which may be carried into the well. The bottom of well should have a fall of 2 feet from entrance gutter to exit pipe. This pipe should run from bottom of well into the dipping bath below lowest dipping level. If a permanent floor is not required, a floor may be formed of battens, constructed in sections and raised about 1 foot above the ground. The battens should be laid across the direction of the swimming bath. Under the battens, corrugated iron is fixed sloping from the centre line to the outsides and draining into galvanized iron gutters fixed on the outside of pens. These gutters discharge into wells as above described for concrete floors. If the draining pens are not in a sheltered position, the posts should be sufficiently high to carry a temporary covering to protect the sheep, when standing in the draining pens, from the sun in hot seasons.

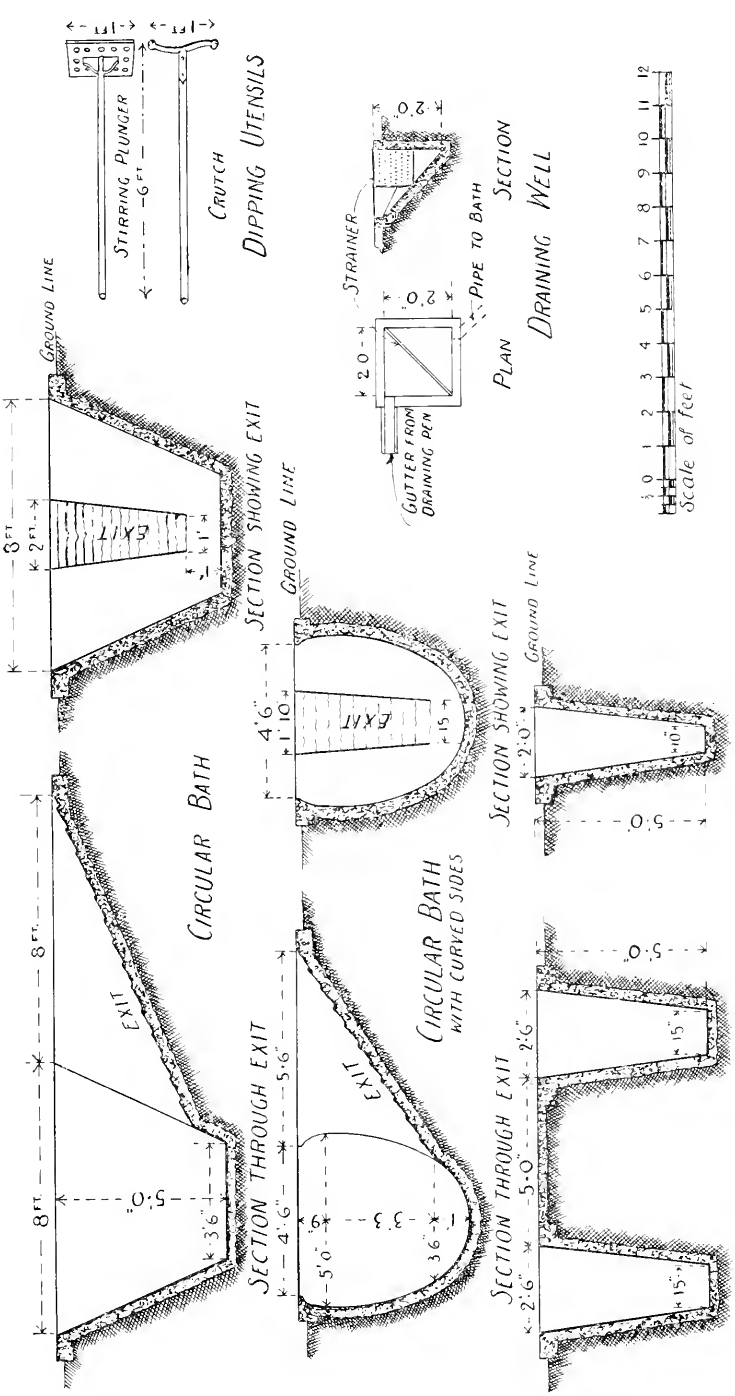
No. 8 drawing shows sections of the various baths, detail of draining well, and dipping utensils.



6. PORTABLE GALVANIZED IRON BATH.



7. DETAIL OF SLIDE AND DECOY PEN.



8 DETAIL SECTIONS, DRAINING WELL, AND DIPPING UTENSILS.

The simplest way to ascertain the capacity of any dipping bath is to measure water into it through a tank of known capacity. First run into the bath sufficient water to float a sheep (30 inches) and keep a record of the number of gallons required to do this by marking same permanently on the side of the bath. Add water in 100-gallon quantities and mark each 100-gallon level on the side of bath up to about 6 inches from top. It is also advisable to keep a rod similarly marked in case the marks on the side of bath become obliterated.

SHEEP DIPPING.

(*Continued from page 52.*)

H. W. Ham, Sheep Expert.

As the construction of sheep dips is dealt with in the current issue, the time is opportune for further reference to sheep dipping, particularly as, up to the present, half the flocks of the State have not been dipped. Moreover, with the coming into force of the *Sheep Dipping Act*, additional information is necessary.

Large dips, such as are used on station properties, are not suitable for dipping farmers' flocks. Smaller dips that can be filled quickly and emptied often and easily of foul wash, are preferable, for the reasons stated later in this article.

There are many excellent dipping preparations on the market. Every man has his own particular fancy, and each will prefer to use his own choice of sheep dip. Further, he will want to leave as little as possible of the wash in the dip when finishing. In large dips too much is needed in the bath before any sheep can be put through, and the same amount must be left behind when the last sheep has been dipped.

The clubbing together of farmers when using large dips will very rarely work satisfactorily. The flock that goes first has the advantage of a clean and full bath. Again, Merino sheep with more wool on them than recently shorn crossbreds will carry out the most wash. Some farmers bring sheep right off the pasture and foul the drainer and subsequently the bath. Some one must come last when the wash is foulest, and at its lowest level. This latter disadvantage means much bruising and often broken legs. It is also, as a rule, then late in the day and the sheep have no chance of drying before nightfall—a very important point in successful dipping. With properly constructed small dips each owner can choose suitable weather and time, and leave very little wash for the next man to throw out, which is necessary, especially if another preparation is used.

There are several designs of sheep dips in use, and all have their advocates, but the straight ahead form of swim bath about 3 ft. wide at the "slide in" end and 20 ins. wide at the "out slope" end, with sloping sides to 10 ins. wide in the bottom, is found cheapest and easiest in construction, whether of wood, stone or concrete. It is just as effective and the sheep suffer the least hardship.

For small holders portable iron dips are very suitable. They can be moved at any time, if found necessary. This is an advantage when farms are leased or in the case of a dispersion sale. Of course, large flocks are better served by larger dips. More sheep can be put through per day, but extremely large dips, 7 ft. in depth and in some cases with 60 ft. of a swim, will never be built again.

The small sized dip similar to plan No. 6 on page 538 suits farmers with 200 to 1,500 sheep, when close to a supply of water. Flocks of 1,500 to 5,000 can be served better by one a foot or 18 ins. deeper and 4 to 6 ft. longer. One stoutly constructed and useful dip made to the order of Mr. McCulloch, of Tooradin, works well. It is of stouter iron than shown in plan, but it is without the "slide in" end. No. 1 (page 532) suits flocks from 5,000 to 15,000 and upwards.

Any dip built without a slide board and having a perpendicular end over which the sheep are put in, causing them to fall suddenly, is very bad, especially for rams.

What is known as the "walk in" principle has been much advocated of late. It really means that the slide forms one end or side of the dip. This plan is being followed in the latest stone or concrete dips. The slide is built in, forming one end or part of the side and the sheep come in from the ground level, not from 4 or 5 ft. above it. In the latter the sheep have a fall of 4 to 5 ft., even when the bath is full, and 6 to 7 ft. when the water is low, often falling one on the other. Some of these dips are in use to-day, and when the last sheep are being put through there is a fall of even 8 to 10 ft. Besides this, there is always a waste of at least 1,500 gallons of wash.

What concerns a sheep owner next to the size and shape of the bath itself, is how to minimize the ill treatment necessary to get the sheep up to the slide. In the latest method of constructing the slide board, as shown in plan No. 7, this trouble is to a great extent done away with. This style of approach slide and decoy pen is recommended, and can be seen at the Inebriate Institution at Lara.

In plan No. 6 the slide will be seen to be part of the dip itself and is what is termed the "walk in" principle. The term sounds well, but sheep never will be persuaded to walk in. Lambs go in readily in any kind of approach and slide, so much so that there is danger of crowding in the bath and drowning, and as a rule they have to be steadied—after they have been in any kind of dip once they never forget it, and old ewes, especially crossbreds, will not leave the furthest corner of the most distant yard. The hardest work connected with sheep dipping is in getting the aged sheep up to the slide board. The "slide in" end or side is necessary to save injury and bruising and is in every way preferable to a perpendicular end.

Small sized dips are less severe on sheep, and are easily cleaned out. They should be built close to a good supply of water, not necessarily fresh, for one of our prominent wool-growers near the coast uses sea water successfully.

Large wool-growers also now favour smaller dips for the same reasons. Small dips allow of emptying out foul wash more often, for no matter how carefully a dip may be constructed, with manure traps and cesspools, the wash gets very foul. No filter has yet been a complete success; the greenish coating on the sheep droppings is washed off and only the larger portions are collected in the cesspools. A filter to overcome this would of necessity be far too slow. The sheep while draining on the battens trample a good deal of manure into liquid. Even when yarded overnight, which all sheep should be, manure is left on the drainer, but nothing like the quantity if they are brought directly in from the pasture and dipped. Whether the exertion in swimming, or the swallowing of the wash is the cause, sheep men will have noticed an increased tendency to leave droppings while draining. Another source of fouling the bath is with the dirt taken in on the feet of the sheep, especially in yards without paving or grating, and particularly after a shower.

Sheep off shears, especially open woolled sheep, can be put through a more filthy bath than those carrying a half-inch or more of wool, for the latter, especially if dense Merinoes, will carry the stain mark of foul dip right on to shearing. It is only in very wet winters that this stain is washed out.

The extra cost of long swims and of cesspools, for it is not really necessary to have the latter on small dips, is better spent in providing a good supply of water close by, and a pump for filling quickly. The mixing of the dipping preparations now on the market takes little time and gives no trouble for each filling.

Manufacturers of dipping preparations usually state in their printed directions that a certain quantity of wash will dip a given number of sheep, calculating that each sheep absorbs so much wash. This, taken on the average, is correct, but there must be a depth of at least 30 ins. of wash before a single sheep can be put through, and this quantity must remain in the dip after the last sheep is dealt with.

It is always best to put rams and all the largest sheep through first while the water is high in the widest part of the dip. Smaller sheep and lambs should come last, when the dip is lowest and the wash is in the narrowest part—they are also the lightest to fall when the bath is shallow.

In large dips a good approach to the slide means less rough handling of the sheep and faster work, but in small dips it is not really necessary. Sheep need not be brought up from the ground level at all. There is, and always will be, hard work connected with getting sheep into dips, and, unless there is necessity for putting through 2,000 to 4,000 per day, there is no need to bring them up an incline race, for it only means a further distance for them to fall when the bath is low and at its narrowest.

Many farmers have used large station dips and lost sheep thereby. Many of these, when once filled, will dip 5,000 sheep without any additional mixing. Should a small wool-grower wish to dip 1,000 sheep he would need to mix 2,000 gallons although 1,000 gallons in a suitably constructed dip would be ample.

The plan of slide board, decoy pen and race, as shown in No. 7, is a combination of all good points yet proved in approaches to dips. For after all this is where the hardest work connected with dipping lies. Men lose their tempers, with old ewes especially, and hard words and severe handling of the sheep follow. In the plan shown it will be noticed that the race is not very steep and that the slide board is part of the dip itself, and that the race and slide board are connected by a declining race. The latter is covered with heavy gauge galvanized iron and is of just sufficient slope to cause them to slip at each effort to stand nearer the slide. The race being narrow they cannot turn round.

The race widens off just as the swinging door is reached, and this encourages the sheep to jump across to the others in the decoy pen. The swinging door comes back into its place after each sheep passes under it. When the decoy pen becomes full the sheep slip in backwards from the far side of the wide slide board and not from the end of the race as is usual—the sheep in the decoy pen really force the latest comers in. Sheep should never be put in head foremost. The decoy pen is higher at the furthest side and is sloping towards the slide. The sheep in it can be seen by those coming into the entrance of the furthest race.

Sheep can be dipped just as effectively in a bath with a swim of 18 or 20 ft., as in one 50 ft., but they must be held in longer, if necessary. When sheep are once clean it takes very little to keep them in that condition, but judgment must be exercised in dipping mixed sheep, for close woolled Merinoes, especially if hand shorn, need to be held much longer in the bath than crossbreds. On the other hand, crossbreds must have more length of wool to retain the wash.

Dipping immediately off shears is not to be recommended. Sheep are "banged" into the shed, kept without food over night, (and often longer in showery weather), shorn and cut about, thrown out and bruised, crammed into the branding race and branded, from there into the dip forcing-yards where, with aged sheep particularly, they undergo a lot of jostling before they can be forced into the bath. If the slide is a high steep one and the bath is getting low it is here that they get the worst of the bruising. Sheep with horns suffer greatly, for they often fall on each other, no matter how careful the crutcher may be. They are prodded under two or three times, and struggle up the out-slope to drain. At the best, there are many lame and sore sheep the next day, with a percentage of broken legs, and all are dejected and miserable looking. If wet and cold weather follows some die, while the remainder take weeks to recover thoroughly.

This is why most dealers, and many owners who have experienced dipping in large dips, prefer not to dip sheep or lambs intended for sale off shears as stores or fats. Off shears dipping is, however, often good management on large stations—it saves mustering large paddocks and driving sheep long distances in the dust the second time. Where flocks are small and have not far to travel, it is better to let them have a few weeks' rest and recover the effects of shearing, and get hardened to the weather.

The experience of farmers has conclusively proved that four main faults to avoid are:—

1. High steep sliding boards.
2. Excessively long swims.
3. Making the width in bottom too wide.
4. Making the bath narrow where the sheep fall in.

(To be continued.)

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

The work of pruning should be completed before the end of August. This is particularly necessary this year, as every indication points to an early spring. The winter, in June and July, has been a very mild one; and in several districts, even at the end of July, it was observed that the buds of various fruit trees were showing signs of sap movement, and were swelling and changing colour.

For this reason, if the winter spraying has not been carried out, it should be done without delay. One of the most general winter sprays is red oil. The caustic properties of this oil are well known; and in order that no damage will arise from burnt buds, it is advisable to finish the red oil spraying immediately. Once the buds commence to move, all oil preparations should be kept from the trees. It has previously been stated that a strength of 1 in 30 of red oil is amply sufficient to destroy such pests as bryobia mite, scale insects, and woolly aphis; when the oil is used late in the season, it certainly should not be sprayed at a greater strength than this. Red oil may be emulsified by combining it with soft soap, using 1 lb. of soft soap to one gallon of oil; or it may be used in combination with lime, using 1½ lbs. of lime, dissolved in water, to 1 gall. of oil, afterwards reducing this down with 30 galls. of water. Crude petroleum, or kerosene, may also be used in an emulsified form for a winter spray, but general practice has shown that the red oil is the superior of all oil emulsions.

The work of planting will also require to be finished before the end of the month. Indeed, it is not at all advisable to defer planting even so late. It has often been advanced by growers that late planted peaches thrive far better than early planted ones; but it is well to get the trees in as early as possible, in the event of the season setting in early.

Preparation should now be made for planting orange and lemon trees. These may be lifted and planted out as soon as the season sets in warm; but the soil should be thoroughly drained and sweetened before these trees are planted in their permanent positions. No trees require so thoroughly an aerated soil as the citrus family; and, to insure successful growth, the ground should be placed in good heart before planting. Although the planting of this class of fruit trees may be delayed until mid-summer, it is advisable to plant them as soon as the soil is warm enough to induce new root growth, so that they may thoroughly establish themselves during the first season.

A much neglected fruit in Victoria is the Persimmon or the Japanese date plum. Up to the present, it has always brought good prices, and it should become a very popular fruit. The persimmon requires a particularly rich soil, and it should be manured heavily to induce good growth and to produce a strong tree. Plenty of water is another factor to success; in fact, the young trees very often refuse to start into growth, until several excessive waterings have been given.

Vegetable Garden.

The work in this section during the month of August is comparatively light, provided that it has previously been kept up to date. The soil should be mellowing and sweetening, in anticipation of the planting of the main crop in a short time.

Seeds of lettuce, tomato, cabbage, carrots, peas, radish and broad beans may now be sown.

Potatoes may be planted out.

Where a frame and hot bed are in use, celery, cucumber, vegetable marrow, and pumpkin seeds may be planted.

All seedlings ready for planting out, such as cabbage, cauliflower, onion, and lettuce, may now be planted in the beds.

Herbs of all descriptions should be sown.

Flower Garden.

The pruning of roses and deciduous shrubs, if still uncompleted, should be hastened on, so that it will be finished as quickly as possible.

Digging, clearing out weeds and rubbish, and general tidying up of the beds will also need to be kept in advance. The earlier that this work can be finished, the better it is for the garden, as the soil is for a longer time exposed to the sweetening influences of the sun and the atmosphere. If this work is kept well forward, no delay can then occur in planting out herbaceous plants and annuals.

All hardy annuals, including sweet peas, will be needing attention now. They should be kept free from weeds, and if they are already in their permanent situations they should be kept well thinned out, so that every plant may have a chance to develop, and to grow vigorously.

The planting of shrubs should also be completed by the end of the month. A very common need in most gardens is a supply of winter-flowering shrubs. No difficulty is found in producing a splendid variety of flowers in spring, summer, and autumn; but there is generally a dearth of flowers in the winter. Therefore, in the garden scheme, it is necessary to provide room for such plants as will produce winter blooms. A selection of winter flowering shrubs is given, so that these may be planted this season if required.

The well-known *Pyrus japonica*, the Japanese flowering quince, is a popular winter favourite; and where room can be found for it, it is exceptionally welcome. There are several varieties, ranging from scarlet to white. The Camellia, Daphne, and Veronica, of various species are all useful winter flowering shrubs. *Cuphea platycentra* and *C. Jorullensis* are two profuse flowering dwarf shrubs, carrying orange and red flowers. *Erica arborea*, and *Diosma alba* are acceptable white flowering shrubs of the heath family. *Habrothamnus elegans* (red), *Agathæa cælestis* (blue) *Othonna Athanasiæ* (yellow), *Lasiandra macrantha grandiflora* (violet), *Heeria rosea* (rose), and *H. alba* (white) are all useful and hardy winter flowering shrubs.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. ***All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.***

GARLIC.—W.F. inquires as to cultivation of Garlic.

Answer.—Garlic requires practically the same treatment as an onion crop. The land must be thoroughly cultivated and enriched with well-rotted stable manure which must be properly worked into the soil. Plant out in rows the small offsets or bulbs keeping them about 6 or 9 inches apart. They may be planted in early spring and should be ready for harvesting in late summer. Keep the soil always cool by occasional waterings and by frequent cultivation. Above all, allow no weeds or foreign growths in the beds.

Cupressus Lambertiana Horizontalis.—M.K. asks whether propagation by means of cuttings is practicable.

Answer.—It is extremely difficult to grow from cuttings. Nurserymen with every convenience and appliance only get from 5 to 10 per cent. The usual method now adopted is to graft very young seedlings with wood of the horizontal variety. The plants are then potted off and grown in pots till they are of the required size for transplanting.

Citrus Culture.—W.P. wishes to know whether Williamstown is suited for orange and lemon trees, and also whether they require pruning.

Answer.—The soil should be friable, sandy if possible, and thoroughly drained; aspect to be free from frosts. If these conditions exist, citrus trees should grow successfully. Pruning is necessary almost every season and should be carried out in summer.

Bathurst Burr.—J.M. forwards specimen of plant for identification.

Answer.—The specimen forwarded is *Xanthium spinosum*, L., The Bathurst Burr. It is a native of Europe, Asia, and Africa, now introduced and widely spread in this State; proclaimed under the Thistle Act for the whole State. The weed is essentially a pastoral one, easily kept down by cultivation and hence partially suppressed by combined pasturage and rotation systems. The burrs adhere to the wool of sheep and seriously impair the value of fleeces, and also adhere to the tails of stock and manes of horses. For further information see "Weeds, Poison Plants, &c., of Victoria," price 2s. 6d, postage 5d. Can be obtained from the Secretary for Agriculture, Melbourne.

Hedge for Poultry Run.—H.C. asks whether there is anything better than Tree Lucerne for a shelter hedge for poultry. Slower growth will not matter, as the hedge will not be required for that purpose for about five years. He also asks whether Black Wattles require pruning.

Answer.—(1) Tree Lucerne is a most suitable hedge, and valuable in that the clippings may be used as green feed for the poultry. If another hedge is desired and is not wanted for period mentioned, *Cupressus torulosa* or *Cupressus Lambertiana horizontalis* would be very useful. (2) All weak, thin, and straggling shoots and limbs may be thinned out. Always keep the main trunk and limbs as free from light wood as possible.

Crops for Silage.—H.S. writes:—(1) Do you think that buckwheat and millet would grow as a mixed crop for silage? (2) Have you seen cow peas planted with maize after the latter was up?"

Answer.—(1) The mixture is not advised, but the sowing of the following is recommended:—Stout white oats, 1 bushel; Cape barley, 1 bushel; rye, ¼ bushel; tick beans, ½ bushel; field peas, ¼ bushel. This mixture should be sown at the rate of 3 bushels per acre, the tick beans and peas to be ploughed in about 2 inches deep. The balance of the seeds should be mixed together and either drilled in or sown broadcast. (2) Cow peas can be planted with maize and make a very satisfactory ration. It would, however, be very much better if they were sown separately; the maize in drills 3 feet apart and the cow peas 2 feet apart, so as to allow for intercultivation. The result will be a heavier return per acre of both fodders.

Grease.—M.M. inquires as to best treatment of greasy heels in horses.

Answer.—See page 342 of the *Journal* for June, 1908.

Discharge from Nostrils.—J.W.T. writes:—"I have a horse, about 12 years old, that is suffering from I take to be nasal gleet. There is a copious discharge of yellowish matter from both nostrils with an offensive odour, accompanied by frequent snorting. He eats well but has lost condition."

Answer.—Place in manger a bucket of boiling water, and add a small quantity of turpentine. Tie the horse's head close over the bucket so that he will be compelled to inhale the steam, for half an hour twice a day. Keep the horse warm and feed warm mashes and boiled barley.

Colic.—(1) H.T. asks what is the best treatment for Colic in horses. (2) B.A. states that he put a pony gelding (3 years old), reared on grass only, into work and fed with chaff and oats. In about a week the pony showed slight colic every evening after an hour's work. After an interval of three weeks he was again affected.

Answer.—(1) Give in a pint of water the following:—Compound spirits of ammonia, 1 oz.; sweet spirits of nitre, 1½ oz.; laudanum, 1 oz. (2) Hard feed should be given to young horses sparingly and gradually. When work requires it, oats may be added to bran and chaff. Ease off hard feed and probably trouble will not recur.

Ulcers on Jaw of Sheep.—D.B. writes:—"Some of my sheep are suffering from a complaint the symptoms of which are as follows:—A dry scab forms on the lower jaw reaching from the front of the under lip to the wool on the throat. The dry scab comes away and leaves the lower jaw a mass of small ulcers which discharge a yellowish offensive matter. The sheep quickly lose condition and in a couple of instances they died. The body becomes very much tucked up, giving the sheep the appearance of a greyhound. The complaint lasts about five weeks."

Answer.—Smearing of the jaws of affected sheep with zinc ointment is recommended.

Foul Sheath.—S.F. asks how he should treat a stallion suffering from a foul sheath. Also, the point of the penis is sore in the inside, cork-like matter sticking on the end.

Answer.—Wash out sheath frequently with warm water and soap to which a little washing soda has been added. If the growth increases have stallion examined by a veterinary surgeon as it may be of a malignant character.

Affected Quarter.—D.W. writes:—"The milk from one teat of my cow is bad; sometimes it is like water and at other times like matter. Will the milk in the other teat be affected?"

Answer.—The cow is suffering from inflammation of the lining membrane of the milk ducts and will most likely lose the use of that quarter. The milk of the other quarters will not be affected except by contamination by matter from the affected part. Milk out bad quarter occasionally after other milking has been done and destroy the matter yielded.

Non-Pregnancy.—S.J. states that a young Jersey heifer of his dropped her first calf last November and was served again in March but has come in season regularly since. When the latter occurs there is a slight bloody discharge from the vagina.

Answer.—The heifer is probably suffering from some obstruction in the uterine passage, and it would be advisable to have her examined by a veterinary surgeon. Do not use the milk until the nature of the trouble is determined.

Cattle Lick.—S.J. inquires *re* cattle lick.

Answer.—Supply a lick composed of sterilized bone meal and sheep salt in equal parts and place in accessible boxes protected from the weather.

Strangles.—H.G.P. desires advice as to feeding young colt just recovering from a bad attack of strangles. He states that he is feeding him heavily on oats, bran, and chaff, also oil cake.

Answer.—Do not give oats too heavily. An occasional feed of boiled barley will be beneficial. Give for four successive days in morning feed damped the following powder:—Powdered sulphate of iron and powdered gentian of each 1 dram.

Ration for Dairy Cows.—(1) H.G.P. states that he is feeding his cows on chaff, bran, and oil cake. He wishes to know what is the best ration. (2) D.F.G. furnishes the analysis of some green feed, and asks how it compares with well-known green fodders such as maize, &c.

Answer.—(1) Chaff, 30 lbs.; bran, 4 lbs.; and oil cake, 3 lbs. (2) Comparison of analyses shows that mentioned (moisture, 94.48; ash, 1.16; fibre, 0.16; alluminoid, 0.38; carbohydrates, 3.28; ether extract, 0.10) to be low in feeding value being about half the value of turnips and mangolds and quarter that of maize.

Ration for Trotting Pony.—W.F. asks what is recommended as the best feed for putting strength and condition on a pony intended for trotting and show events.

Answer.—The following is recommended for a light horse:—Oats 10 lbs., hay or chaff 12 lbs., bran 2 lbs., carrots 3 lbs. The oats may be increased as the work becomes harder, with a corresponding decrease in the quantity of hay. Care should be taken that the quantities are not unduly disproportionate as there is always a danger of digestive derangement if insufficient fibre is given. A reduction in quantities, according to the weight of the pony, should of course be made.

Soil Improvers.—R.G. submits several questions relative to value of crushed limestone, mortar from old buildings, Thomas phosphate, &c., as soil improvers.

Answer.—(1) Crushed limestone can be obtained from the principal lime merchants. The price is about 24s. per ton. (2) Old mortar from buildings is of no value compared with lime, as its caustic properties have been neutralised by combination with silica, and consequently its value for agricultural use has been minimised. It would not pay to cart. (3) Thomas phosphate contains a small percentage of free lime, and acts principally as a phosphatic fertilizer. It would be most suitable for your soil, and would retain its value for the time stated (three months). It can scarcely be compared with lime as its value depends principally on its phosphoric acid content. (4) The cost would be considerably greater for Thomas phosphate.

STATISTICS.

Rainfall in Victoria.

SECOND QUARTER, 1910.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with the corresponding monthly and quarterly averages for each Basin, deduced from all available records to date.

Basin or District.	April.		May.		June.		Total amount for Second Quarter.	Average for Second Quarter.
	Amount.	Average.	Amount.	Average.	Amount.	Average.		
	points.	points.	points.	points.	points.	points.	points.	points.
Glenelg and Wannon Rivers	130	226	375	285	260	363	765	874
Fitzroy, Eumeralla, and Merri Rivers	164	258	375	318	242	381	781	957
Hopkins River and Mount Emu Creek	101	215	285	256	226	309	612	780
Mount Elephant and Lake Corangamite	92	211	235	245	191	277	518	733
Cape Otway Forest ...	214	332	487	401	344	464	1,045	1,197
Moorabool and Barwon Rivers	87	223	286	236	217	266	590	725
Werribee and Saltwater Rivers	61	210	203	210	141	243	405	663
Yarra River and Dandenong Creek	117	330	331	306	214	372	662	1,008
Koo-wee-rup Swamp ...	125	327	300	308	292	379	717	1,014
South Gippsland	136	414	267	312	224	431	627	1,157
Latrobe and Thomson Rivers	128	313	247	278	195	378	570	969
Macallister and Avon Rivers	42	182	107	145	126	255	275	582
Mitchell River	35	234	103	226	199	286	337	746
Tambo and Nicholson Rivers	27	182	89	177	311	253	427	612
Snowy River	25	245	75	275	480	397	580	917
Murray River	7	159	175	180	236	272	418	611
Mitta Mitta and Kiewa Rivers	47	232	298	305	347	527	692	1,064
Ovens River	17	253	277	340	389	540	683	1,133
Goulburn River	21	202	261	254	355	350	637	806
Campaspe River	26	180	298	252	380	310	704	742
Loddon River	21	155	237	193	340	248	598	596
Avon and Richardson Rivers	25	134	237	180	212	223	474	537
Avoca River	18	145	212	184	268	221	498	550
Eastern Wimmera	35	158	280	237	373	309	688	704
Western Wimmera	43	180	278	217	236	268	557	665
Mallee Country	9	119	191	156	203	181	403	456
The whole State	52	201	240	212	274	306	566	719

100 points = 1 inch.

H. A. HUNT, *Commonwealth Meteorologist.*

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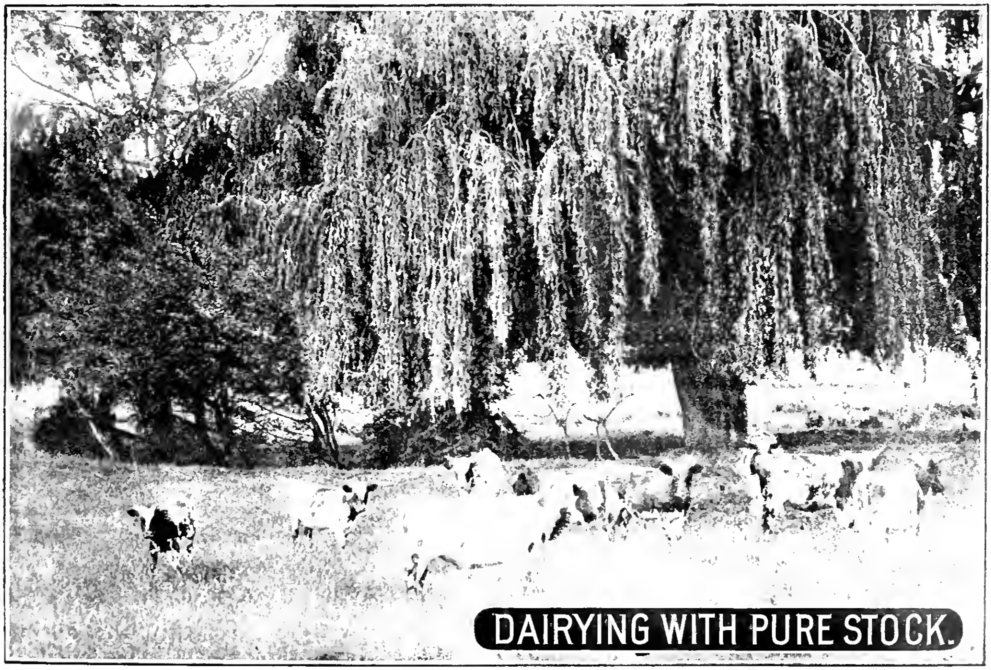
Sept., 1910.



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A. T. SHARP, Editor.

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THE JOURNAL

OF

The Department of Agriculture

OF

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HANDLING GRAIN IN BULK.*

W. G. McRobert, Bendigo.

The question of handling grain by a better and more economic system than at present obtains not only in Victoria, but also in the Commonwealth, is an imperative necessity. If we intend to settle, with a vigorous and hardy population of wealth producers and real nation builders, also to develop with the best results the hidden wealth lying untouched in our almost limitless and unequalled agricultural areas; if we intend to successfully compete with other grain producing countries in the effort to supply the human race with that important natural food product; we must adopt the bulk and elevator system of our competitors, which has built up their immense trade and made them so successful in settling and developing their agricultural lands, and by means of which they are leaving us far behind, although we enjoy much better and indeed, unsurpassed natural conditions of life. Again, there are local impelling influences that are demanding better facilities, such as our great distance from the markets of the old world, the increasing price of land, the coming dual land tax of the State and Federal Governments, low yields per acre, the increasing cost of all kinds of labour, with shorter hours in the harvest field, and the annual loss on bags to hold each year's produce. All these conditions at once reduce the benefit of our cheap system of harvesting, as well as affecting and increasing the cost of production, and they can only be met by a saving in handling the grain.

Our chief competitors are Canada, United States, Argentina, and Russia. All these countries handle and ship grain in bulk, using the elevator system. The United States have solved, and Canada is rapidly solving, the question of settling their immense arable areas, under adverse conditions unknown to us, by aiding the settler in every possible way, and

* Paper read at the Convention of the Victorian Chamber of Agriculture held at Ballarat.

getting his grain to market with the least expense and labour. The farmer there has to cut his crops with the reaper and binder, then thresh it mostly in the field, and cart the grain loose in a box waggon to the barn, where it is stored in bulk, bags being used only to convey it from the thresher to the waggon, and often dispensed with altogether, the grain being elevated direct into the waggon. The box waggon is simply a large box, strongly made, with a shoot in the side or bottom, capable of holding 100 bushels or more, and bolted on to the platform of the ordinary farm waggon. The barn is strong, wheat proof lined, and may be built on the silo principle, or square, according to suitable conditions, with a raised roadway on one side, so that the grain can be shot in from the box waggon near the roof. On the other side a sunken roadway is required to fill the waggon by gravitation from the shoots near the bottom of the barn, when carting the grain to the railway station. These two roadways do away with the need of machinery, to elevate the grain. Barns may be divided into bins, and a movable shoot directs the grain into any bin required, according to quality and cleanness.

A country railway station has either an elevator capable of storing from ten to fifty thousand bushels, some with cleaning and automatic weighing machines, or raised platforms with sloping ends so that the box waggons may be drawn on to them; the shoot is then adjusted, and the grain runs by gravitation into the truck, emptying in a few minutes. The length of these platforms depends on the traffic at the station.

The terminal elevator is at the port of shipment, and is capable of storing immense quantities of grain. Most of the cleaning is done there. The giant elevator of the world is at Port Arthur, on Lake Superior, in Canada, and is owned by the Northern Railway Company. It is capable of storing 7,000,000 bushels, and able to unload 30 trucks of 1,000 bushels each per hour. The charge for unloading, reloading, cleaning, weighing, and storing for fifteen days is half a cent or ¼d. per bushel; after that ¼d. per bushel for every 30 days. The cost of an elevator depends on the storing capacity, and 6d. per bushel of storage will build a country one. The pneumatic system, which elevates the grain by suction, is considered the better and cheaper method, as the working cost per bushel is very small. The bins in this system are made of steel and are circular, thus giving perfect safety to the grain from fire and insects, while the loss of weight by evaporation is hardly noticeable.

The Manitoban Grain Act, which is a masterpiece of legislation in the producers' interests, practically governs the handling of grain in Canada, and it requires the owner, lessee, or manager of any elevator, warehouse, or mill, also grain commission merchants and track buyers, to have an annual licence, find security bonds and keep books of all transactions in a form approved by the Commissioner. The charge for storage, cleaning, handling, insuring, receiving, and delivering is subject to such regulations or reductions as the Governor in Council from time to time deems proper. All grain is graded and weighed by officials, who fix the dockage and give a certificate showing the grade of the wheat. The dockage is the estimated loss on a bushel through cleaning. Wheat must be cleaned before shipment to Europe.

In Canada in 1900-1901 there were 421 country elevators and five terminal elevators, with a storage capacity of 19,000,000 bushels. In 1909-10 country elevators had increased to 1766, and terminal, milling, and transfer elevators to 36, storing a total of 94,000,000 bushels. Canada, by this method of handling grain, is fast becoming the great wheat producer of the Western World, despite her rigorous climate. For the last five years her wheat yield averaged 124,000,000 bushels, and in 1909 it was 166,000,000 bushels—58,000,000 bushels more than in 1905. Of this 101,000,000 were exported in bulk, Great Britain taking 77,000,000. It must be remembered that Canada makes good use of her lake system, for the lake boats come down through the Welland Canal to Montreal, where transfer elevators put the grain into the ocean-going steamers. The distance from Fort William or Port Arthur, on the north-western end of Lake Superior, where the chief terminal elevators are, to London, is 4,100 miles, and Canada lands her wheat in England for $8\frac{1}{2}$ cents, or $4\frac{1}{4}$d. per bushel, from out West.

We have better natural facilities for handling grain in bulk on our railways than our competitors and the first great advantage of this method to our farmers would be the saving of the purchase of bags to hold each year's produce. The loss on bags on this year's yield of 28,800,000 bushels, at 4d. per bag, is £155,000 for wheat bags alone, and the loss on bags for oats and barley should be considered, as all cereals would be handled by this system; that is averaging the bags at 5s. 6d. per dozen to hold 186 lbs. of wheat, selling it at 3s. 9d. per bushel, and allowing 2 lbs. for each bag. This is a fair estimate, I think, and it means a loss of $1\frac{1}{4}$d. per bushel, or £17 per thousand bags, to the farmer. This money would be much better spent in building a wheat and vermin-proof storage barn on the farm than in the bag-maker's pocket; and while admitting that the present small bag has made handling easier, it has really intensified the evil, as outside of wheat it is a useless bag to the farmer for his other work.

The second is the saving of human labour in the field by doing away with bag-sewing and the work of carting the bags to the farm yard and stacking them there for safety after or during harvest. This is overcome by the team in the morning taking the box waggon to the field and the driver emptying the bags from the harvester into the waggon. The team pulls it to the barn at the dinner hour, and the wheat is shot in, and so on every day. This practice safeguards the grain of each day. Again, in carting to the railway station, the waggon is filled from the shoots or spouts in the barn, and at the station the wheat is either shot straight into the truck from an elevated platform or into a ground-level bin at the elevator, the loading and unloading of a waggon taking only a few minutes, with no delay to other teams.

A third saving is, or should be, a lower scale of freight and handling charges, through quicker loading and unloading and despatch of trains, with little chance of a grain block at country or terminal railway stations, also in the loading and despatching of vessels.

A fourth is a better price for wheat through its being a cleaner and a uniform sample. Again, a buyer has a much better chance of judging the wheat in bulk than in bags, and it does away with the antiquated f.a.q. standard.

A fifth is a saving in the loss of grain by leakage from bags and from stacks; also freedom from damage by exposure to the weather. Bulk wheat keeps better than bagged—the greater the bulk the less shrinkage in weight and damage by insects or vermin. A sixth saving is the doing away with the present method of truck weighing, which is as unsatisfactory as the single bag method of former years.

All these benefits are possible, and the primary producer is justly entitled to specially favourable consideration from the Railway Department for on his success its success depends.

One of the main questions that greatly concerns us, and on which the success of the system depends, is the practicability of shipping bulk wheat over a great distance, but Argentina adopted the system in 1900, and last year exported in bulk 70,000,000 bushels of wheat and 18,000,000 bushels of oats, against 23,000,000 bushels of wheat and 6,000,000 of oats in bags, the latter going to ports with no elevator accommodation. Another important question is the value of wheat in bulk and in bags. The Commonwealth *Year Book* for 1907 gives the following average prices in London:—

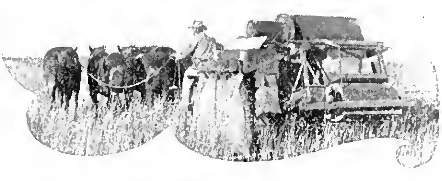
Per Quarter.

	£ s. d.		£ s. d.
Bagged wheat (Australian) ...	1 13 8	Atlantic Coast	1 13 9
Pacific Coast	1 11 9	Argentina	1 11 6
Bulk wheat (Canada) ...	1 14 0		

The advantage, if any, is in favour of bulk wheat. Again, the Royal Commission which, ten years ago, took evidence on this system of handling grain, admitted the efficiency and economy of the method, also the improvement effected in the quality of the wheat, but reported that "Insufficient wheat was produced. Ports possessing facilities for handling wheat in bulk too limited, and its effect on vested interests too great."

However, all these objections are now, or should be, obliterated, as the improved methods in cultivation have increased the yield, so as to leave an average exportable surplus for the five-year period ending 1909-10 of 14,000,000 bushels, equal to the whole average production for the five-year period ending 1901, when the Commission sat, and the Commonwealth yield has increased from 48,000,000 bushels in 1901 to 91,000,000 in 1909; also, owing to the growing trade in bulk wheat, all the principal ports in importing countries have elevators, while there is now among shipping companies an eagerness to cater for Australian trade, which did not exist ten years ago.

In conclusion, it is with great pleasure that I now quote the Minister for Public Works in his address to his constituents at the Echuca Town Hall, on the 24th May last. He said:—"We recognise it is the duty of the Government to create the best facilities for shipping produce, and to enable the producers to put their stuff on the markets of the world at a minimum of cost, so that they will be able to compete with producers in other countries. The Government is alive to this responsibility." Here is a recognition by a Minister of the Crown of what the farmer has been urging for many years, and it is earnestly hoped that the first facility to be created will be the handling and shipping of grain in bulk.



THE VALUE OF PEDIGREE IN SEED WHEAT.

J. T. Pridham, Wheat Experimentalist.

A prominent feature of the work of the Wheat Improvement Committee at the Longerenong Agricultural College is the production of selected or pedigreed stocks of grain of the best varieties. While it is proposed to increase the average wheat yield by breeding new varieties, we cannot overlook the importance of maintaining the best of the old varieties up to a high yielding standard until their place is taken by superior kinds.

The sowing of wheat more or less thickly in rows by means of the modern seed-drill makes individual differences in the wheat plants by no means easy of detection. Where improvement is sought for, the individuality of the wheat plant is often overlooked and the selection of a number of large ears gathered here and there through the crop made the basis of a fresh start with the variety. Large ears do not always spring from a prolific plant so that mere size of ear is not a safe guide.

In the case of maize, more attention has been given to seed selection than with the wheat crop, and growers readily agree that the best practice is to pick out the finest cobs for a seed plot to provide for field sowings. Even better results are secured by sowing the grains from each of the best cobs separately, thus securing a high-yielding strain from a single individual. The best results of all are obtained when the alternate rows are detasselled, thus preventing possible self-fertilization, and all barren plants in the field cut out to prevent their pollen inoculating prolific plants.

If wheat plants be isolated, each grain being sown separately as peas in a row, the individual differences at once become apparent; and wheat lends itself more easily than maize to improvement as each plant inoculates itself and reproduces its own characteristics without being affected by its neighbours.

Cases of natural cross-fertilization are known to occur, but where pure pedigree seed is used little harm will result. In the moist climate of England natural crossing is extremely rare—only three cases have been recorded; but on the Continent of Europe it occasionally happens in warm weather, and in India, Howard*, of the Department of Agriculture, says five cases have recently come under notice at Lyallpur. Last season, no less than six cases were detected at Longerenong, the seed having been obtained from plants growing in field crops the previous season.

New light is thus thrown on the notoriously impure nature (to the trained eye) of seed which has been left to reproduce itself year after year without selection. On most farms, two or more varieties of wheat are grown and, unless the drill and harvester are thoroughly cleaned out before starting on a fresh variety, there will be admixture. Other sources of impurity are the transference of grains from one part of a paddock to another in the process of harrowing after the drill when the soil is sticky; catching the edge of an adjacent variety in the harvester comb when turning; the carrying of grain by birds; the use of bags which have held wheat before and have not been turned; and the bagging up of loose grain from the floor of the shed where wheat of more than one variety has been stacked. Any variety of wheat will become more or less mixed unless the stock of seed is renewed after a time from a pure source.

* *Memoirs of the Department of Agriculture in India.*—A. Howard, M.A., and Col. C. Howard, M.A., May, 1910

In 1908, when the work was started by the Department at this College, a crop of Federation was thinned out to single plants standing about 6 inches apart to the number of about 2,500. From these at harvest time the best six plants were selected and their weight of grain in each case recorded. In 1909 the produce of each plant was sown separately in rows 1 foot apart, the grains being planted at every six inches. From these six strains of Federation the best plants were respectively chosen and weighed separately as before, the strain showing the highest average yield being retained for sowing. This season we have enough seed to sow at least three-quarters of an acre, so that next harvest we should secure, given a fair season, enough seed to put in 10—15 acres with the seed-drill, all descended from the single plant harvested in 1908. In order to test the value of the selected seed, it was determined to sow alongside it samples of seed from a crop that had not been subjected to the process. Mr. D. Jones, of Haycroft, Nhill, had a fine crop of Federation in 1908 and some prolific good plants were marked in his paddock and harvested separately, taking care to obtain in each case only the stalks springing from a single set of roots. These were sown in 1909, with the result that only two out of the eleven strains compared favourably with the selected Federation in adjacent drills. Hays,* of Minnesota, considers, from the results of his experiments in the improvement of Bluestein wheat, that a 25 per cent. increase in ten years is by no means unreasonable to expect in a given district. Yandilla King and Bunyip are going through this process and to a small extent, College Purple Straw and Comeback. While we aim at increasing the yield, the grain must also be of sufficient apparent milling quality.

It has been shown that selection, as thus practised, has far greater value than change of seed from one district to another. No amount of change of seed would account for the increase in yield of the improved varieties of maize that have been produced of late years. Neither would heavy manuring, nor the most admirable methods of cultivation, have produced the increase without the process of selection. It has been often claimed that good cultivation and judicious manuring are the main factors for success in wheat-growing. Admitting this, it must be acknowledged that the seed itself is a very important factor, for with the best methods of farming it is impossible to obtain maximum yields from a crop of wheat plants which vary more in productiveness than the men of a country do in height.

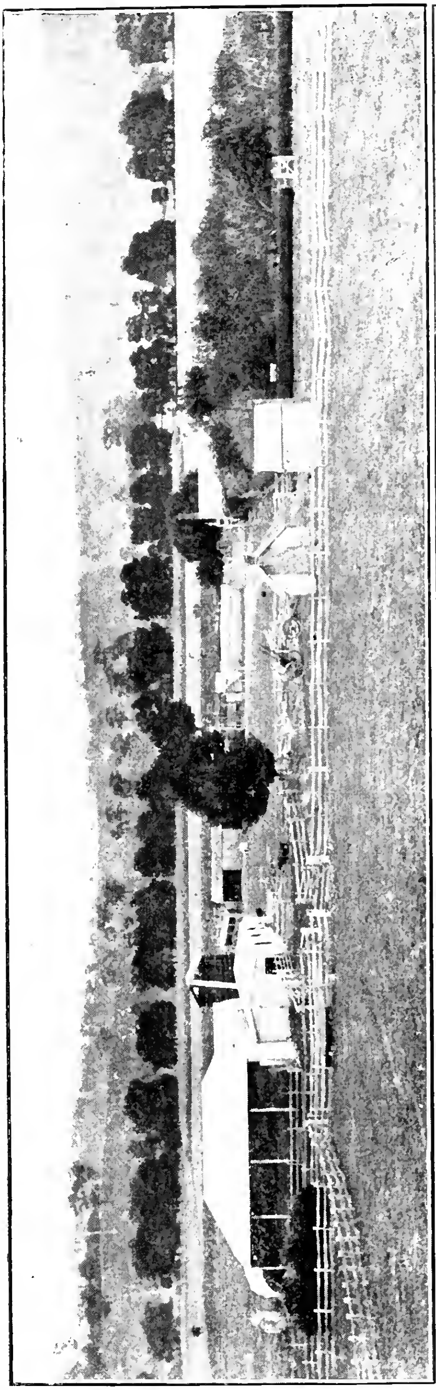
The principles of breeding in plants are fundamentally the same as in the case of animals, and while no farmer would be indifferent to the mating of his stud draught mares, or to the selection of stud rams for his flock, it has not yet occurred to him to give the same consideration to the raising of a stock of prime seed wheat.

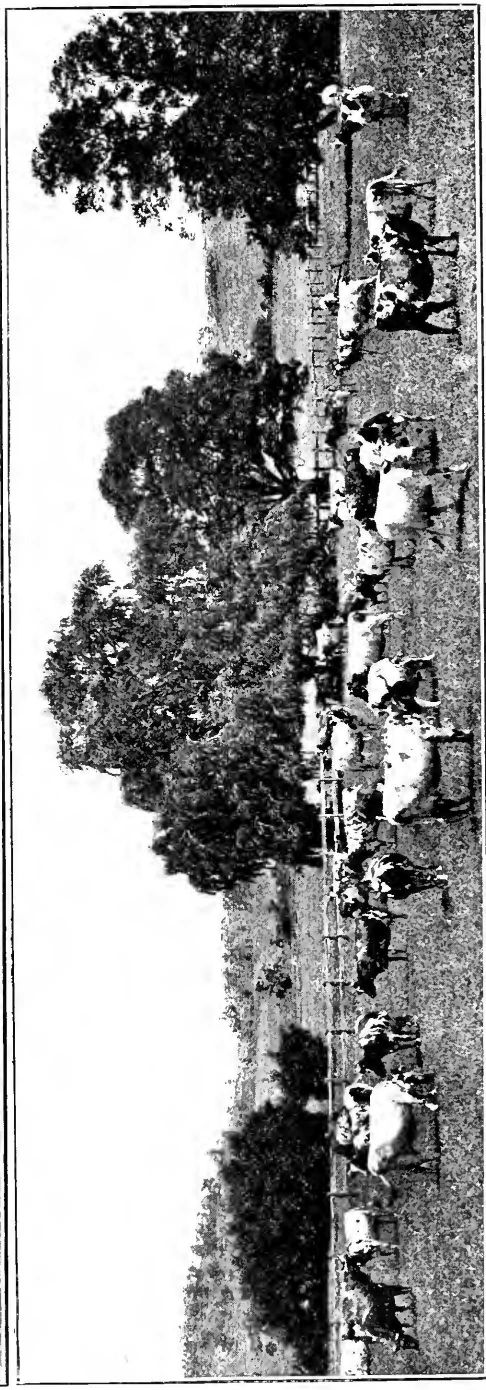
DAIRYING WITH PURE STOCK.

E. J. Turner, Dairy Supervisor.

Of the farms in the Fern Tree Gully Shire which supply milk to Melbourne, for retail distribution, Messrs. Selman Bros., Willow Vale Farm, near Lower Fern Tree Gully, is conspicuous. This farm is situated in a

* Bulletin No. 29. U.S.A. Department of Agriculture. Plant-breeding, by W. M. Hays.

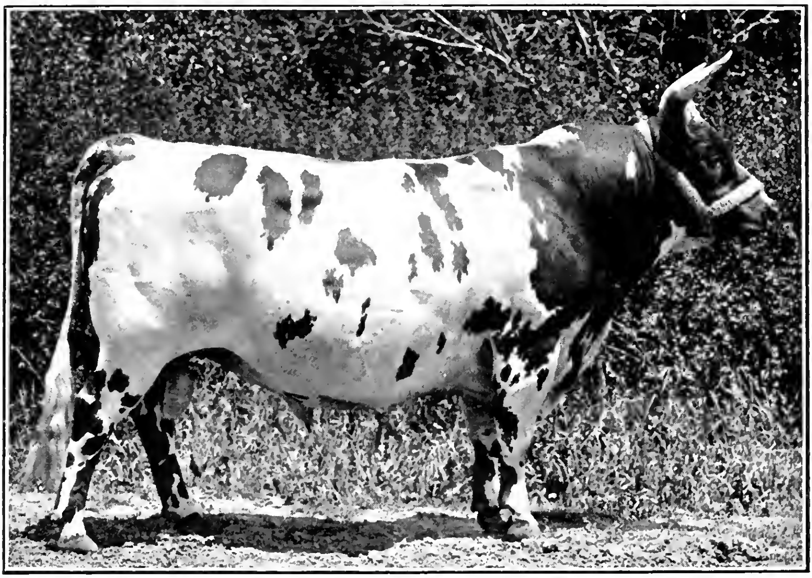




"WILLOW VALE" HOMESTEAD AND DAIRY HERD.

fertile valley between the township of Fern Tree Gully and Lysterfield, and viewed from the surrounding hills makes a very pretty picture. There are in all 922 acres in this property, which is divided into several paddocks; 200 acres are rich black creek flats, and the remainder is more or less hilly country and poorer in quality.

The hilly country is still in its natural grass, but the flat land has been sown with English grasses; rye grass and white clover now predominating. About 7 acres of the flat land are in lucerne and 60 acres of oats are grown every year on the poorer hill land towards Lysterfield. By manuring and early sowing, the crops obtained are very fair, averaging 50 cwt. of hay to the acre. Maize is sown each year on the creek flats and, as might be expected, some very heavy yields are obtained. Several varieties



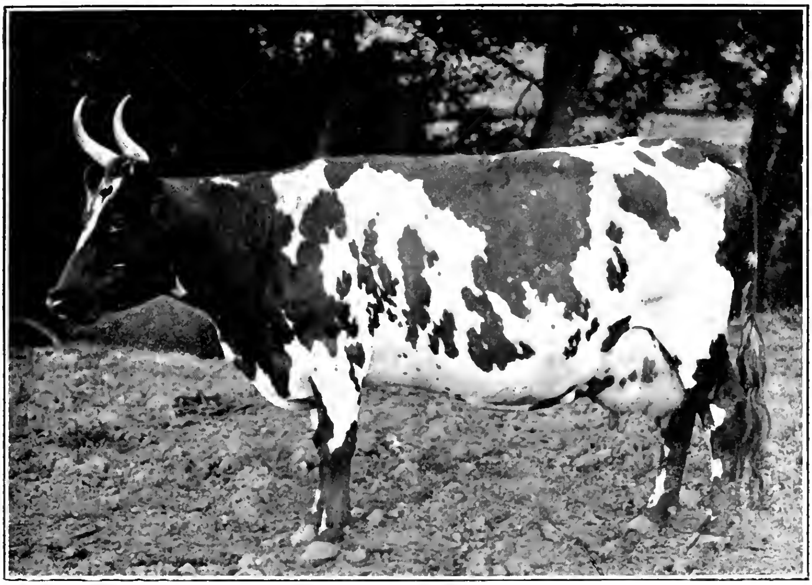
"ANNETTA'S PRIDE."

of maize have been sown, and no great difference is noticed in the growth, the average of which will run from 15 to 20 tons per acre.

The lucerne is cut, and fed to the cows in the stalls, as soon as the grass is getting dry, and this keeps the milk supply up till the maize is fit to cut. When this latter crop is matured, it is harvested to the silos of which there are two overground, with a combined capacity of 120 tons. The maize is chaffed and delivered into the silos by elevator, the power being provided by a 6 h.p. oil engine. It is within the last three years that the silos have been erected on this farm, and as the silage has gradually done away with the necessity of growing mangolds this latter crop has been gradually reduced. Mangolds constitute a splendid standby on the farm where no silage provision is made, but the length of time they take in maturing, and the work of cultivating and harvesting root crops, is so much more tedious than with a fodder crop, like maize, that to some extent the mangold is gradually being superseded, for dairy stock.

Following on advice from officers of the Dairy Supervision Branch, one silo was erected in 1907, and another in the following year, and the results from their use have been very satisfactory. No concentrated food is found necessary with this silage, and in July last 55 cows, on pastures and maize silage alone, were giving 103 gallons of milk daily, which speaks well for the quality of the fodder. Besides growing all the fodders required for the farm use, there is usually enough hay to allow of a surplus being sold; in the autumn of 1908, the cash receipts from this source ran into a substantial amount.

The creek running through the property provides permanent water for the stock, and as the Dandenong service pipe from Monbulk passes through the farm, this supply is made use of for the requirements of the farm.

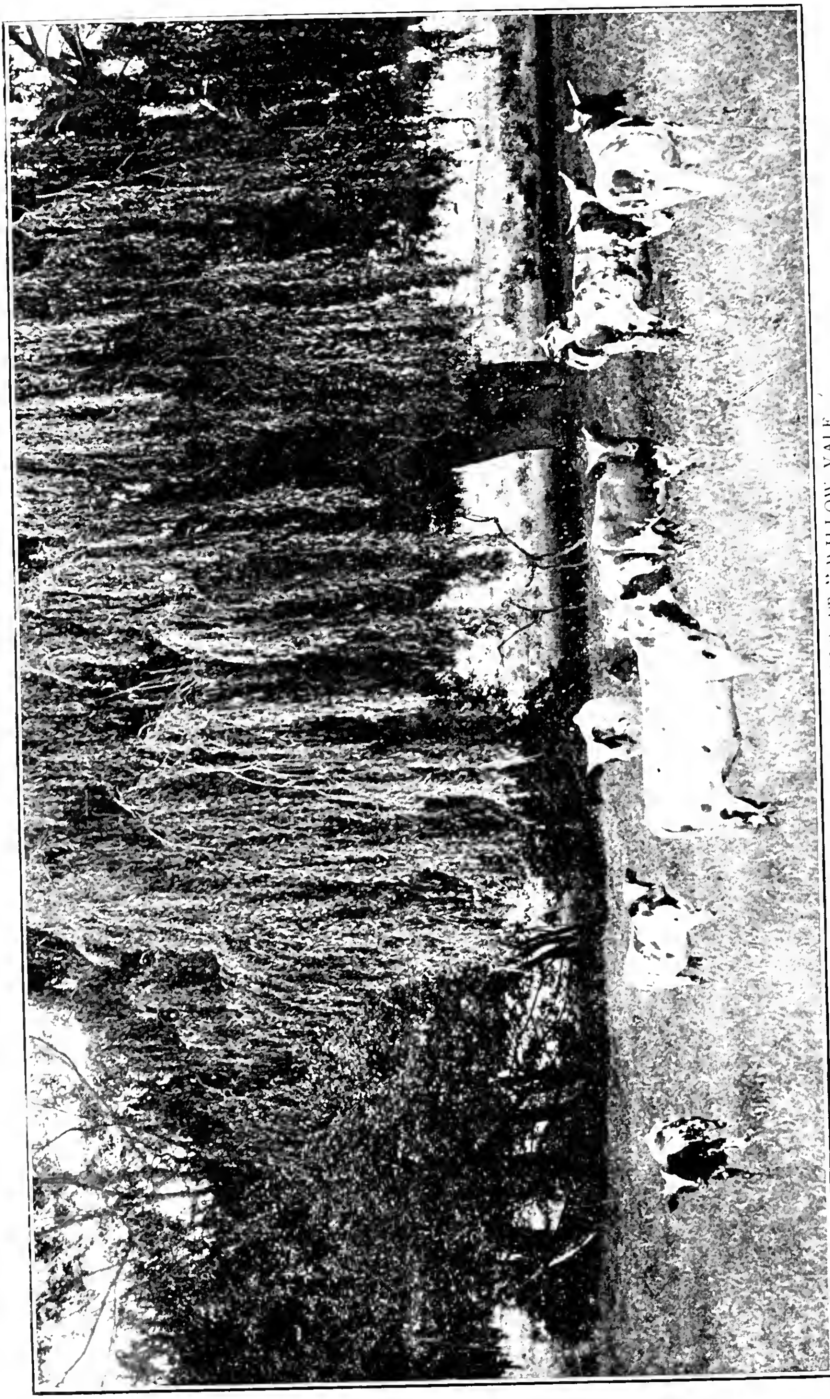


"MADGE II."

The work of the farm is mainly dairying, but the stock kept are all high-class Ayrshires, and considerable trade is done in the sale of pure stock of this breed. The "Willow Vale" cattle have a very wide, and sound reputation, both for show purposes and milk production, and about 30 calves from the best stock are raised each year, to support this outside demand for breeding stock. Some idea of the robust type of this strain of Ayrshire stock can be gained from the accompanying photographs.

With the assistance of two employés, the work of the farm is carried out by the Selman family, and each section of the work is under the direct supervision of one of the firm.

A herd of 90 cows is kept, and of these, 70 are usually in milk. During 1908 the milk produced by the whole herd amounted to 42,057 gallons, or an average of 467 gallons per cow, which for the number of cows, inclusive of heifers, is a very creditable yield. The cash return from this yield amounted to £1,639 2s. 7d., or an average of about £18 2s.



YOUNG PUREBRED AYRSHIRE BULLS AT "WILLOW VALE."

per cow. When it is remembered that this was obtained in an exceptionally dry season, and without purchase of any foodstuff and was thus practically all profit, it is a striking example of what can be obtained from dairy farming with pure-bred stock.

ABORTION IN COWS.

At the recent Convention of the Victorian Chamber of Agriculture, held at Ballarat, Professor Gilruth, of the Melbourne University Veterinary School, delivered an address on Abortion in Cows. A report by our representative is here given.—*Editor.*

Professor Gilruth introduced the subject by remarking that although all animals might abort from various causes such as injury, excitement, digestive arrangement, diseases of the womb (especially tuberculosis) and fever conditions, yet as far as the cow is concerned, in the great majority of cases, abortion is due to a specific microbe, and is a contagious disease; that in fact, whenever a cow aborts, no matter how evident the cause may appear to be, it is the safer plan for the farmer to treat the animal as if she were affected with the contagious form.

So far as the history of the disease is concerned it appears to have been well known as early as the eighteenth century, for we find writers of that date speaking of it as being so contagious, that in certain parts of Europe every precaution was taken to prevent pregnant cows even walking over a place where an abortion had lain or been carried.

Curiously enough the theory of contagion seemed, during the first three quarters of the nineteenth century, to have been entirely discarded, and the old theories as to causation, such as bad odours and improper feeding, reverted to. In explanation of the evident fact, that where one cow aborted others in the same herd or shed were almost certain to soon follow suit, the theory of a "sympathetic imitation" was propounded. These theories, however, were seriously upset thirty years ago, when it was demonstrated that the discharges from an affected animal, if introduced into the vagina of a pregnant animal, would produce abortion in her almost without fail.

Later on a commission of scientific men, who were intrusted with the investigation of the disease in Scotland, at the instance of the Highland and Agricultural Society, repeated these experiments with success, and further proved that the disease could be transmitted by the injection of a small quantity of the discharges from an aborted cow under the skin of a healthy pregnant cow. In 1897, Professor Bang, of Copenhagen, after much experiment, finally succeeded in isolating and cultivating on artificial material, the actual cause—a small bacillus—and reproducing the disease at will by means of artificial cultures.

Further, during the past three or four years, the Board of Agriculture in Great Britain has been conducting an important series of investigations regarding the disease, and has thrown much light upon the subject.

Prevalence.

The disease is very prevalent in all parts of Europe, particularly in those districts where the dairying industry is extensively pursued. Even in Australia and New Zealand it is by no means unknown. In the latter country, the lecturer had observed its spread throughout the length and breadth of the country, and had seen how much harm it could do to the dairying industry, although, fortunately, the disease is now completely under control there, and now does little damage.

Animals Affected.

The disease, as a contagious disease, chiefly affects cows, although outbreaks are noted from time to time amongst sheep, and occasionally epidemics of abortion have been recorded in studs of mares. As to whether it is the same microbe that produces the disease in each of these animals is not yet known, but experiments have proved that the bacillus which causes bovine abortion will actually produce the same disease in sheep.

Symptoms.

The symptoms manifested by an animal about to abort are extremely slight and indefinite in the majority of cases. Often none whatever are manifested, and this may even apply to experimental cases, for frequently the only evidence of the trouble is the presence of the aborted fœtus found lying behind the mother in the morning. At other times, however, a general uneasiness may be observed, there may be a rapid swelling of the udder, a slight discharge of slimy, sometimes blood-tinged material from the vulva, but generally nothing more definite. As a rule, the owner of animals which are not housed is made aware that a case of abortion has occurred by finding the immature fœtus on the ground, or by noticing a cow with an unexpected flow of milk and some discharge from behind, staining the tail. The general condition of the animal is so little disturbed that otherwise she remains quite normal. The reason of this is not difficult to find. If an animal which has just aborted be slaughtered, and carefully examined, it will be seen that the only disease changes which have occurred are in the lining membrane of the womb. Even then one only observes a small quantity—sometimes so small as to be readily overlooked—of a light-brownish or dark coloured sticky semi-fluid material. Sometimes the "cotyledons" or raised areas may be pulpy looking and yellowish, but this is not always to be observed.

Shortly, the conditions that exist are simply due to a slight catarrhal inflammation of the womb. Even the aborted fœtus is usually quite normal, as are the covering membranes. Occasionally, however, the fœtus may be partially mummified, due to the fact that it has been dead some time before expulsion.

Methods of Infection.

The microbe which causes the disease is practically only to be found in the sticky exudate which covers the inside of the womb and the surface of the membranes or cleansings. It will therefore be seen that the chief means whereby the disease is spread are the discharge which is apt to be persistent for some time after the cow has aborted, and the portions of the abortion, particularly the cleansings. It has been proved that the microbe may retain its vitality and virulence for a period of six months, provided it is kept moist and away from the sunlight. As the membranes may lie upon the ground in a shady place and not become thoroughly dried, it is obvious that unless they are discovered and destroyed they may remain for a considerable period a source of further infection. Under experimental conditions it has been proved that one very certain means whereby the germ may gain entrance into the system is along with the food supply, and as cows are very prone to chew all sorts of material, and particularly liable to congregate where any blood-stained matter is to be found, the danger of leaving the membranes undestroyed becomes doubly obvious.

One point of great importance is the fact that cows which abort when they are well advanced in calf are apt to retain portions of the cleansings, and these portions are expelled at irregular intervals as they break down within the womb. This is accompanied by a more or less continuous slimy discharge. Such a cow naturally becomes for a long period a source of infection for others, and not only that, but she is almost certain to contaminate the bull, who although himself not suffering from any diseased condition, thus becomes the carrier of the germs to other cows. The result is that other cows served by such bull, very often either fail to conceive, or having conceived, abort at such an early date, that this is only shown by their manifesting again a desire for the bull, when that is unexpected. In other words, the disease is very apt by this means, to develop into what may be termed *a contagious form of sterility, or barrenness.*

The lecturer detailed what he had found to be a common history of the introduction and the result of the disease in various herds:—

A dairy factory becomes established in a district where formally dairying was not actually much in vogue. Various farmers agree to supply the factory with milk, and it becomes necessary for them to increase their herds in order to do so. The sale yard is visited and cows purchased from various sources. Shortly after the introduction of these cows to the herd one aborts; other cases, at various intervals, may follow. As the cows are perhaps near the time of calving, the exact date of which is not known, and they give a certain supply of milk, probably little attention is paid to the circumstance, especially as the calves may be of little value to the owner. The aborted cow or cows, in due course, are put to the bull; they do not conceive, but come in heat again later on. Meanwhile, other cows have calved in the natural way. These are served by the same bull, and also become barren, or abort within a few weeks of conception. The result is that the owner sees a bad outlook for next year, for although some of them may ultimately get in calf, many do so at such a late period that it means a loss of the milk supply for next year, through the cows calving late in the season. Too often the owner considers the fault to lie solely with the bull. Imagining he is impotent, the owner turns him into the sale yard, where he is bought by some other unsuspecting dairyman, and so spreads the seed of trouble in a new herd. This phase of the contagious form of barrenness, or sterility, becomes thus, in many dairying districts, a more serious condition than the phase of actual abortion, for the season's milk supply of a cow is often worth as much, if not more, than the cow herself. The lecturer had known of cases where farmers had found it impossible to get more than 20 or 30 per cent. of their cows in calf, entirely as a result of this condition.

Natural and Acquired Immunity.

Returning to true abortion, or the actual expulsion of the immature fœtus, it was pointed out that apparently no pregnant cow was naturally immune, or free from the possibilities of aborting as the result of infection. It had been observed, however, that after one and especially two attacks had been completely recovered from, the animal was very unlikely to abort for a third time, this being evidently due to a definite degree of immunity having been acquired.

Experimenters had thought that it might be possible to artificially confer such immunity, and experiments were now under weigh to test a definite plan of so doing. It has been found that an empty non-pregnant cow may withstand with impunity enormous doses of artificial cultures of the abortion bacteria, introduced by the mouth, or under the skin. He himself had injected several ounces of cultures containing myriads of germs under the skin of non-pregnant cows without producing the slightest evidence of any disturbance. Experiments were at present being carried out in Great Britain and to a small extent here, with the intention of producing an immunity by such injections. It was of course necessary to treat the cows some months before they were served, otherwise barrenness might result before the animal had time to completly get rid of the germs introduced and so become immune. Nothing definite could be said at present further than that from the reports he had received the indications were hopeful.

Segregation of Infected from Non-infected.

Another point of importance was the fact that an animal on being contaminated by the germ of abortion might not abort for a very long period afterwards. As a matter of fact it had been shown that as a rule a month elapses between the time of actual infection and actual abortion, and that in some cases several months might elapse. It is clear that there must always be a great difficulty in knowing which cows are likely to abort and which are not. In other words, it becomes impossible to separate those which are actually clear of the disease from those which may contain the germs. Yet, were such a separation possible, manifestly much could be done to stamp out the disease in a herd

Recently, the British investigators have prepared a material which they term "abortin," which they hope may be used for this purpose. Abortin is prepared from sterilised cultures of the abortion microbe, much in the same way as tuberculin is prepared from sterilised cultures of the tuberculosis microbe. Abortin is applied much in the same way as tuberculin, that is, it is injected under the skin in small doses. If the animal has aborted recently, or if she contains the germs of abortion, and so is likely to abort in the near future, the injection of the abortin is followed in from six to twelve hours by a definite rise of the body temperature, which can be detected by the thermometer. Animals which have not aborted, and which do not contain the germ of abortion are totally unaffected in any way by the abortin.

It will be seen that if further experiments bear out these conclusions, a definite means will be placed at our disposal, by the use of which a herd may be divided into two groups at any moment, and so at least the further spread of the disease may be stopped by the prevention of fresh contamination.

Treatment of Infected Animals.

As to treatment of animals which have been exposed to infection, that is to say, the treatment of a herd in which abortion had appeared, attention has been drawn to the supposed value of carbolic acid, administered either by the mouth, or under the skin. The lecturer failed to see how much good could be expected from such treatment. The germ, to be killed, is present in the womb. It is more resistant to the action of carbolic acid than are the cells of the blood of any animal, yet, either from the intestine, or from the tissues under the skin, the drug can only reach the womb by way of the blood stream, in which it must necessarily be so diluted as to be harmless at least for the blood. In other words, if any antiseptic were strong enough to kill the germ in the womb, it should be likely to do harm to the system before reaching there. In experimental cases, where it was known the microbes were actually present—having been artificially introduced—the carbolic acid treatment had failed. In one case the administration of a total quantity of 8 ozs. of pure carbolic acid, distributed over a period, had failed to prevent the animal aborting. Nevertheless, it was admitted that in some experiments made by the Veterinary Department here, under the direction of Dr. Cameron, the indications were, that direct injection into the blood stream of small quantities of carbolic acid was of some value. So that at present the use of carbolic acid could by no means be condemned.

PREVENTION.

The lecturer was of opinion that those who at present had no experience of the disease, should take every precaution to prevent its introduction. This could be best done by being extremely careful in the purchase of bulls and cows. As to those in whose herds the disease had appeared, with his present experience of the disease, he could not, he felt, do better than recommend in their entirety the methods which had been found to be successful in New Zealand, where the disease was reduced to a minimum, although it was estimated at one time that the annual loss to dairymen in that country was between £100,000 and £200,000.

The treatment recommended had now become part of the usual routine of the vast majority of dairy farmers in New Zealand, there being few who do not keep in hand the necessary appliances, and who do not treat —especially all newly purchased cows—in the manner indicated.

The following is an extract of a leaflet prepared by Professor Gilruth, when Chief Veterinarian in New Zealand:—

TREATMENT.

1. Whenever a cow actually aborts, *search immediately for the fœtus and destroy it by burning it on the spot where it lies if possible.* If this is not feasible it should be buried deeply.

2. *Thoroughly dig up the ground* on which the fœtus has lain, together with an area of say 3 yards on every side of it, and saturate the surface with a liberal quantity of non-poisonous sheep dip, or other safe disinfectant.

3. *Isolate the cow* and keep her isolated for at least two weeks, using a temporary bail, if necessary, for milking purposes. Meanwhile remove any remains of cleansings from the womb, and apply treatment by irrigation as described hereinafter.

4. In the case of a cow failing to conceive and returning to the bull after short intervals, treatment by irrigation should be applied, as described later.

5. Where several cows in a herd abort, or keep returning to the bull, it is found to be absolutely necessary, in order to prevent the spread of the trouble, and to insure its complete eradication, that not only these cows, but *every cow in the herd should be treated.*

6. *In all cases the bull should be treated.*

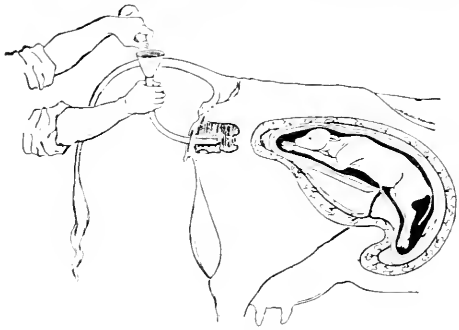
Material Required.

From our experience the antiseptic drug, which best combines efficacy with simplicity of application is mercuric chloride (corrosive sublimate). This drug is for such purposes as this put up in flat circular pellets, each containing a definite quantity (8.75 gr.). We have found the "soloids" prepared by Messers. Burroughs, Wellcome, and Co., to be undoubtedly reliable, having now despatched from this laboratory nearly 100,000 of these, and up to the present the few complaints we have received have been undoubtedly traced to improper or careless administration on the part of the operator.

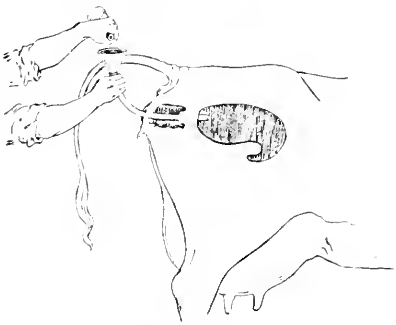
In addition to the pellets of mercurial chloride, it is also necessary to be provided with a *3-foot length of stout india-rubber tubing of ½-inch diameter* and a *small funnel either of glass or enamelled metal.*

Neither the drug nor its solution must on any account be allowed to come into contact with plain metal on account of its strong chemical action on such material.

Also, for use in the *treatment of the bull*, an ordinary *enema syringe with vulcanite fittings* should be obtained.



IRRIGATING VAGINA OF IN-CALF COW AS A PREVENTIVE OF ABORTION.



IRRIGATING WOMB OF COW WHICH HAS ABORTED.

ENEMA SYRINGE FOR IRRIGATING SHEATH OF BULL.

The strength of the solution of mercurial chloride to be used is as follows:—

(*a*) For *cows which are repeatedly returning to the bull*, or are apparently sterile, 1 in 1,250. This can be conveniently prepared by dissolving *one pellet in an ordinary (clear glass) whisky bottle of water*, which has been boiled and allowed to cool to about blood heat.

(*b*) For a bull, a solution of the same strength (1 in 1,250) should be used.

(*c*) For *cows which have just aborted*, a weaker solution (1 in 2,500) should be used and applied once daily for three successive days, and at bi-weekly intervals afterwards if there be any discharge from the vagina. This solution can be made by dissolving *one pellet in two whisky bottles-full of water.*

(*d*) *For in-calf cows more than three months pregnant* which are to be treated as a preventive measure, the solution (1 in 2,500), as in paragraph (*c*) should be used.

Unless in the case of an actually aborted cow one application only is necessary if properly carried out.

The Method of Procedure in Treating Cows.

1. Boil for five minutes the tube with the funnel inserted into one end, and then apply to the outside of the tube a dressing of salad oil or good lard.

2. Wash the hands and arms thoroughly in hot water to which a disinfectant has been added.

3. Place the free end of the piping by means of the hand gently into the womb (or in the case of an in-calf or sterile cow, as far up the vagina as possible without undue force being used) taking care not to injure the lining membranes. During insertion, the curve of the tubing is better turned downwards.

4. Hold the outer end of the tubing with the funnel about 6 inches above the root of the cow's tail.

5. Pour the solution of mercuric chloride, as described, gently into the funnel and so thoroughly irrigate the parts. If the fluid does not run fairly freely from the tube the inner end need only be moved gently to and fro to secure a free flow. The intention is to thoroughly irrigate every portion with the solution.

6. Thoroughly wash down the parts from the root of the tail to the bottom of the udder with some of the same solution at that used for irrigating.

7. Release the animal immediately after irrigation so that excess of fluid may not be retained.

The Method of Procedure in Treating a Bull.

Place the animal in a crush-pen or otherwise secure him in such manner that he may be readily handled without danger. Then grasp the prepuce (or sheath) by the left hand and pass the nozzle of the syringe inside the sheath, afterwards holding it in position with the same hand, then with the right hand pump into the sheath a quantity of the solution, sufficient to thoroughly irrigate the parts.

NOTE.—*Be certain that the whole of the pellet is thoroughly dissolved before using the solution as any undissolved particle lodging in the lining membrane of the vagina or womb would cause intense irritation.*

CAUTION.—*In connexion with this treatment it is necessary to remember that mercuric chloride is a highly poisonous drug if swallowed, and therefore every care should be exercised in order to prevent accidents.*

CHECKING AND CONTROLLING SWARMING.

R. Beuhne, President, Victorian Apiarists' Association.

The swarming season is again close at hand and bee-keepers should take steps now to prevent as far as possible excessive swarming of their colonies. One of the greatest inducements to swarm is the want of additional comb space in colonies which have bred up early. Where supers have been taken off for the winter, as they should be, it is necessary to replace them on the hives as soon as, or even a little before, all the combs of the brood-chamber are covered with bees. If supers have been left full, on the hives, some of the combs heavy with honey may be removed and replaced by empty ones.

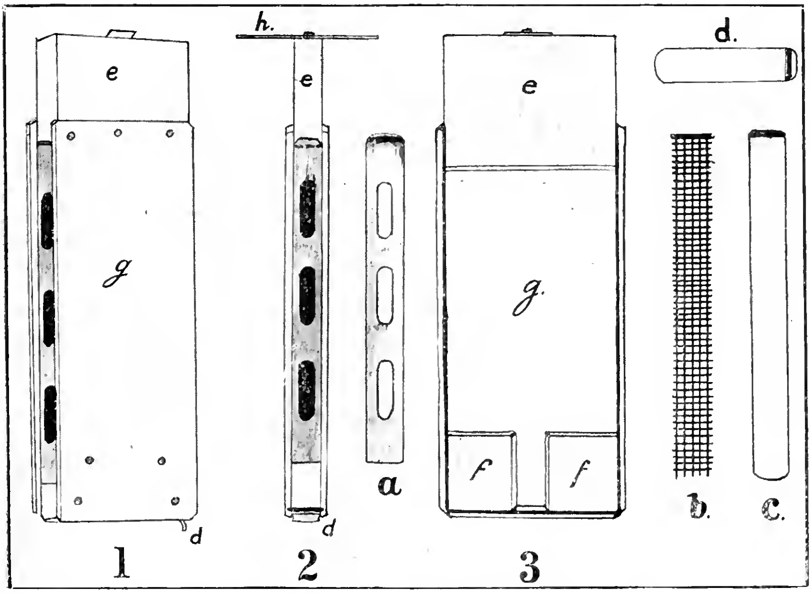
In most localities it is best not to insert honey boards between brood chambers and supers till the swarming season is over. The queen-excluding honey board checks the expansion of the brood nest by restricting the queen to the combs of the lower story. As bees do not readily pass into combs from which the queen is excluded the brood chamber becomes too crowded with bees and swarming results. The greater the comb surface available for brood rearing, the less inclination there is to swarm. But this comb surface must consist of finished empty combs; giving a super of frames with starters, or even full sheets of foundation, has very little effect in checking swarming. A sufficient supply of drawn combs is a valuable asset in an apiary during a honey flow; but particularly at swarming time.

When drawn combs are not available and bees require additional combs, the check to expansion, resulting from putting a set of empty frames over the brood chamber, may be minimized to some extent by taking one or two combs from the lower box and putting them into the centre of the upper story with the frames of foundation alongside; brood should not, however, be shifted up into the super unless the colony is sufficiently strong and the weather mild. As the combs required for supering and for hiving swarms are wanted before the conditions are favourable for drawing foundation into combs, a supply for the next season's requirements should be created during the summer or autumn honey flow. If done then, in the right way, it may be accomplished without adversely affecting the development of colonies and the yield of honey.

Whatever may be done to prevent excessive swarming by the timely addition of supers of empty combs there will still be a considerable number of swarms, when the strain of bees kept is of the common black variety or of a mixed description. The percentage of swarms to the number of colonies is also largely affected by the nature of the season, and the climate and bee flora of the locality. But even when the percentage of swarming is high, much may be done by the bee-keeper to prevent the development of what is aptly called "swarming mania." When an apiary gets into this condition hives will throw swarms without having made any preparation in the way of raising queen cells; and swarms which were hived will swarm again within a month, or turn out repeatedly a day or two after being started in a new hive.

Bees from some of the swarms which have scattered and joined other hives are the principal cause of this abnormal swarming. This frequently happens when clipped queens are not at once picked up when the swarm issues, or when the queen fails to come out with the swarm or returns to the hive without taking wing. Swarms which turn out after being hived are particularly inclined to scatter, and the bees which joined other stocks set up the desire to swarm in the hives they entered. To prevent this troublesome turning out of hived swarms, or rather to compel them to return, many bee-keepers fasten queen-excluding zinc over the entrance, but while this prevents the queen from leaving the hive the obstruction of the entrance interferes with and annoys the bees, particularly when there are many drones with the swarm.

To prevent the absconding of natural swarms, or of bees which have been shaken off their combs in the treatment for foul brood, I keep the queen for several days in a special cage suspended from the top bars of the frames. Fig. 1 is a side view and Fig. 2 an end view of the cage, while Fig. 3 shows it with the thin board of one side removed. The



QUEEN CAGE WITH FREE-WAY FOR WORKER BEES.

cage is 5 inches high by $1\frac{7}{8}$ inches wide and $\frac{3}{8}$-in. thick. The narrower ends are covered by a movable slide (*a*) made of queen-excluding metal, such as is used for honey boards. At the bottom end of the cage is a square hole $\frac{1}{4}$ in. x $\frac{5}{16}$ in. and $\frac{3}{4}$-in. long; this is closed by a tin slide (*d*) and like the slides (*a*) runs in a fine groove made with a tenon saw into the thin pieces covering the sides of the cage. The neck of the cage (*e*) is only $\frac{1}{4}$-in. thick and will therefore go evenly between the wide top bars of Hoffman frames without departing from the normal spacing.

When the queen of a swarm is thus caged between the frames the worker bees have free access to her and will start drawing foundation near the cage, or commence getting cells ready when empty combs are given. As the queen has been attended to just as if she were at liberty, she will commence laying as soon as released, whereas a queen in an ordinary cage is generally out of condition and the bees are discontented during her captivity.

When a swarm issues and the queen is seen she may be caged, the cage left on the alighting board till a few bees have collected on it. It should then be carried to a convenient place where it is desired the swarm should settle, that is, if the swarm is to be hived on a new stand. To hive it on the old stand it is only necessary to remove the parent colony to a new location and put the new hive in its place, the cage with the queen being left on the alighting board till the swarm commences to return when it is placed between the frames.

This free-way cage may also be used for caging the queen of a hive before swarming till all brood is sealed; after breaking out all queen cells, the queen is released. When superseding queens it is advisable to keep the old queens till new ones are safely introduced. In these cages queens may be kept for weeks between the super combs of any strong colony, having an old queen below the excluder.

During swarming time it frequently happens that a number of fine virgin queens are found hatching in a swarmed colony which would often be very useful to supply to other stocks a few days later, or to nuclei the queens of which are not yet laying. When caged in the hive they hatched from, or one in the same condition, any number of virgin queens may be kept in perfect condition for four or five days, and they will be fed and attended to by the workers.

To introduce strange queens or virgins the queen-excluding slides (*a*) are removed and slides (*b*) and (*c*) inserted instead. The queen to be introduced is put into the cage alone, the square hole in the lower end of the cage being filled with queen candy. The only means of communication between the queen and the workers is through the wire screen (*b*), from which the queen can withdraw should the bees be hostile to her at first. The cage is suspended between the centre brood combs of the hive and the queen soon assumes the odour of the hive and is accepted by the bees when they release her from the cage by eating out the candy. When introducing virgin queens to colonies from which a fertile queen has only just been removed, it is best to cover the candy with the slide (*d*) for two days as virgin queens are not so readily accepted.

The cage described is not sold by supply dealers but is easily constructed by any one at all handy. All that is needed is—

Wood—one piece, $1\frac{3}{4}$ x $1\frac{1}{2}$ x $\frac{1}{4}$ (*e*); two pieces, $\frac{3}{4}$ x $\frac{3}{4}$ x $\frac{1}{4}$ (*f*); and two pieces, $4\frac{1}{8}$ x $1\frac{7}{8}$ x $\frac{1}{16}$ (*g*); with a shallow groove on three sides for the slides.

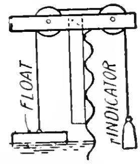
Metal—two pieces, queen-excluding zinc, $3\frac{1}{2}$ x $\frac{5}{16}$ (*a*); one piece wire screen, $3\frac{1}{2}$ x $\frac{5}{16}$ (*b*); one piece, tin or zinc, $3\frac{1}{2}$ x $\frac{5}{16}$ (*c*); one piece, $1\frac{1}{2}$ x $\frac{5}{16}$ (*d*); and one piece $1\frac{1}{2}$ x $\frac{1}{4}$ (*h*).

PUMP AND WATER MEASUREMENT.

On receipt of the following queries from G.C.B. relative to Pump and Water Measurement they were referred to Mr. Kenyon, Engineer for Agriculture, who has furnished the replies given hereunder:—

(1) How to tell the depth of water in an overhead tank?
(2) How to measure volume of water flowing in a V-shaped flume?
(3) About packing glands of oil pump in an oil engine?
(4) How to measure brake horse-power of an engine?

1. A double pulley fastened on top of rim of tank with a large wooden float in the tank and a heavy—on account of wind action—indicator running down the outside. When full, the indicator will be at the bottom.

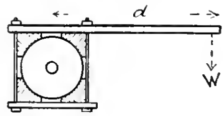


2. Unless the flume is running very fast, a system of float measurement should be suitable. Float a piece of wood along a length of, say, 100 feet. Take number of seconds and thus find feet travelled per minute. Reduce this by 20 per cent. This, multiplied by the square feet in section, will give cubic feet per minute. Each cubic foot equals $6\frac{1}{4}$ gallons. For instance, suppose a triangular flume 12 inches wide at surface of water and 6 inches deep, the area is $\frac{1}{2}$ x $\frac{1}{2}$ = $\frac{1}{4}$; and suppose that float travels 100 feet in 55 seconds, then 55:60::100 = 109 feet per minute, deduct one-fifth or 20 per cent., the velocity is 87 feet per minute, and this multiplied by the area, $\frac{1}{4}$ sq. foot, gives, say, 22 cubic feet or 137 gallons per minute.

For weir measurement, the area of the notch must be not more than one-sixth, say, of approach channel and, the depth passing over the notch, must be measured to still water. The discharge in cubic feet per minute equals length of notch in feet by the square root of the cube of the depth in feet by 200, or in symbols $Q = 200\ lh^{\frac{3}{2}}$. For instance, notch is 18 inches or $1\frac{1}{2}$ feet long and depth flowing over is 3 inches or $\frac{1}{4}$ foot then—

$$Q = 200 \times 1\tfrac{1}{2} \times \tfrac{1}{8} = 37\tfrac{1}{2} \text{ cubic feet per minute.}$$

3. The soap used in packing will not repel kerosene for any time. Get asbestos packing, but see that it is somewhat larger than space between spindle and gland. It should be well rubbed with powdered graphite and packed into space tightly a little at a time. Coiling it on the spindle and trying then to put all in at once will not give satisfaction.



4. There are several methods of which the most practicable, in your case, is the Prony brake, which consists of a square frame with shaped brake blocks surrounding the circular shaft or pulley with a long lever arm. The brake is screwed up by the bolts till the engine is exerting its full power, a weight on the end of the lever keeping the brake from revolving round the wheel. Sand poured into a box is a good weight as it can be added gradually. The formula is:—

W = weight in pounds at end of arm.
d = length of arm measured from centre of wheel in feet.
R = revolutions per minute.

$$\text{BHP (Brake-horse-power)} = \frac{W \times 3{\cdot}14 \times 2d \times R}{33{,}000}$$

Gradually screw up brake, adding sand as found necessary. We cannot, however, recommend you to take on the testing yourself, unless there are special reasons. A considerable amount of experience is required to provide against unforeseen events, which may affect results seriously.

"SCAB" AND EEL-WORM IN POTATOES.

Results of Experimental Plots.

Report by E. S. Holmes, Assistant to Chief Inspector of Produce.

The experimental plots for the purpose of testing means for the prevention of Scab and Eel-worm in potatoes were situated in various parts of the State—two in Gippsland, two in the Warrnambool district, one at Lancefield, and two at Wallace, near Ballarat. It will thus be seen that the experiments extended over a very wide range of potato-growing country.

Of these seven plots, four were satisfactorily carried out, and gave reliable returns. I refer to those of Mr. Crowe, at Koroit, Mr. Summers, at Lancefield, and Mr. Shearer and Mr. Downey, at Wallace. The plot at Mr. Gummisch's farm at Bunyip, although well looked after, was finally destroyed by "Sore-eye" disease, and no reliable results could be obtained, whilst the plot at Illowa gave no results, as it was neglected, and the cows obtained access to it. The plot on Mr. Morton's farm at Drouin became more or less overgrown with bracken fern, and being in hard ground, the results were poor.

Classifying the five plots from which results were obtained, three (those of Messrs. Downey, Shearer, and Summers) supply returns for Scab treatment, whilst those of Messrs. Crowe and Morton give data for the treatment of Eel-worm. The scheme of treatment was the same for both.

The plots in every case were situated on portions of land which were known to be more or less subject to either one or the other condition, and as the experiments were thus carried out under exacting conditions, the benefits derived from any line of treatment are worthy of full consideration. Taking the plots for Scab first, we find that whereas some so-called remedies did not fully justify their use, others again were very satisfactory. The latter was the case with the formalin treatment of Scab.

Experimental Plots for Scab Treatment.

Formalin Treatment.—Formalin, as is well known, is a strong fungicide, being often used in place of bluestone for the pickling of wheat to prevent smut, and it was thought that probably its use would result in the restriction of a disease like Scab,* which in one form is caused by a minute fungus living on the substance of the potato. For the purpose of testing this idea, two plots of six rows each were taken side by side. In one plot, scabby seed was sown without any treatment, while in the next the seed was treated before sowing with a solution of formalin of a strength of 1 lb. to 30 galls. of water. The seed was soaked whole in the solution for two hours, and was then dried before cutting.

As shown by the following table, No. 1 plot at Mr. Downey's, which was sown with untreated scabby New Zealand Pink-eye seed, returned only 45.7 per cent. of clean potatoes, while in plot 2, which was sown with similar seed which had been treated with formalin, yielded 74 per cent. of clean tubers, or a gain of 28.3 per cent., equal to $5\frac{1}{2}$ cwt. in each ton of produce. Further, the rejected sample from the untreated seed was badly scabbed, whilst that from the treated seed was comparatively lightly scabbed, and many of the potatoes could have been included in a marketable sample; this also applies to Mr. Shearer's plot.

* Whilst the Potato Scab known to science is caused by the fungus *Oospora scabies*, other agencies, even mechanical injuries, may produce a "scabby" appearance of the tubers. In this report the term "scab" has been used in its widest sense.—Editor.

Name of Grower.	Plot 1. Scabby Seed. Not treated.		Plot 2. Scabby Seed. Treated.		Gain by use of formalin-treated Seed.
	Clean.	Scabby.	Clean.	Scabby.	
	%	%	%	%	%
Downey	45·7	54·3	74	26	28·3
Shearer	56·7	43·3	76·5	23·5	19·8

NOTE.—The percentages recorded throughout this report were obtained from the weighed produce of the row or set of rows as the case may be.

Taking the corresponding two plots at Mr. Shearer's farm, the one sown with untreated scabby seed returned 56.7 per cent. clean produce, whilst the other which was sown with formalin-treated seed, returned 76.5 per cent. clean potatoes, a clear gain of 19.8 per cent., or 4 cwt. of clean potatoes in each ton of produce. The cost of the formalin is trifling—1s. 6d. per lb., and as 1 lb. is sufficient to treat seed for about two acres, the return for the outlay is immediately seen.

At Mr. Summers' farm, Lancefield, Carman seed was sown in the two corresponding plots, but at the time of digging, the results from the treated and untreated plots were about the same. The Scab in this district, however, does not resemble the "pitted" appearance of the Ballarat disease, but resembles more a "scab" caused by the bursting of blister. If it is caused by Eel-worm it is not, as Mr. Crowe's plot at Koroit shows, amenable to formalin treatment.

To test whether any good results were obtainable by the use of formalin where clean seed was employed, two more plots were sown, one with clean seed which was soaked in the formalin solution for two hours, the other with clean seed that was not treated. At Mr. Shearer's farm the results were about equal for both plots, but at Mr. Downey's farm, the untreated seed returned 59.5 per cent. of clean tubers, where the treated seed returned 74 per cent. clean potatoes, or a gain of 14.5 per cent. by treatment. Mr. Summers' plots, on the other hand, showed a slight decline in the formalin-treated seed, and taking his plots right through, the form of Scab occurring on this farm seems to offer little, if any, response to formalin, and, as stated before, is probably not due to a fungus disease.

Use of Clean as against Scabby Seed.—During the course of the experiments, it was often stated by the farmers that they could grow just as clean a crop from scabby as from clean seed. Some useful light is thrown on this point by these experiments, which certainly do not lend much strength to this argument. By comparing plot 1, which was sown with scabby untreated seed, with plot 3, which received clean untreated seed, the difference in favour of using clean seed is evident.

Name of Grower.	Plot 1. Scabby Seed. Not treated.		Plot 3. Clean Seed. Not treated.		Difference in favour of Clean Seed.
	Clean.	Scabby.	Clean.	Scabby.	
	%	%	%	%	%
Downey	45·7	54·3	59·5	40·5	13·8
Shearer	56·7	43·3	67·3	32·7	10·6

As seen by this table, scabby seed produced 45.7 per cent. and 56.7 per cent. clean potatoes on two farms, whereas clean seed produced 59.5 per cent. and 67.3 per cent., or a gain of 13.8 per cent. and 10.6 per cent. respectively. As 10 per cent. represents 2 cwt. per ton of produce, the gain by use of clean seed would be considerable in, say, a twenty acre crop.

Green Manuring.—At the time the experiments were inaugurated it was decided to put in a plot at each farm for testing the action of green manuring in relation to these diseases, but as no area of suitable size carrying a crop of green material was available, only one row in each plot received green manure. Besides increasing the yield it was often held that green manuring produced a cleaner crop. In many parts of Victoria it is customary to plough in a crop of oats or barley at the time of sowing the potatoes with the special object of increasing the yield, and it was thought by many farmers that this also resulted in the crop coming off a cleaner sample.

The greater yield was fully borne out by the experiments, an increase taking place of from 1 to 1½ tons per acre, but the cleanness was a very variable quantity, increasing in Mr. Shearer's plot by about 8 per cent., and decreasing about the same per cent. in Mr. Downey's plot; while Mr. Summers' plot, where spear grass was used as green manure, the decrease was considerable.

The following is a table showing the increase in yield due to green manuring and its effect on Scab:—

Name of Grower.	Plot 1. — Green Manure. Clean.	Plot 1. — No Manure. Clean.	Difference.	Plot 1. — Green Manure. Yield.	Plot 1. — No Manure. Yield.	Increased Yield by Green Manure.
	%	%	%	tns. cwt.	tns. cwt.	tns. cwt.
Downey ..	41	49·7	8·7 decrease	4 2	2 17	1 5
Shearer ..	62	54	8 increase	6 0	4 19	1 1
Summers ..	51	83	32 decrease	2 13	1 2½	1 10½

Iron Sulphate.—The use of iron sulphate has been recommended for the treatment of fungus diseases, as it possesses a slight antiseptic action. It resembles, though in a much lesser degree, the action of copper sulphate or bluestone, which is used as a fungicide in Bordeaux mixture; it was therefore decided to give it a trial against the Scab in potatoes, and for this purpose it was sown, at the rate of 1½ cwt. per acre, with the seed at the time of sowing. Two rows at each farm received this substance; in one it was sown on top of the land after scabby seed untreated with formalin had been covered, while in the other it was sown in the manure section in the furrow with the formalin-treated seed to try its effect amongst the special manures.

In both cases, however, the results from the use of this substance were poor, no improvements taking place on the general sample of potatoes; this may have been due to the fact that iron sulphate is easily soluble in water, and might thus be washed out of the soil, or it may undergo chemical change in the soil. Whatever may have been the cause, no good results followed its use, the potatoes from these rows being badly scabbed and about equal in sample to those which received no treatment.

The following table gives the results from the use of this substance:—

Name of Grower.	Plot 1. — Iron Sulphate, sown on top of Ground. Clean.	Plot 1. — No manure. Clean.	Difference.	Plot 5. — Iron Sulphate, sown in Furrow. Clean.
	%	%	%	%
Downey	42·5	49·7	7·2 decrease	62
Shearer	57	54	3 increase	66
Summers	85	83	2 ,,	70

As seen, a slight increase took place in two plots which, however, is so small as to be negligible, while in the third a decided decrease took place. The sample from plot 5 was in two cases cleaner than that from No. 1, and this was no doubt due to the fact that the first named received clean formalin-treated seed, whereas plot 1 was sown with scabby seed untreated. Here, again, Mr. Summers' plot fails to agree with the results from the plots in the Ballarat district.

Spraying.—As spraying is becoming a general practice with potato growers in New Zealand and countries where Irish Blight and other fungus diseases are prevalent, it was decided to obtain a spraying machine in order to try the effect of sprays on the general health of the potato crops.

A Victorian pump, kindly lent by Messrs. Langwill Bros. and Davies, was mounted on a Tasmanian carriage capable of spraying five rows at a time. The power for driving the pump was obtained off the main axle by a clutch and crank connecting with the handle of the pump by an iron rod. This machine was sent to the various farms, and certain rows of each plot sprayed with Bordeaux mixture and Paris green. In some cases, also, a small area was sprayed for those farmers who were desirous of testing the machine.

The spray used was Bordeaux mixture (bluestone, 6 lbs.; lime, 4 lbs.; water, 50 galls.); with the addition of Paris green. It was made in the usual way by pouring the dissolved bluestone and lime water slowly together into a third vessel and stirring well; to this was added 4 ozs. of Paris green and the mixture carefully strained into the barrel on the machine.

The action of the spray seems to have been to increase the general health of the plant to some extent. After spraying the plants looked fresh and healthy, and as the returns in most cases show, a small increase of yield took place, no doubt owing to the increased vigour of the plant. The beneficial effect of the spray on an under-surface disease like Scab seems to be very doubtful, and it is difficult to see how it could affect it unless the disease had its origin at or above the surface of the ground. No doubt spraying would yield much better results where the leaves or stalks of the plant were attacked by disease.

As will be seen, there was a slight increase of clean potatoes in all the sprayed rows at Mr. Downey's farm, while at Mr. Shearer's a small decrease took place. Mr. Summers' plots show great variation, the average working out a slight increase.

One or two of the farmers expressed the opinion that the patches sprayed for them looked cleaner and healthier during the growing period, but that the yield of clean potatoes was about the same as the unsprayed part of the field.

The following is a table of the results obtained from the sprayed plots:—

Name of Grower.	Plot 2.		Plot 3.		Plot 4.		Remarks. Cleanness.
	Three rows sprayed. Clean.	Three rows not sprayed. Clean.	Three rows sprayed. Clean.	Three rows not sprayed. Clean.	Three rows sprayed. Clean.	Three rows not sprayed. Clean.	
	%	%	%	%	%	%	
Downey ..	76	72	60	59	75	73	Slight increase
Shearer ..	74	79	63·6	71	63·5	67	Slight decrease
Summers ..	82·4	82	78	87	84	70	Variable totals show slight increase.

Artificial Manure.—A plot of six rows was put in at each farm for the purpose of trying six different manures, not so much for their yielding capacity, but to test the theory that Scab is caused by strong alkalies or acids in the soil.

For this purpose several specially strong manures were prepared and sown alongside those of normal strength. Thus, a potato manure containing a double quantity of potash was prepared and used alongside a row receiving a normal potato manure. This was done, as it has been contended that where rubbish had been burned the extra supply of potash conferred on the adjacent soil a power of producing Scab. Likewise, an extra acid superphosphate was prepared and sown alongside a row receiving a normal superphosphate to test the theory that where a stack had decayed and left the soil acid. Scab was more strongly marked. The other two rows were manured with nitro-superphosphate and iron sulphate respectively. All the manures were applied as heavy dressings, namely, 4 cwt., except in the case of iron sulphate, which was applied at the rate of $1\frac{1}{2}$ cwt. per acre.

Taking the following table and comparing the results, it would appear that the extra-strong manures lose little, if anything, by the comparison, and certainly do not uphold the theory of the causation of Scab by strong alkalies or acids in the soil. It is true that a slightly alkaline medium is favourable to the growth of low forms of life since it neutralises the acids which they produce as waste products of their life processes. These acids, if allowed to accumulate, would tend to the destruction of the organism; but in a slightly alkaline medium, such as calcareous soil, the acid is neutralised almost as soon as formed and the organisms have a better chance of increasing. It is in this way that the increase of Scab in limey soils, and in patches where wood ashes have been spread, is accounted for, and it is not due to the action of lime on the skin of the potato.

Manure.	Shearer. Clean.	Downey. Clean.	Summers. Clean.	Average for Three Plots.
	%	%	%	%
Potato Manure A	66·5	76	84	75·5
Potato Manure (Double potash) ..	74	75	73	74
Superphosphate (Normal)	60	76	74	70
Superphosphate (Extra acid)	67·3	63	89	73·1
Nitro-superphosphate	80	80	77	79
Iron sulphate..	66	62	70	66

Taking the average of the three plots, the very slight decrease in the case of the strong potash manure over the normal potash is not sufficient to prove a harmful effect, just as in the case of the superphosphates the small increase for the use of extra acid manure is not sufficient to prove a beneficial effect.

No matter how closely the figures for these manured plots are scrutinized the fact remains that the plots turned out a clean sample in every case. The rejected potatoes were comparatively lightly scabbed, except in the case of iron sulphate, and the marketable tubers were of much finer quality than those from unmanured portions. It may be contended that this was due to the use of clean formalin-treated seed, but that some of the manures played an important part in producing cleanness, is seen by a study of the figures in the last column of the table. It will be readily seen that between the lowest average in the three plots and the highest, there is a difference of 13 per cent., and this can only be put down to the value of one manure over the other, or if we leave iron sulphate out as not being a true manure, a difference of 9 per cent. between nitro-superphosphate and superphosphate must be accounted for in the same way.

It is a convincing fact that where clean seed, formalin treatment and artificial manuring were resorted to, by far the best results were obtained, and it is reasonable to expect that a much smaller dressing of manure would have the same good effect as the larger quantity.

Increased Yields from the use of Manures.—Although the plots were not put in primarily for the purpose of testing the yielding capacity of the manures, still some useful information was gained on this point by weighing the produce of each row and comparing the results.

The following table demonstrates the relative value of different manures and also their value over no manure on five different farms:—

Name of Grower.	Potato Manure A.		Potato Manure (Double Potash).		Super-phosphate (Normal).		Super-phosphate (Extra-Acid).		Nitro-super-phosphate		Iron sulphate.		Average of un-manured portion of Plot.	
	tons.	cwt.	tons.	cwt.	tons.	cwt.	tons.	cwt.	tons.	cwt.	tons.	cwt.	tons.	cwt.
Downey ..	5	0	5	0	5	0	4	9	5	4	2	16	3	0½
Summers ..	3	2	3	2	2	7	2	12	2	18	1	4	1	7
Shearer	6	7	6	2	6	0	5	4	7	6	5	4	5	1
Morton	4	5	4	10	4	10	4	10	4	10	2	10	2	5
Crowe	7	10	8	8	8	4	7	0	7	0	6	0	6	18½
Average of Five Plots	5	5	5	8½	5	4	4	15	5	7½	3	11	3	14

A glance at the table shows that the double potash potato manure gave the best results, returning an average of 5 tons 8½ cwts. per acre, while it also had the highest aggregate yield of 8 tons 8 cwts. at Mr. Crowe's farm. Its extra yield over potato manure A does not, however, compensate for its extra cost, as it is quoted at £7 10s., whereas potato manure A may be obtained for £6 10s. per ton.

The cheapest manure would appear to be the ordinary superphosphate. It gave very creditable yields, returning an average of 5 tons 4 cwts. per acre on five farms, and it has the additional advantage of being much cheaper than the potash or nitrogenous manures, as it is quoted at £4 7s. 6d. per ton.

Experimental Plots for Eel-worm.

As Eel-worm is prevalent in the Warrnambool and Gippsland districts, plots of ½ acre each were obtained at Koroit and Drouin respectively for the purpose of carrying on experiments against this pest. The line of experiment was the same as that for Scab, the land being selected from areas that were known to be badly subject to Eel-worm.

As comparatively little is at present known about the nature and habits of the Eel-worm, it was rather a difficult matter to suggest suitable means for its prevention, and so the methods of treatment followed were more or less speculative in character, and were not in any sense tests of already recognised remedies. This being the case, it was to be expected that these two plots would in all probability yield mostly negative results. Although this proved to be so in one or two cases, still some very useful information, mainly relative to the action of manures, both green and artificial, was gained from these two plots.

Green Manuring.—That green manure* acted in a beneficial way could not be doubted when the produce from the manured row was gathered together and compared with the unmanured rows next to it; not only did it show a higher percentage of clean potatoes, but the whole sample was less blistered than the unmanured produce. The green manure was simply cut in the paddocks and filled into the furrow along with the seed at the time of sowing.

The following table gives the actual gain due to use of green manure in these two plots:—

Name of Grower.	Green Manure. Clean.	No Manure. Clean.	Gain by Green Manuring.
	%	%	%
Morton	60	50	10
Crowe	62	57	5

As will be seen, the gain in absolutely clean potatoes was not very great, but a comparison of the total sample had much in favour of the green manure.

Artificial Manuring.—The best results in these plots for Eel-worm were obtained from the use of artificial manures.

The manures used were the same as those in the plots for Scab, the object being in both cases the same to test extra strong manures against those of normal strength to ascertain if strong acids or alkalies in the soil were conducive to their production. As in the case of Scab, the manured section gave very satisfactory results, the returns showing a large advance in cleanness over those plots which received no manure.

The following table shows the relative value of five different manures over plots receiving no manure:—

Name of Grower.	Nitro-superphosphate. Clean.	Superphosphate (Normal). Clean.	Superphosphate (Extra Acid). Clean.	Potato Manure A. Clean.	Potato Manure (Double Potash). Clean.	No Manure. Clean.	Iron Sulphate. Clean.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Crowe	63	70	71	72·2	67·5	56·75	53·6
Morton	83	73	66	73	60	54	48
Average	73	71·5	68·5	72·6	63·75	55·4	50·8

* Although green manure gave slightly beneficial results, other experimenters, both local and foreign, hold that it is favourable to the development of the Eel-worm. Growers should therefore awai further experiments.—EDITOR.

As will be seen from a study of the figures in the above table, there was an average increase of cleanness due to the use of one or other of the manures varying between 8.3 per cent. and 17.6 per cent. Nitro-superphosphate again came out on top though potato manure A is practically on the same level with it. In this case, strong potash manure fell considerably below the manure of normal strength, but it must be remembered that although this decline took place with the strong manure still it shows a considerable increase in clean potatoes over those rows which received no manure.

When a strong manure like the above is applied in as heavy a dressing as 4 cwts. to the acre, and produces a cleaner crop than where no manure is used, it can scarcely be contended that its presence in the soil is highly beneficial to the increase of Eel-worm. However, as the table shows, a moderate strength manure is to be preferred to a strong application in the case of this pest, both from the point of view of cleanness as well as cost. The same may be said in the case of the extra acid superphosphate. Here, the difference is not very great in favour of the normal manure, but still as the normal manure is more efficient it needs no further recommendation.

The results from the use of iron sulphate have nothing to recommend it for future use. It cannot be classed as a true manure and gave no increase in yield or cleanness.

Formalin Treatment and Spraying.—The treatment of the seed with formalin, used at the same strength as in the case of Scab, was not attended with any remarkable results. This pest, not being of a fungoid nature, would scarcely respond readily to a fungicide, and even if the seed were rendered free from the living parasite by immersion in a formalin solution, it could hardly be expected that the action would continue over several months in a soil which was at once the home and breeding ground of the parasite.

Taking the above into consideration, it is not a remarkable fact that the formalin-treated seed turned out, taking an average, practically the same percentage of clean potatoes as the plots which were sown with untreated seed.

What has already been said respecting spraying in the plots for Scab applies equally in the case of Eel-worm. The spray used was the same, namely, Bordeaux mixture with Paris green. As before, in most cases the yield was slightly increased, but the average percentage of clean potatoes was about the same as where no spraying was given.

SUMMARY.

Taking a general review of the plots, I think that it has been demonstrated that the treatment of seed with formalin was efficacious in preventing Scab in that form at least in which it occurs in the Ballarat district, while clean seed and artificial manures were also factors worthy of notice as aids in the production of a clean sample.

As regards Eel-worm, green manuring and the use of artificial manures and especially the latter, are worthy of consideration for future experiments. Formalin treatment did not prove as efficacious as in the case of Scab, but as in the case of Scab the use of clean seed is to be recommended.

The following is a full tabulated return of the results obtained from the five experimental plots.

Potato Experimental Plots, 1909-10.

No. of Plot.	No of Row.	Seed.	Treatment.	Sprayed.	Date of Spraying.	Manure per Acre.	Results.	Yield per Acre. Remarks.
J. SHEARER, WALLACE.								
1	1	N.Z. Pink-eye (Scabby) ..	Nil	No ..	..	Nil	55% Clean 45% Scabby	4 tons 14 cwt.
	2	N.Z. Pink-eye (Scabby) ..	Nil	No ..	..	Iron sulphate, 1½ cwt. on top of ground	57% Clean .. 43% Scabby	5 tons
	3	N.Z. Pink-eye (Scabby) ..	Nil	No ..	..	Green manure (Spear grass)	62% Clean .. 38% Scabby	6 tons. Scabby potatoes not badly scabbed
	4-6	N.Z. Pink-eye (Scabby) ..	Nil	Yes ..	4·1·10 21·3·10	Nil	53% Clean .. 47% Scabby	5 tons 4 cwt. outside rows
2	1-3	N.Z. Pink-eye (Scabby) ..	Formalin, 1 lb. in 30 gals. water for two hours. Dried and cut	No ..	..	Nil	79% Clean .. 21% Scabby	5 tons 9 cwt.
	4-6	N.Z. Pink-eye (Scabby) ..	Formalin, 1 lb. in 30 gals. water for two hours. Dried and cut	Yes ..	4·1·10 21·3·10	Nil	74% Clean .. 26% Scabby	4 tons 16 cwt.
3	1-3	N.Z. Pink-eye (Clean) ..	Nil	Yes ..	4·1·10 21.3.10	Nil	63·6% Clean 36·4% Scabby	4 tons 18 cwt.
	4-6	N.Z. Pink-eye (Clean) ..	Nil	No ..	..	Nil	71% Clean .. 29% Scabby	4 tons 10 cwt.
4	1-3	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. to 30 gals. water for two hours. Dried and cut	Yes ..	4.1.10 21.3.10	Nil	63·5% Clean 36·5% Scabby	4 tons 18 cwt.
	4-6	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. to 30 gals. water for two hours. Dried and cut	No ..	..	Nil	67% Clean .. 33% Scabby	4 tons 18 cwt. Not so badly affected as rows 1, 2, 3
5	1	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours. Dried and cut	No ..	..	Potato manure (double potash), 4 cwt.	74% Clean .. 26% Scabby	6 tons 2 cwt.
	2	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours. Dried and cut	No ..	..	Superphosphate, 4 cwt. (acid)	67·3% Clean 32·7% Scabby	5 tons 4 cwt.
	3	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours. Dried and cut	No ..	..	Potato manure A, 4 cwt.	66·5% Clean 33·5% Scabby	6 tons 7 cwt.

	4	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours. Dried and cut	No ..	..	Iron sulphate, 1½ cwt. Sown in furrow	66% Clean .. 34% Scabby	5 tons 4 cwt. Sample badly affected
	5	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours. Dried and cut	No ..	..	Superphosphate (normal), 4 cwt.	60% Clean .. 40% Scabby	6 tons
	6	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours. Dried and cut	No ..	..	Nitro-superphosphate, 4 cwt.	80% Clean .. 20% Scabby	7 tons 6 cwt. Outside row
				J. DOWNEY, WALLACE.				
1	1	N.Z. Pink-eye (Scabby) ..	Nil	Yes ..	5.1.10 21.3.10	Nil	43% Clean .. 57% Scabby	2 tons 16 cwt. Very scabby
	2	N.Z. Pink-eye (Scabby) ..	Nil	Yes ..	5.1.10 21.3.10	Iron sulphate, 1½ cwt. after seed was covered	42·5% Clean 57·5% Scabby	3 tons. Very scabby
	3	N.Z. Pink-eye (Scabby) ..	Nil	Yes ..	5.1.10 21.3.10	Green manure ..	41% Clean .. 59% Scabby	4 tons 2 cwt. Badly scabbed
	4–6	N.Z. Pink-eye (Scabby) ..	Nil	No ..	..	Nil	56·5% Clean 43·5% Scabby	2 tons 18 cwt. Badly scabbed
2	1–3	N.Z. Pink-eye (Scabby) ..	Formalin, 1 lb. to 30 gals. water for two hours	Yes ..	5.1.10 21.3.10	Nil	76% Clean .. 24% Scabby	3 tons 6 cwt. Affected potatoes slightly scabbed
	4–6	N.Z. Pink-eye (Scabby) ..	Formalin, 1 lb. to 30 gals. water for two hours	No ..	..	Nil	72% Clean .. 28% Scabby	3 tons 13 cwt. Only slightly scabbed
3	1–3	N.Z. Pink-eye (Clean) ..	Nil	No ..	..	Nil	59% Clean .. 41% Scabby	2 tons 15 cwt. Rather badly scabbed
	4–6	N.Z. Pink-eye (Clean) ..	Nil	Yes ..	5.1.10 21.3.10	Nil	60% Clean .. 40% Scabby	2 tons 18 cwt. Rather badly scabbed
4	1–3	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours	No ..	..	Nil	73% Clean .. 27% Scabby	2 tons 8 cwt.
	4–6	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours	Yes ..	5.1.10 21.3.10	Nil	75% Clean .. 25% Scabby	2 tons 10 cwt. Affected potatoes slightly scabbed
5	1	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours	No ..	..	Nitro-superphosphate, 4 cwt.	80% Clean .. 20% Scabby	5 tons 4 cwt. Very clean
	2	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours	No ..	..	Superphosphate (normal), 4 cwt.	76% Clean .. 24% Scabby	5 tons. Fairly clean
	3	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours	No ..	..	Iron sulphate, 1½ cwt. Sown in furrow	62% Clean .. 38% Scabby	2 tons 16 cwt. Fairly scabby
	4	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours	No ..	..	Potato manure A, 4 cwt.	76% Clean .. 24% Scabby	5 tons. Fairly clean
	5	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours	No ..	..	Superphosphate (acid), 4 cwt.	63% Clean .. 37% Scabby	4 tons 9 cwt. Fair percentage slightly scabbed
	6	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours	No ..	..	Potato manure (double potash), 4 cwt.	75% Clean .. 25% Scabby	5 tons. Fairly clean

POTATO EXPERIMENTAL PLOTS, 1909-10—*continued.*

No. of Plot.	No. of Row.	Seed.	Treatment.	Sprayed.	Date of Spraying.	Manure per Acre.	Results.	Yield per Acre. Remarks.
			MR. SUMMERS, LANCEFIELD.					
1	1–3	Carman (Scabby) ..	Nil	Yes ..	14.1.10 5.4.10	Nil	83% Clean .. 17% Scabby	1 ton 5 cwt.
	4	Carman (Scabby) ..	Nil	No ..	..	Green manure (Spear grass)	51% Clean .. 49% Scabby	2 tons 13 cwt.
	5	Carman (Scabby) ..	Nil	No ..	..	Iron sulphate, 1½ cwt. On surface of ground	85% Clean .. 15% Scabby	1 ton 2 cwt.
	6	Carman (Scabby) ..	Nil	No ..	..	Nil	83% Clean .. 17% Scabby	1 ton
2	1–3	Carman (Scabby) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Nil	82% Clean .. 18% Scabby	1 ton
	4–6	Carman (Scabby) ..	Formalin, 1 lb. in 30 gals. water	Yes ..	14.1.10 5.4.10	Nil	82·4% Clean 17·6% Scabby	1 ton
	1–3	Carman (Clean) ..	Nil	Yes ..	14.1.10 5.4.10	Nil	78% Clean .. 22% Scabby	1 ton 10 cwt.
	4–6	Carman (Clean) ..	Nil	No ..	..	Nil	87% Clean .. 13% Scabby	1 ton 11 cwt.
4	1–3	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours. Dried and cut	Yes ..	14.1.10 5.4.10	Nil	84% Clean .. 16% Scabby	1 ton 6 cwt.
	4–6	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water for two hours. Dried and cut	No ..	..	Nil	70% Clean .. 30% Scabby	1 ton 4 cwt.
5	1	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Nitro-superphosphate, 4 cwt.	77% Clean .. 23% Scabby	2 tons 18 cwt.
	2	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Superphosphate (normal dry), 4 cwt.	74% Clean .. 26% Scabby	2 tons 7 cwt.
	3	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Iron sulphate, 1½ cwt. Sown in furrow	70% Clean .. 30% Scabby	1 ton 4 cwt.
	4	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Potato manure A, 4 cwt.	84% Clean .. 16% Scabby	3 tons 2 cwt.
	5	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Superphosphate (acid), 4 cwt.	89% Clean .. 11% Scabby	2 tons 12 cwt.
	6	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Potato manure (double potash), 4 cwt.	73% Clean .. 27% Scabby	3 tons 2 cwt.

MR. CROWE, KOROIT.

1	1–3	N.Z. Pink-eye (Eel-worm)	Nil	Yes ..	10.12.09 24.12.09	Nil	61·5% Clean 38·5% Eel-worm	7 tons
	4	N.Z. Pink-eye (Eel-worm)	Nil	No ..	..	Green manure (Grass) ..	62% Clean .. 38% Eel-worm	7 tons
	5	N.Z. Pink-eye (Eel-worm)	Nil	No ..	..	Iron sulphate on top of ground	53% Clean .. 47% Eel-worm	7 tons 2 cwt
	6	N.Z. Pink-eye (Eel-worm)	Nil	No ..	..	Nil	53% Clean .. 47% Eel-worm	8 tons 8 cwt.
2	1–3	N.Z. Pink-eye (Eel-worm)	Formalin, 1 lb. to 30 gals. water	Yes ..	10.12.09 24.12.09	Nil	47·3% Clean 52·7% Eel-worm	7 tons
	4–6	N.Z. Pink-eye (Eel-worm)	Formalin 1 lb. to 30 gals. water	No ..	..	Nil	50·5% Clean 49·5% Eel-worm	6 tons 12 cwt.
3	1–3	N.Z. Pink-eye (Clean) ..	Nil	No ..	..	Nil	67·6% Clean 32·4% Eel-worm	6 tons 10 cwt.
	4–6	N.Z. Pink-eye (Clean) ..	Nil	Yes ..	10.12.09 24.12.09	Nil	62·3% Clean 37·7% Eel-worm	7 tons
4	1–3	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Nil	57·4% Clean 42·6% Eel-worm	6 tons 10 cwt.
	4–6	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water	Yes ..	10.12.09 24.12.09	Nil	54·4% Clean 45·6% Eel-worm	6 tons 4 cwt.
5	1	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Nitro - superphosphate, 4 cwt.	63% Clean .. 37% Eel-worm	7 tons
	2	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Superphosphate, 4 cwt.	70% Clean .. 30% Eel-worm	8 tons 4 cwt.
	3	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Sulphate of iron, 1½ cwt. In furrow	53·6% Clean 46·4% Eel-worm	6 tons
	4	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Potato manure A, 4 cwt.	72·2% Clean 27·8% Eel-worm	7 tons 10 cwt.
	5	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Superphosphate (acid), 4 cwt.	71% Clean .. 29% Eel-worm	7 tons
	6	N.Z. Pink-eye (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Potato manure (double potash), 4 cwt.	67·5% Clean 32·5% Eel-worm	8 tons 8 cwt.

Potato Experimental Plots, 1909-10—*continued*.

No. of Plot.	No. of Row.	Seed.	Treatment.	Sprayed.	Date of Spraying.	Manure per Acre.	Results.	Yield per Acre. Remarks.
			Mr. E. R. Morton, Drouin.					
1	1–3	Brownell's Beauty (Eel-worm)	Nil	Yes ..	17.12.09	Nil	52% Clean .. 48% Eel-worm	2¼ tons. Sample poor
	4	Brownell's Beauty (Eel-worm)	Nil	No ..	..	Green manure (Oats ..	60% Clean .. 40% Eel-worm	2½ tons. Fair sample
	5	Brownell's Beauty (Eel-worm)	Nil	No	.	Iron sulphate ..	45% Clean .. 55% Eel-worm	2¼ tons. Sample poor
	6	Brownell's Beauty (Eel-worm)	Nil	No .		Nil	48% Clean .. 52% Eel-worm	2¼ tons. Sample poor
2	1–3	Brownell's Beauty (Eel-worm)	Formalin, 1 lb. to 30 gals. water	Yes .	17.12.09	Nil	56% Clean .. 44% Eel-worm	2 tons. Sample poor and badly affected
	4–6	Brownell's Beauty (Eel-worm)	Formalin, 1 lb. to 30 gals. water	No ..	..	Nil	50% Clean .. 50% Eel-worm	2¼ tons. Sample poor and badly affected
3	1–3	Carman (Clean) ..	Nil	No ..	..	Nil	60% Clean .. 40% Eel-worm	2¼ tons. Sample poor and badly affected
	4–6	Carman (Clean) ..	Nil	Yes ..	17.12.09	Nil	46% Clean .. 54% Eel-worm	2 tons. Sample poor and grubby
4	1–3	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water	Yes ..	17.12.09	Nil	63% Clean .. 37% Eel-worm	2¼ tons. Sample poor
	4–6	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Nil	56% Clean .. 44% Eel-worm	2½ tons. Sample poor, badly affected
5	1	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Nitro-superphosphate ..	83% Clean .. 17% Eel-worm	4½ tons. Sample good, lightly affected
	2	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..		Superphosphate (normal)	73% Clean .. 27% Eel-worm	4½ tons. Sample good, lightly affected
	3	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..		Sulphate of iron ..	48% Clean .. 52% Eel-worm	2½ tons. Sample poor, badly affected
	4	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..		Potato manure A ..	73% Clean .. 27% Eel-worm	4¼ tons. Sample good, lightly affected
	5	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..		Superphosphate (acid) ..	66% Clean .. 34% Eel-worm	4½ tons. Sample good, slightly affected
	6	Carman (Clean) ..	Formalin, 1 lb. in 30 gals. water	No ..	..	Potato manure (double potash)	60% Clean .. 40% Eel-worm	4½ tons. Sample good, slightly affected

BUILDING HINTS FOR SETTLERS.

XI. FARM PLUMBING—ODD JOBS.

C. H. Wright, Instructor in Plumbing, Eastern Suburbs Technical College.

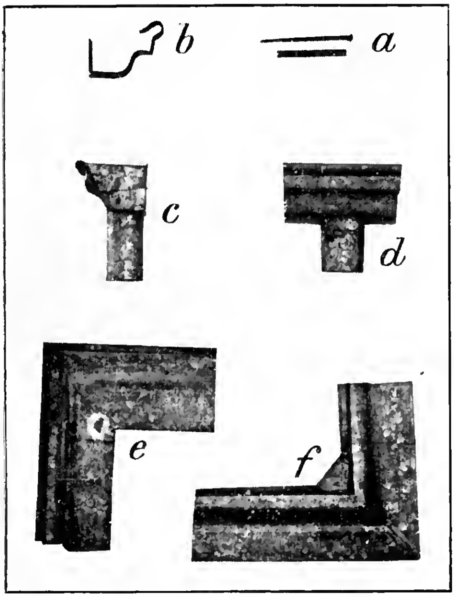
The selection and care of tools, having been described in the previous article, the use of them will now receive consideration. Although amateur plumbing may lack some of the charms of carpentering and engineering, it is none the less useful; and if the farmer were able to do a little himself, it would often add greatly to the domestic comfort of his family. Those living close to townships are in a position to engage qualified mechanics, but others are inconveniently situated and unable to meet this expense.

The soldering of galvanized sheet iron will receive first attention. This metal is used to a great extent in farm dwellings and buildings. Inferior soldering is so frequently met with that it is considered best to describe the process in detail.

Galvanized sheet iron consists of iron rolled out into thin sheets, those in general use being 26 and 24 gauge respectively. It is then galvanized by being dipped into molten zinc. The solder used, which should consist of equal parts of tin and lead, melts at 370 degrees Fah. This heat is applied with a soldering iron, which has been made hot in a firepot made of an old white-lead tin or nail can. If, while one is being used, another is getting hot, no time will be wasted in waiting. A flux is required to make the solder adhere to the metal; for galvanized iron use raw spirits of salts, which is applied by means of a brush. As brushes wear out quickly, it is well to know how to make one. This may be done in the following manner:—Cut a piece of tin 6 inches by $\frac{3}{4}$ inches, and bend it double; this will then be $\frac{3}{8}$ inch wide. Before tightly closing it place some horse-hair inside so as to leave a tuft projecting from one end. Then compress the sides together, and finally trim the hair with the snips.

When the soldering iron is hot it must be tinned quickly as follows:—First file the four tapered sides bright towards the point. Then insert the bright point in a piece of sal-ammoniac and then rub on a piece of solder, and the iron will, if hot enough, show a brightly tinned "face." Failing the sal-ammoniac, a piece of galvanized iron and a little spirits of salts may be used to tin the filed surface. By rubbing the soldering iron in the sal-ammoniac at frequent intervals a good face will be retained on the iron. With a little practice the right working heat will be readily ascertained; if too cold the solder will not flow freely, and if too hot the tinning will be burnt off.

With the actual soldering, first see that the lap fits well, and then run the spirits along the seam with the brush. Melt a tack of solder here and there to hold it in position. Then hold the face of the iron well *on* the lap, and feed it with solder as you draw it along. This will sweat the solder underneath and make a strong joint. Should it appear rough, run the iron over it the second time, only do not add any more solder—just a little spirits to help it to flow freely while you hold the lap down with the point of a file or some similar tool. Then wash it with a piece of rag, as any spirits left on will deteriorate the material. When soldering tin, some pieces of zinc must be clipped into the spirits to "kill" it.



5. SPOUTING.

a, Spike and tube; *b*, bracket; *c*, stop end; *d*, down-pipe socket; *e* and *f*, angles.

When repairing a tank or any other galvanized article, see that the joint is clean, and, if painted or discoloured, scrape it well with the shavehook. Apply spirits freely, and wipe it with a cloth before attempting to solder. In repairing old spouts, &c., one may have some trouble in getting the solder to take; but in soldering new material it will flow easily enough, so clean the surface well, and scrape till the material is bright, and use a hot iron.

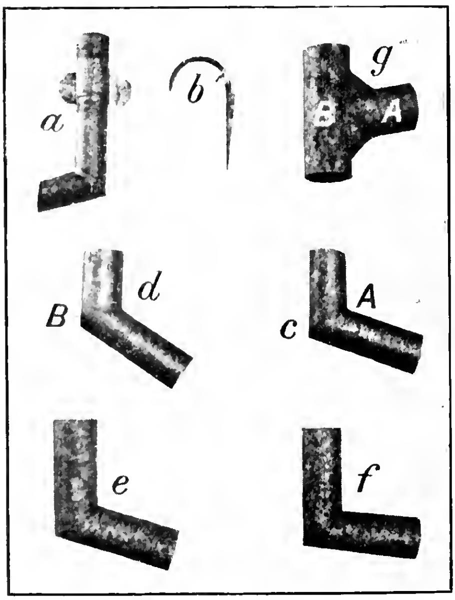
Spouting.—This is sold in 6-ft. lengths, 4, $4\frac{1}{2}$, and 5 inches respectively wide. These are joined together to make up the length required to suit a building, each joint having about 2 inches of a lap. Spouting is fixed by the aid of spikes and tubes, or brackets. (Illustration No. 5—*a* and *b*.)

Stop ends are fixed by first marking the print of the spout correctly on to a piece of plain iron. Cut same to the pencil line, but leave about $\frac{3}{4}$ inch to turn around the back. (5*c*.)

Sockets for down pipes are made as follows:—First cut off 6 inches of down pipe; break the joint, and refix, giving it a slight taper. Next place it on the bottom of the spouting and mark around with a lead pencil. Cut out the hole neatly to the line, and insert the socket from the inside, and trim off so as to allow 1-16th inch lap inside. Turn this over at right angles, pull well down, and, after seeing that the socket is square with the spout, it can be soldered. (5*d*.)

Angles in spouts are so difficult to make that it is better to buy them ready made.

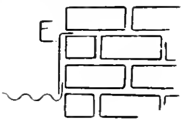
Hints on Fixing.—First drive in a carrying-spike or long nail at each end of the building, giving the necessary

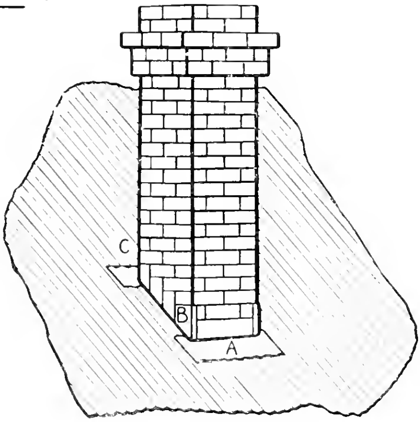


6. DOWN PIPES.

fall to the outlet. Then stretch a chalk line from nail to nail, driving additional spikes under it at intervals of about 4 feet. Then lay the spout on, and fix with screws and tubes, but, if brackets are used, they must be fixed before the spout is placed in position. But above all, if you are anxious to make a creditable job, see that it is straight. Do not attempt to join more than four lengths together on the bench or ground. If you require a longer length, have a slip joint in the centre, cutting the back on the bevel for convenience of soldering. This joint can be made when the spouting is fixed in position.

Many farmers will find it to their advantage to collect the rainfall and convey it into storage tanks. When erecting new buildings, arrange the catchment areas of the roofs so that the rainfall is not split up into small sections, and not worth collecting. But, in any case, if the water is wanted, store it, for tanks are cheap, and can be had to hold from 50 gallons upwards. Rain water may be conveyed from the spouts to the storage tanks by the aid of *down pipes*. These are sold in 6-ft lengths, from 2 inches to 4 inches in diameter, and are fixed to wood-work by the aid of straps (6*a*) and to brick-work by hooks (6*b*) or straps. Change of direction and branches can be made on the job. On perpendicular pipes seams are kept to the back; on horizontal pipes, to the top. Lap all joints and elbows the same as the flow of water, or they will catch and retain any obstructions that may be washed down.



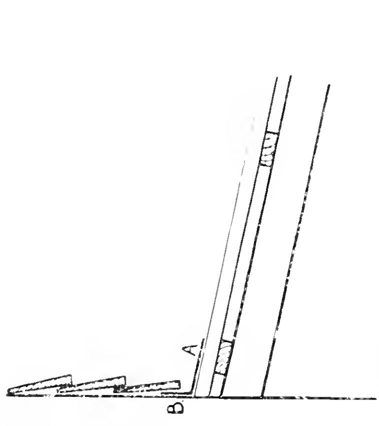


7. CHIMNEY FLASHING.

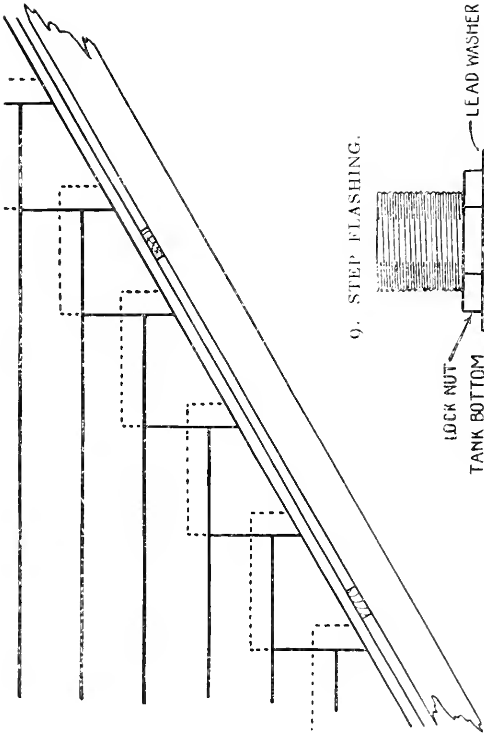
Elbows.—First mark bevel required on a board, then cut pipe as shown in 6*c*. Mark the point A with a pencil, and trim with the snips to the line. Tap edge slightly over at A. Place it again in position and mark back, as shown in B. (6*d*.) Tap back over about 1-16th inch and solder. Always give an elbow as much fall as possible, see 6*e* which shows a good fall; No. 6*f* shows a bad fall, likely to get stopped up.

Branches are more easily made (6*g*). First fit pipe A to pipe B, then mark around pipe A on pipe B. Cut hole to mark, fit, and solder. Do not allow pipe A to project inside pipe B. With all work try to keep it straight or plumb, or it will not be worth looking at.

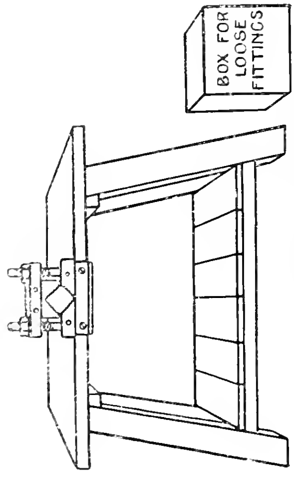
Roof Flashing is used to prevent water finding its way in between an upright wall and the roof covering. A chimney may be flashed in lead, iron, or zinc (No. 7). An iron roof must be cut to fit tightly against the chimney at A, and the sides must be turned up 2 inches at B. A small iron gutter can be fixed at C, and allowed to project 4 inches past the sides of the chimney at each end. The joints between the course of



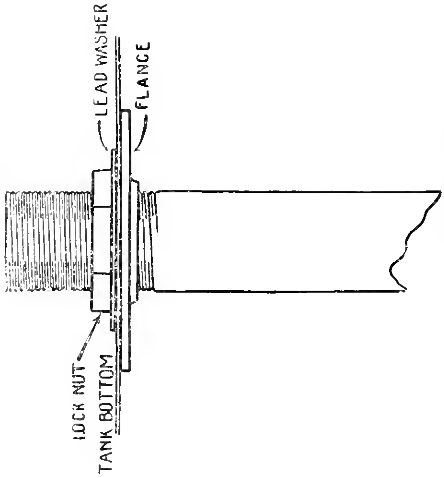
8. FLASHING FOR LEAN-TO ROOF.



9. STEP FLASHING.



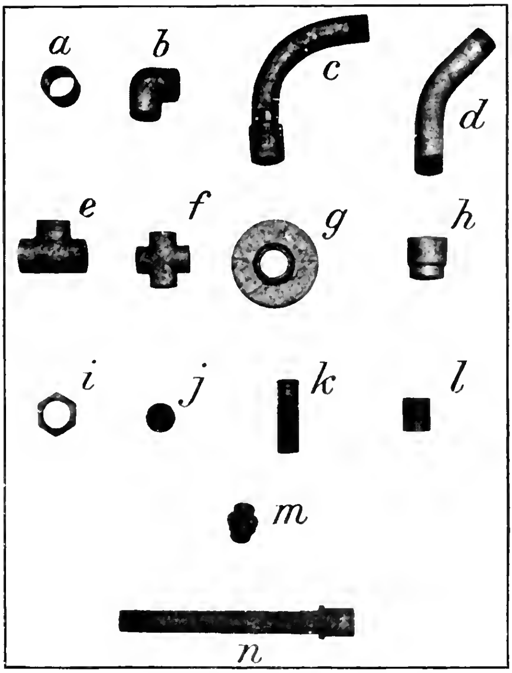
10. PIPE VICE BENCH.



11. TANK CONNEXION.

bricks of the chimney can be then raked out, and the iron flashing can be fixed as follows:—

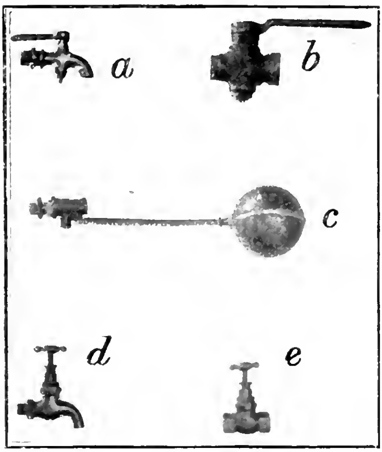
At A turn 1 inch in the brick-work and 6 inches on the iron. The flashing is held in position by hoop-iron wedges, and a few spring-head nails driven into the roof batten through the apron. For step flashing at B, laps are arranged as shown at E. The back of the chimney gutter should also be flashed, and the ends of the gutter and apron will require cutting down and soldering. A "lean-to" roof may be flashed in lead, galvanized iron, or zinc, as shown in No. 8, with 4-in. or 5-in. lap at A and 3 inches turned up at B. Step flashing with iron between a weatherboard wall and an iron roof may be done as in No. 9.



12. SOCKETS, ELBOWS, BENDS, TEES, ETC.

a, Pipe socket; *b*, pipe elbow; *c*, pipe bend; *d*, pipe spring; *e*, tee or branch; *f*, cross; *g*, flange; *h*, reducing socket; *i*, lock nut; *j*, plug; *k*, nipple (long); *l*, nipple (short); *m*, barrel union; *n*, long thread.

Water Pipes, Fittings, and Taps.—Galvanized wrought iron pipes are made in sizes from $\frac{1}{4}$ inch to 4 inches, and are joined together by sockets. Changes of direction are made by the aid of elbows, bends, and springs. Branches are made by the aid of fittings called tees. Other useful fittings are given in No. 12.



13. TAPS—LOW PRESSURE AND HIGH PRESSURE.

a, L.P. bib; *b*, L.P. stop; *c*, L.P. ball; *d*, H.P. bib; *e*, H.P. stop.

Cutting and Screwing Pipes. First fix your vice on a bench as shown in No. 10, or on any suitable post or rail. To cut a pipe it must first be fixed in the vice. Then fix the cutters on the mark, and slowly revolve them around the pipe, tightening them down and adding a little oil from time to time until the cut is completed.

To thread a pipe set up the right size guide and die, then place the stocks on the pipe (guide first), turn them around, keeping a constant direct pressure against the pipe until the dies grip. Do not have too much pipe projecting from the vice or it may twist and split. After revolving them two or three times, remove the dies, and oil the thread; then replace, and continue screwing until the end of the pipe projects through the face of the die. Up to $1\frac{1}{4}$ inch screwing is easy work for one, but for larger sizes assistance will be required.

A *connexion* to a tank is illustrated on page 586 (No. 11). All the fittings required are named. These will need to be bedded with white lead or paint. Keep the end of the pipe up from the bottom of the tank to prevent sediment getting into it. If necessary to run the pipe to a draw-off tap for domestic, dairy, or other purposes, or to a water trough, proceed as follows:—

First open your trench, if any, about a foot deep or deeper where under cart tracks. Then get the length from tank to ground and cut and screw the pipe to suit. Place a bend at the bottom, or a tee plugged one end would be better to allow for future extensions. Work from this to the trough, screwing up all joints firmly on the way—a little hemp on the threads will assist in making them water-tight. Should a branch be required, use a tee. It would be as well to consider whether one is likely to be required for future use; if so, fix it now, and plug up, for it is very troublesome to insert one afterwards.

When screwing up small pipe, say $\frac{3}{4}$ inch or $\frac{1}{2}$ inch, a little caution is necessary to prevent splitting the fitting; so for small work do not use the powerful wrenches or long levers suitable for heavy strong pipe. When entering the thread let it find its own way just as in screwing a nut on a bolt. Keep the pipe straight and do not use force or you may cross the thread and strip it. When once it has entered it may be screwed up with the pipe wrench.

It would be wise to fix a stop tap (13*b*) just below the tank. A ball tap similar to that illustrated (13*c*) can be used for the troughs. The other taps shown in No. 13 are suitable for farm, dairy, domestic, and other uses.

HOUSEHOLD INSECT PESTS.

(*Continued from page 482.*)

C. French, junior, Assistant Entomologist.

Cockroaches.

Cockroaches are usually found in crevices near fire places. They are omnivorous, their food consisting of any dead animal matter, cereal products, and other kinds of food. It is also stated that they will eat woollens and leather, frequently causing extensive damage to books.

The eggs, instead of being deposited separately as with other insects, are brought together in the abdomen of the female into a hard horny pod or capsule, which often nearly fills the body of the parent. The number of eggs in the capsule varies in the different species. They are arranged in two rows, the position of the eggs being indicated on the exterior of the capsule by transverse lateral impressions. The capsule is oval, elongate, or somewhat bean-shaped; and the young when hatched pass through a number of moults. It is stated by some entomologists that it takes four or five years for a cockroach to reach full growth, but this is not yet confirmed. The general opinion is that one generation per year is produced.

Remedies.—Powdered borax sprinkled into crevices is an old fashioned but reliable remedy. Mr. Tepper, Entomologist of the Adelaide

Museum, recommends a rather novel method. He places a saucer containing one part of plaster of Paris to four of flour, well mixed, and close to it, another saucer full of water, with a few sticks resting against them, so that they can easily get to the food and water. The cockroaches become thirsty after a flour and plaster diet and then drink the water, with fatal results. Pyrethrum powder (insecticide) blown into crevices soon rids a house of these pests. Fumigation by hydrocyanic acid gas is absolutely the most effective remedy, but owing to its dangerous nature, it should only be used by experienced persons. Bisulphide of carbon has also been tried with success, but this also requires the utmost care in handling, as it is highly inflammable. Phosphorus paste has been found of value. It must, however, be used with great care; it should be placed in position the last thing at night, and the remains removed in the morning before the children are about.

ANTS.

Several species of ants are found about houses, the small Black Ant, the Sugar Ant, and the small Red Ant being the most troublesome. The first named often make their nests in the walls, and are sometimes difficult to find; but when once located it is an easy matter to destroy them. Syringe the nest with strong benzine, kerosene, boiling water, carbolic acid, or bisulphide of carbon. The last named is one of the best remedies, but, as stated before, care must be taken when using it. Sprinkling insecticide about the crevices by which they enter is also a good method of exterminating them.

The so-called Sugar Ant (*Camponotus nigriceps*) makes large mound-like nests. When these are noticed, procure a stout stick, and make a hole about a foot deep. Into the centre of the nest pour about half-a-cupful of bisulphide of carbon, and immediately close the hole over with clay or some other heavy soil. The fumes from the carbon will penetrate through the nest, and will not only kill the ants, but destroy the eggs as well. This remedy has also been tried for the common Bull-dog Ants (*Myrmecia*), Jumping Ants (*Myrmecia nigrocincta*, *M. pilosula*, &c.), and the small Red House Ant (*Monomorium pharaonis*), with much success. The so-called White Ant (*Termes sp*) is perhaps the most serious pest. In some houses joists, uprights, and verandah posts are completely hollowed out by these insects. A great mistake is often made by people when building in a white ant-infested district. When clearing the land of eucalypts and other trees, instead of grubbing and burning the stumps, they allow them to remain in the ground. These are often full of white ants. When a house is built over these stumps or in the vicinity, it is then a simple matter for the ants to leave the stumps, and to commence their work of destruction. In such districts it is advisable to have the houses built so as to permit of entrance under them for the purpose of examining the timber in the joists from time to time. This is a common practice in many places along the Murray River, as well as in the Northern States.

Remedies.—If the joists or beams are badly infested with white ants, it is far better to have them taken out carefully and new ones put in. But the latter before being put in should be treated with corrosive sublimate dissolved in alcohol or even water. Carbolic acid may also be used for this purpose. The old ones should be at once destroyed by burning. Another useful remedy is Quibell's mixture (in proportions of one to thirty parts of water) in which the timber should be dipped before using. Painting the wood with tar is also a preventive. "Preservative Oil" is highly recommended by Mr. Froggatt, Government Entomologist of New South Wales. He states that floor joists after they are laid should be thoroughly dressed with the oil, to which has been added one pound of arsenic to one gallon of oil. Various patent preparations for the destruction of the white ant are on the market, and several have been found useful.

FLEAS.

Fleas are usually found in houses where cats and dogs are kept, and it is often by these means that they are distributed. The eggs are deposited among the hair of these animals, and they drop on the floors when the animals move about. From the eggs are hatched the larvæ, which penetrate any crevices in the floor and live there until fully grown, feeding upon organic matter usually to be found in cracks. The larvæ develop very rapidly. On becoming fully grown, the larva spins a delicate, white, silken cocoon, and turns into the pupa, and thence into the perfect insect a few days later. Professor Howard states that a whole generation may develop in the course of a fortnight, in warm, damp, weather; but a great increase in the moisture of the weather results in the destruction of vast numbers of the larvæ. Before a vacant house is locked up the floors should be well swept, as the eggs are destroyed thereby.

Remedies.—Persons who keep cats and dogs should provide rugs or sacks for them to lie on. These should be brushed or well shaken daily and the dust containing the eggs thrown into a fire. The animals should be continually washed with phenyle, or some other reliable preparation should be rubbed into their hair. Pyrethrum powder rubbed or sprinkled amongst the hair will cause the fleas to drop off.

Avoid cocoanut matting or other such material for floors, as the young larvæ penetrate into the crevices and if not disturbed will soon become adult insects. Washing bare floors with hot soap-suds, spraying with benzine, and dusting insecticide on carpets, are effectual remedies. There are several species of house fleas in Australia, the Cat and Dog Flea (*Ctenocephalus canis*) and the common House Flea (*Pulex irritans*) being the most common kinds. These insects are introduced species.

BED BUGS.

The Bed Bug is nocturnal in its habits. During the day it conceals itself in crevices and other places. The eggs of the bug are white oval objects, having a projecting rim round the edge, and they hatch in a week or ten days. A period of about eleven weeks is generally supposed by writers on entomology to elapse for the complete maturity of this insect.

Remedies.—Owing to the Bed Bug concealing itself in crevices, it is usually beyond the reach of powder. Therefore it is best to thoroughly syringe such places with benzine, kerosene, carbolic acid, or boiling water. Corrosive sublimate and oil of turpentine are also suggested as remedies. Dr. J. A. Lintner, State Entomologist of New York, mentions another effective means of eradication:—

> Place in the centre of the room a dish containing about 4 ounces of brimstone, within a larger vessel, so that the possible overflow of the burning mass may not injure the carpet or set fire to the floor. After removing from the room all such metallic surfaces, as might be affected by the fumes, close every aperture, even the keyholes, and set fire to the brimstone. When four or five hours have elapsed, the room may be entered and the windows opened for a thorough airing.

Another remedy which has proved successful is the hydrocyanic acid fumigation treatment.

FURNITURE BEETLES.

Under the above heading it is advisable to place insects belonging to the genera *Lyctus*, *Xestobium* (*Anobium*), *Bostrychus*, and others. These are the principal insects which bore into furniture of all kinds, and cause serious damage. The backs of book-cases and cupboards are particularly liable to attacks. Ordinary table legs and wicker work furniture seem to be favourite breeding places for these insects. Such articles as these should be carefully examined before being brought into a house. If any small holes and sawdust are noticed, the furniture should be discarded, and, if badly infested, destroyed by burning. Flooring joists and other timbers in houses are occasionally attacked.

Remedies.—Should timber or furniture be attacked by any species of furniture beetles, no time should be lost in taking measures to suppress the pest. If furniture is attacked it is advisable to treat it with strong benzine, by pouring it over the small holes made in the furniture by the larvæ of these beetles; if this is repeated at intervals it penetrates into the wood and destroys the grubs. Corrosive sublimate (a poison which requires careful handling), carbolic acid, preservative oil, and other remedies recommended for treating White Ants will also be found effective.

SILVER FISH.

This insect is sometimes known as Silver Louse. It measures about one-third of an inch in length and is of a silvery colour, resembling a minute fish. It has two prominent horns or antennæ, and at the end of the body are three long bristle-shaped appendages. The whole surface of the body is covered with small scales, like those on the wings of moths. It is an exceedingly active insect, and is of a slippery nature; it is soft, and it is almost impossible to capture a specimen without crushing it.

Remedies.—Fortunately these insects are easily got rid of. Advantage may be taken of their liking for fabrics and other articles containing starch to poison them. Slip bits of cardboard, on which a thick boiled starch paste liberally poisoned with arsenic has been spread and dried, into all crevices where they occur. But this plan is not to be recommended in places to which children have access. Various insecticides (Pyrethrum powders) sprinkled where these insects most frequent, form a most reliable remedy. Powdered borax or benzine is also of use. The former should be sprinkled in their haunts and the latter syringed into any crevices.

VINEGAR OR FERMENT FLIES.

These are pests which can, with a little care, be kept out of pantries and store-rooms, where they are sometimes found in countless numbers attacking jams, pickles, over-ripe fruit, wine, &c. The female, which is a very small light brownish fly, measuring about an eighth-of-an-inch long, deposits her eggs in or on the receptacles holding any of the above named articles. When the larvæ are hatched and nearly fully developed they leave the liquid, and pupate on the sides and tops of the vessels. The first flies generally issue about four days later.

Remedies.—All receptacles for jam, &c., should be hermetically sealed. Over-ripe and decaying fruit should not be allowed to remain in pantries or store-rooms. A little Pyrethrum powder dusted about where the flies are will soon destroy them.

Conclusion.

There are other insects, viz., the Larder Beetle (*Dermestes*), Flour Beetles (*Tribolium*), Meal Worms (*Tenebrio*), Meal and Dried Fruits Moths and Beetles (*Plodia*, *Asopia* (*Pyralis*), *Ephestia*, *Carpophilus*), Grain Beetles (*Tenebrioides*, *Canandra*), Pea and Bean Weevils (*Bruchus*), Rice Weevils (*Calandria*) and many others; but as they do comparatively little harm in the ordinary households in this country, I have not considered them worthy of special reference. Specimens of these are exhibited at the office of the Government Entomologist, where further particulars may be obtained.

TESTING LUCERNE SEED.

Report on Samples submitted by the Lands Purchase Board.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in the Melbourne University; and Bertha Rees, Government Research Scholar.

The samples have been tested for germination power, purity, presence of weed seeds, and of the spores of parasitic fungi. They vary considerably, many being below the proper standard. Lucerne seed should not contain more than 10 per cent. of hard seeds and the remainder should give a germination of 96 to 98 per cent. Samples 1, 2, 7, 9, 10, 12, 17, 18, 19, 21, 22, 23, 24, 26, 28, 29, 30, 31, 32, 34, all fell much below the standard. The Australian-grown seed, in particular, contained an unduly high percentage of hard seeds, possibly as a result of the drier climate under which the seeds ripen.

As regards weed seeds, the samples were fairly good. Samples 1, 7, 9, 12, contained more than 2 per cent. of weed seeds. The following samples contain weed seeds prohibited entry into the Commonwealth, viz., Nos. 1, 4, 5, 6, 7, 9, 10, 11, 12, 15, 16, 18, 19, 24, 26, 27, 28, 29, 33, 34, but for the most part in extremely small amount. As regards weeds, the worst sample was No. 12, with no less than 6 per cent., including Dodder. This was French Provence seed. The purest samples were Nos. 20, 21, 22, 23, 25, 30, 31, 32, which were all practically free of weed seeds and were all Australian-grown.

The spores of parasitic fungi were present upon samples 19, 21, 22, 23, 34, all of which were Australian-grown, with the exception of No. 34, in which the country of origin is not given. To plant such seed, however pure it may appear externally, is to invite disaster. The following can be regarded as the best samples which could be recommended for purchase with safety, viz., Nos. 3, 4, 5, 6, 8, 11, 13, 14, 15, 16, 20, 25, 27, 33. Some of the samples are rejected on account of the percentage germination being much below standard, since the same price is usually charged for such samples, and they are apt to give rise to many weakly plants. The prices placed on the seeds do not appear to correspond to their value to the purchaser; thus, samples 20, 21, and 22 are all from the same firm and are priced at 1s. 8d., 1s. 9d., 1s. 10d. per lb. respectively. The cheapest sample is one of the best examined. Neither of the two dearer ones could be recommended for purchase on account of the presence of fungus spores and the low percentage germination.

Results of Tests.

No.	Country of Origin.	Germinated.	Hard Seed.	Weed Seeds.	Broken or Damaged Seeds.	Fungus Spores.	Price.
		%	%	%	%		s. d.
1	Imported ? ..	67	17	2·2	3·1	None	..
2	Imported ? ..	67	9	1·7	1	,, ...	..
3	Imported ? ..	93	3	0·5	1·2	,, ...	..
4	Imported ? ..	90	4	0·81	0·9	,, ...	..
5	Imported ? ..	90	1	1·7	4·3	,, ...	..
6	Hungary ..	97	1	0·1	0·2	,, ...	..
7	France ..	69	18	2·5	3	,, ...	..
8	Imported ? ..	96	3	0·1	1	,, ...	..
9	France ..	80	17	2·3	0·4	,, ...	..
10	France ..	83	12	1·6	2·1	,, ...	..
11	Hungary ..	92	3	0·4	0·5	,, ...	..
12	France ..	77	13	6	1·6	,, ...	..
13	France ..	91	4	0·4	1	,, ...	..
14	France ..	96	1	0·3	2	,, ...	..
15	Turkestan ..	98	1	0·3	0·6	,, ...	..
16	Imported ? ..	97	2	0·2	1	,, ...	..
17	Imported ? ..	80	14	0·9	2·5	,, ...	..
18	France ..	79	12	1·5	0·9	,, ...	..
19	Hunter River ..	75	21	2	1·5	Uredospores ..	..
20	Darling Downs	95	4	Nil.	Nil.	None	1 8 lb.
21	Hunter River ..	70	24	Nil.	..	Uredospores and teleutospores	1 9 lb.
22	Tamworth ..	80	13	Almost Nil	1	Uredospores ..	1 10 lb.
23	Hunter River ..	75	13	,,	..	,, ..	..
24	Tamworth ..	79	11	,,	2	None	..
25	Queensland ..	92	3	Nil.	..	,, ...	..
26	Turkestan ..	71	9	1	1·5	,, ...	..
27	Hungary ..	91	4	0·4	1	,, ...	..
28	France ..	64	6	1·8	1	,, ...	..
29	Hunter River ..	64	28	1·2	1	,, ...	..
30	Australia ..	49	46	Almost Nil.	..	,, ...	1 4 lb.
31	Hunter River ..	33	56	,,	4	,, ...	..
32	Warwick ..	82	7	,,	5	,, ...	..
33	Imported ? ..	94	1	,,	1	,, ...	..
34	Imported ? ..	82	4	,,	..	Uredospores ..	..

Percentages of Weed Seeds in Samples.

Sample

1.—2.2 per cent., including White Goose-foot (*Chenopodium album*), Plantain (*Plantago lanceolata*), Red Clover (*Trifolium pratense*), Dock (*Rumex*), Charlock (*Brassica Sinapis*).

2.—1.7 per cent., including Plantain, Red Clover, White Goose-foot, Dock (2 species).

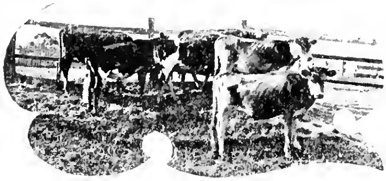
3.—0.5 per cent., including Plantain, *Phalaris* (species), Field Chamomile (*Matricaria inodora*).

4.—0.81 per cent., including Plantain, White Goose-foot, *Phalaris* (species), Dock.

5.—1.7 per cent., including *Phalaris* (species ?), Dock, Black Mustard (*Brassica nigra*).

6.—0.1 per cent., including Dock, White Goose-foot, Red Clover, Composite (Chicory ?), Linseed, Plantain.

7.—2.5 per cent., chiefly Plantain, also Red Clover, White Goose-foot, Dock, Campion (*Lychnis* species), *Phalaris* (species?) *Compositæ?*
8.—0.1 per cent., including White Goose-foot, *Compositæ*.
9.—2.3 per cent., including Dock, Plantain, Red Clover, Wild Caraway (*Carum Carui*), Campion.
10.—1.6 per cent., including Red Clover, Plantain, White Goose-foot, Dock.
11.—0.4 per cent., including White Goose-foot, Plantain, *Phalaris* (species?), *Compositæ* (species ?), Dock.
12.—6 per cent., chiefly White Clover (*Trifolium repens*), also Plantain, Red Clover, Dock, White Goose-foot, *Compositæ* (species ?), and one also of Dodder.
13.—0.4 per cent., including Plantain, *Phalaris* (species?), *Compositæ* (species?), Rye Grass (*Lolium perenne*), Black Mustard.
14.—0.3 per cent., including *Compositæ* (species?), Black Mustard, White Goose-foot.
15.—0.3 per cent., including Plantain, Mustard, Dock, White Goose-foot, *Compositæ* (2 species?).
16.—0.2 per cent., including White Goose-foot, Dock, Plantain, *Compositæ* (species ?), also Fly sent to Mr. French and identified as a small wasp, one of the *Chalcideæ*.
17.—0.9 per cent., including Plantain, *Phalaris* (species ?), White Goose-foot, *Compositæ* (2 species ?).
18.—1.5 per cent., including Plantain, *Phalaris* (species ?), *Compositæ* (species), Red Clover, *Umbelliferæ* (species ?), Dock.
19.—2 per cent., including Dock, Plantain, White Goose-foot.
20.—Good sample, seed well ripened and no weed seeds present.
21.—No weed seeds present. Not so good as previous sample. Seeds unevenly ripened, and many had shrivelled appearance.
22.—Practically free of weed seeds. Only a few seeds of an Umbellifer, probably Wild Caraway.
23.—Practically no weed seeds present. Found one Dock, and one *Phalaris* (species ?), but many seeds of sample were imperfectly ripened, so appeared greenish and shrivelled.
24.—Practically no weeds, few Dock, Umbellifer (species?), and *Phalaris* (species?). Seed fairly well ripened, but many lacked plumpness.
25.—Good clean seed, few broken or pierced. No weed seeds in sample.
26.—1 per cent., including Plantain, White Goose-foot, Dock, *Phalaris* (species ?), *Compositæ* (3 species), *Umbelliferæ* (2 species ?).
27.—0.4 per cent., including White Goose-foot, Dock, *Phalaris* (species ?), *Compositæ* (species?).
28.—1.8 per cent., including Red Clover, Plantain, Dock, *Compositæ* (species), Umbellifer (species).
29.—1.2 per cent., including Dock, White Goose-foot, Umbellifer (species ?), *Compositæ* (species ?).
30.—Sample almost free of weed seeds—a few of White Goose-foot; fairly evenly ripened, but contained a number of shrivelled seeds. Low germination due to presence of hard seeds.
31.—Practically free of weed seeds. Sample appeared good, but contained a very large proportion of hard seeds.
32.—Practically no weed seeds. Sample not well cleaned, contained scraps of foreign matter of different kinds, dust, bits of husks, &c.
33.—Few weed seeds of Plantain, *Compositæ* (species ?), *Phalaris* (species ?), Red Millet (*Panicum miliaceum*), Dock.
34.—Included a small proportion of weed seeds. Dock, Plantain, Umbellifer (species). Sample contained a number of broken seeds, bits of husks and other foreign matter.



THE PROTECTION OF FISH AND GAME.

J. M. Semmens, Chief Inspector of Fisheries and Game.

Some months ago, whilst driving along a country road with a young farmer who considered himself a sportsman, we were discussing the never-ending question of Close Seasons for Wild Duck and Quail. On turning a corner of the road we saw a number of Straw-necked Ibis in a paddock, *apparently* engaged in eating as much of the grass as possible. My companion at once found a text for his arguments, saying:—" Now, there is a bird which is protected during the whole year. If I had my way they would all be shot on sight." On being informed that the ibis is a great eater of grubs, etc., and that a party of them will go systematically through a paddock and clean it up in this regard, he became a little less confident, and promised to look into the matter. When I saw him again recently he was not only satisfied regarding the ibis, but having gone into the matter he had found that quite a number of other birds were worth protecting because of their assistance to farmers.

Generally speaking, these " Farmer's Friends " are protected during the whole year. Other birds and animals are protected for other reasons, *e.g.*, some beautiful birds such as the Lyre Bird are gradually becoming extinct in spite of protection, but without it they would share the dodo's fate in double-quick time. Then take the Native Bear (*Koala*), often called the Monkey Bear and, more recently, the " Teddy " Bear. He is an inoffensive animal whose food is the leaves of the Eucalypt. Surely it is a sin, as well as an offence against the Game laws, to kill him!

The birds and animals which are protected for only portion of the year are those which are considered worth retaining, but which can fairly hold their own by having a close season which corresponds to their usual breeding period. I say " usual " advisedly, because many species of birds are very erratic as regards a breeding time. Among these may be included wild ducks of various kinds, and also quail. The close season is designed to give the birds a rest, and also to cover the " average " breeding time of the birds for an " average " year, so that each bird may have a reasonable chance of assisting in the work of procreation.

Coming to fish, the like applies. Some female fish produce millions of eggs. It is not contended that in any instance every egg would be hatched, but when the mother fish is killed while carrying spawn *every one* of her eggs is lost. Another method of conserving fish is the minimum legal weight provision. The weights are designed, generally speaking, to protect the fish until they are old enough or large enough to spawn once. The legal weights vary from 1 oz. for Garfish to 1½ lb. for Murray Cod and 3 lbs. for Yellowtail.

Following are lists of the various close seasons for imported and native game and the minimum legal weights for the various species of fish.

Other methods of protection are in force, *e.g.*, native game sanctuaries, waters closed against all fishing in some cases and against netting in others, &c. It should be particularly noted that the only legal method of fishing in inland waters is by rod and line or hand line.

Any information regarding the Fisheries and Game Acts may be obtained from the Chief Inspector of Fisheries and Game, Railway Buildings, Flinders-street, Melbourne.

List of Game and Native Game Protected in Victoria under the Second and Third Schedules to the Game Act 1890.

The Whole Year.

All Australian Fauna (with the exception of Snakes) in the National Parks and Public Gardens.
Acanthizae or Tits.
Babblers.
Bee-eaters.
Bitterns.
Bustard or Wild Turkey.
Caterpillar-catchers.
Coach-whip Birds.
Cockatoos, Black.
Cranes—all birds known as Cranes, such as Herons, Egrets, &c. (except the Native Companion or Australian Crane).
Cuckoos.
Cuckoo-shrikes.
Deer.
Doves, Java Turtle
Doves, Wild
Emus.
Ephthianuras or Chats.
Fan-tails.
Fly-catchers.
Frogmouth or Podargus and Mopokes.
Graucalus Family, all members of.
Ibis.
Kangaroos, Black-faced or Mallee (*Macropus melanops*).
Kangaroos, Large Grey (*Macropus giganteus*).
Kangaroos, Large Red (*Macropus rufus*).
Kingfishers, all kinds, including the Great Kingfisher or Laughing Jackass.
Larks (including *Cincloramphus*) and Pipits.
Lyre Birds.
Magpie Larks (Pied Grallina).
Mallee Hens.
Native Bears (*Koalas*).
Nightjars.
Owls.
Parrakeets, Swamp or Ground.
Parrots, Black-tailed or Rock-Pebbler.
Petrels—White-faced Storm, on Mud Island in Port Phillip Bay.
Pheasants.
Pigeons, Wild, including Bronze-winged.
Platypus.
Plover, Southern Stone or Curlew.
Quail, Californian.
Robins.
Seals.
Shrike-tits.
Sittellas or Tree-runners.
Skylarks, English.
Southern Stone Plover or Curlew.
Spoonbills.
Swallows and Martins.
Swans, Black.
Swans, White.
Thick Heads.
Thrushes.
Thrushes, English.
Tree-creepers.
Warblers.
Wedge-bills.
White-faced Storm Petrels on Mud Island in Port Phillip Bay.
Wood Swallows.
Wrens.

From the 1st day of July to Half-past Five o'clock in the Morning of the 1st day of February next following.

Avocets.
Ducks, Wild and Teal.
Gang Gang Cockatoos.
Geese, Wild of all kinds.
Honey Eaters, all kinds (except Wattle Birds and Leather Heads).
Magpies.
Native Companions or Australian Cranes.
Land Rail, and all other members of the Rail Family—Porphyrio, Coots, &c.
Plover, all kinds (except the Southern Stone Plover or Curlew).
Stilts.
Wild Ducks and Teal of all kinds.
Wild Geese of all kinds.

From the 1st day of August to Half-past Five o'clock in the Morning of the 1st day of March next following.

Quail (except Californian Quail).

From the 1st day of March to the 31st day of October.

Opossums.

From the 1st day of May to the 31st day of October.

Wallaby, Black-tailed (*Macropus ualabatus*).
Wallaby, Red-bellied (*Macropus Billiardieri*).

From 1st day to 30th day of November.

White-faced Storm Petrels (see also the Whole Year on Mud Island).

Note.—The commencing and terminating dates are included in the period of the close season.

Close Seasons for Fish.

Black Fish	From 1st September to 15th December in each year (both dates inclusive).
Crayfish	The whole year for all less than 9 inches in length, and for Female Crayfish from the 1st June to the 30th November (both dates inclusive in each year).
English Roach	From 15th September to 15th November (both days inclusive) in the River Yarra, from the Johnston-street Bridge to the place known as Dight's Falls.
English Trout	From the 1st May to the 31st August in each year (both dates inclusive).
Gippsland Perch	From 1st August to the 30th November in each year (both dates inclusive).
Murray Bream, Murray Perch, Murray Cod	From the 1st October to the 30th November in each year (both dates inclusive).

Minimum Weights of Fish.

Barracouta	4 oz.
Blackfish	4 ,,
Bream	5 ,,
Bream, Silver	5 ,,
Butter fish	4 ,,
Cat fish	4 ,,
Crayfish—length	9 ins.
Flathead	4 oz.
Flounder	6 ,,
Garfish	1 ,,
Grayling or Yarra Herring	2 ,,
Ling	5 ,,
Luderick	6 ,,
Mackerel	5 ,,
Mullet	2 ,,
Murray Cod	$1\frac{1}{2}$ lbs.
Murray Perch	8 oz.
Perch	5 ,,
Perch, English	4 ,,
Pike	6 ,,
Red Mullet	4 oz.
Rock Cod	4 ,,
Rough or Roughy	2 ,,
Salmon Trout	2 ,,
Salmon, California	8 ,,
Salmon, English	8 ,,
Sand Mullet or Poddies	6 ,,
Schnapper	12 ,,
Silver fish or Silver Perch	4 ,,
Skipjack	4 ,,
Snook	4 ,,
Sole	5 ,,
Stranger	2 ,,
Travale or Trevalla	6 ,,
Trout of all kinds, not indigenous to Victoria	8 ,,
Trumpeter	6 ,,
Whiting	4 ,,
Whiting, Sand	2 ,,
Yellow Tail	3 lbs.

SPRING FROSTS.

Some Reminders and a Recent Development.

F. de Castella, Government Viticulturist.

Our mild climate renders us safe from the severe winter frosts which, in many less favoured climates, may even in midwinter kill vines outright. At 15 deg. C., =5 deg. F., vines suffer severely; considerably less intense cold may do damage to young grafted vines unless the union be protected by a mound of earth. In such countries as Bessarabia (Southern Russia) intense winter cold necessitates complete burial of the whole vine in order to protect it; this is, in fact, one of the cultural peculiarities of the region. Even in France, winter burial is usual in the coldest parts, such as Champagne, which is situated at the northern limit of the vine-growing climatic zone.

In Victoria, it is only spring frosts that we need consider. Serious damage is occasionally caused by these, especially in the more inland districts where the regularizing influence of the sea is no longer felt, and where the extreme dryness of the air causes evaporation to be active. In some of our most northern districts, though the summer is very warm, severe spring frosts during October and November have occasionally to be reckoned with, visitations which may in a couple of hours destroy the result of a whole year's work, and by damaging the pruning wood even injuriously affect the following year's crop. Nor are vine-growers the only sufferers; orchardists, tomato-growers, and all cultivating tender plants are equally interested in the question

Anything that can be done to prevent, or even to reduce, such damage is well worthy of consideration, and there is no doubt that much can be done in various ways. In the *Journal* for September, 1902 (Vol. I., p. 877) and November, 1903 (Vol. II., p. 342) much valuable information is given concerning the question by Messrs. R. Dubois and G. H. Adcock respectively—to these growers are referred. It is to be regretted that more has not been done on the lines therein indicated, for with few exceptions our vine-growers and orchardists pay but little attention to frost prevention and the closely allied question of frost prediction.

CONDITIONS CONTROLLING THE OCCURRENCE OF FROST.

Before recalling the leading preventive and palliative measures it is well to briefly review the causes which contribute to the general fall of temperature which constitutes the phenomenon known as a frost.

Cold is the absence of heat. When the loss of heat is sufficient for the thermometer to fall below 0° C. or 32° F. water freezes and we have a frost. It is to the sun that we owe the heat that is manifest in every object around us. The surface of the earth absorbs this during the day and during the night it loses it by radiation into space. The rapidity of radiation varies enormously according to circumstances; if sufficiently active or, in other words, if it be not checked by adverse atmospheric conditions, enough heat is lost for the temperature at the surface of the soil to fall below freezing point. The following are the principal causes which prevent a rapid fall of temperature:

Wind. Spring frosts do not occur on windy nights. The soil loses heat by radiation more rapidly than the air, the lower layers of which cool down by direct contact. This cold air being heavier settles in low places where a frost occurs. Wind, by mixing the different layers, prevents this.

Opacity of the Atmosphere to Heat Rays.—It seldom freezes when the sky is overcast. Clouds constitute a screen which prevents radiation in much the same way as the loss of animal heat is prevented by a rug or blanket. Dense clouds are not necessary for this result—a slight haze, even, may be sufficient to prevent a frost. This is one of the ways in which smudge fires act, as we shall see presently.

Latent Heat given off by Water on Condensation and Congelation.—Whenever water changes its state the change is accompanied by either absorption or liberation of heat. The fall on evaporation is particularly well known. We have practical illustrations of it in our water bags and butter coolers—a like absorption takes place on liquefaction (freezing mixtures). The inverse changes, viz., those from the gaseous to the liquid and from the liquid to the solid are accompanied by an exactly equivalent heat transaction; only in the contrary direction—instead of heat being absorbed and the temperature falling, heat is liberated. This cannot, for obvious reasons, bring about a rise in temperature such as would be manifest to our senses. Hence, this change is not so readily realized as the fall of temperature on evaporation; nevertheless it constitutes a most valuable check. Once dew commences to deposit, a further fall of any consequence is not to be feared, since the latent heat liberated counterbalances further loss by radiation.

A similar liberation of heat takes place on congelation or, in other words, the change into hoar frost of the water first deposited as dew. Hence it is that, even though the temperature may fall sufficiently for there to be a frost, disastrously low temperatures will not be reached if abundant moisture be present.

White or Black Frosts.

Thus is explained the well known popular distinction between white and black frosts. In the case of the former, the moisture deposited from the atmosphere, at first in the form of dew, has gradually frozen into the white hoar frost so well known to all. Such frosts are seldom very severe owing to the liberation of heat during the changes in state of the deposited water referred to above. The general temperature can only fall very gradually and it is rare for it to reach a point sufficiently far below freezing for really grave damage to be done.

In the case of a black frost, conditions are very different. They can only occur when the air is so dry that there is not sufficient water vapour to condense and thereby check a further fall. If the other conditions permit active radiation there is nothing to hinder the steady fall of temperature which may thus reach a disastrously low point, although there is practically no outward visible manifestation.

Indirect Preventive Measures.

In addition to the obvious course of only selecting as a site for a vineyard a locality little exposed to frost,* there are several cultural methods by which the vine may be caused to delay coming into leaf for a few days and in this way damage by frost may often be avoided. These methods may be briefly recalled.

Selection of Late Budding Sorts.—Different vines vary greatly in their susceptibility to frost; late sorts often escape when earlier ones succumb. The severe frost at Mildura in September, 1908, did much damage to the Sultana crop, whereas Zantes and Gordos were practically unharmed. Again, several sorts possess the peculiarity of producing fruit on the laterals thrown out as the result of damage to main buds.

Late Pruning.—By delaying the pruning until the buds are about to burst, sprouting may be delayed a week or even two, which may be sufficient to tide over a critical time. This method cannot well be applied to a whole vineyard, but it is always safer to leave the pruning of low-lying parts of a vineyard to the last. The provisional pruning practised in many parts of Europe consists in the removal of all useless wood and the leaving of spurs two or three times the required length, at the first pruning. When the buds are about to burst, these can be rapidly shortened back to the length required, the commencement of vegetation being thus almost as effectively retarded as by late pruning applied to the whole vine.

Sometimes extra rods are left on the vine; these are tied vertically until danger of frost is passed. Should no frost occur, they are removed. In case of frost, they bear the crop, the rest of the vine being shortened back. Sometimes, where vines are trained on cordons, the whole of this is tied vertically until danger of frost is past, and afterwards brought to its horizontal position.

* Hillsides are well known to be less frosty than low-lying flats. The moderating influence of large bodies of water is considerable; in northern Victoria vineyards situated close to the Murray River are much less liable to frost than those 10 or 12 miles from it.

Sulphate of Iron Treatment.—Many ingenious methods have been devised, by means of which a few days or even weeks in the commencement of active growth may be postponed. It has been noticed that the acid sulphate of iron treatment against black spot delays the starting of the buds and its application has thus a dual effect.

Ground Condition.—Keeping the vineyard clean and free from weeds and avoiding cultivation of the soil at the time frost is to be feared serve the same purpose. Weeds and freshly moved soil evaporate moisture actively and thereby accentuate the fall of temperature. It has even been recommended to roll the ground, it having been proved experimentally that such treatment causes the soil to lose several degrees less heat than if left lumpy, owing to the lesser surface exposed by the rolled land.

DIRECT MEASURES.

Several direct means of combating frost have been employed with more or less success. Chief among these are direct heating, smudge fires or the use of smoke, and irrigation. It is not proposed to say anything here about the straw, cardboard, or other movable shelters, which in some parts of Europe are extensively employed, nor the use of white powders, lime washes, &c. Their cost and the amount of labour they necessitate render them unsuited for Australian conditions.

Direct Heating.—At first sight, it might appear that the simplest and most logical method of fighting frost would be by direct heat from fires, and yet, until recently, this method does not appear to have been tried, or even thought of. Smudge fires and protection of various kinds have been recommended and practical use has been made of them since the remotest times, but it is to our American cousins that we have to look for the practical application of direct heating, as a method of fighting frost, and with them its use on a large scale appears to be quite recent. Even in France, many districts of which are frequently devastated by disastrous frosts, I have never heard of recourse being had to the direct heat from fires. It is only indirectly, as a means of producing smoke, that fires are ever referred to. Direct heating seems to be a comparatively recent introduction in America, and to be the result of a disastrous frost in the orchards of the State of Colorado in the spring of 1907. In the following spring, a few orchardists adopted what are now largely used under the name of orchard heaters or fire pots, in order to avoid a repetition of the catastrophe. The success was such that their use has become very general; so much so that in 1909 hundreds of thousands of heaters were employed for protection against frosts on the Western Slope. Various types have been patented, some burning oil, others coal or charcoal. The writer is indebted to Cr. W. B. Lloyd, of Mildura, for prospectuses of several different types of orchard heaters. The following details as to oil heaters are taken from the advertising booklet of the Denver and Rio Grande Railroad, published in 1908:—

> The oil burning orchard heater costs about 22 cents (11d.), and it takes 100 of them to each acre. It is a pot of sheet iron, about the size of a ten-pound lard bucket; a lid of sheet iron slides across the top. The fruit-grower . . . places . . . one in every space between the rows of trees. A gallon of crude oil is put in each heater and a small lump of waste floats on top of the oil, serving as a wick. The height of the flame can be regulated by sliding the cover open or nearly closed. . . . Soon after lighting. . .vapour pours out . . .and mixes with the air in burning, producing a large volume of heavy warm vapour. . . . By keeping up the fires the orchard can be kept above freezing point, even through an outside temperature of 20 degrees F. The cost of equipping an orchard with the heaters is

about \$25 per acre. The cost of operating is about \$5 per acre per night, including labour and oil.

Another type of fire pot burning coal is the "Ideal," in which 15 lbs. coal will burn for $3\frac{1}{2}$ hours, and 25 lbs. $5\frac{1}{2}$ hours.

According to the prospectus the Olson coal orchard heater is a sheet iron pot measuring 18 inches across the top, 9 inches on the bottom, and 12 inches in depth. . . . It burns from 15 to 50 lbs. coal per night, depending entirely on service required. Two men can charge 50 pots in 40 minutes, and one man can light them in three minutes. In a reasonably close orchard 40 to the acre will do the work and save the crop with a temperature of 10 degrees below freezing.

These few extracts, as well as the photograph reproduced from the "Olson" prospectus, in which the pots are much closer to one another than is necessary, will give some idea of the practical results already obtained by this novel method of frost-fighting, in which the heat directly radiating from the fire pots makes good the natural loss by radiation into space.

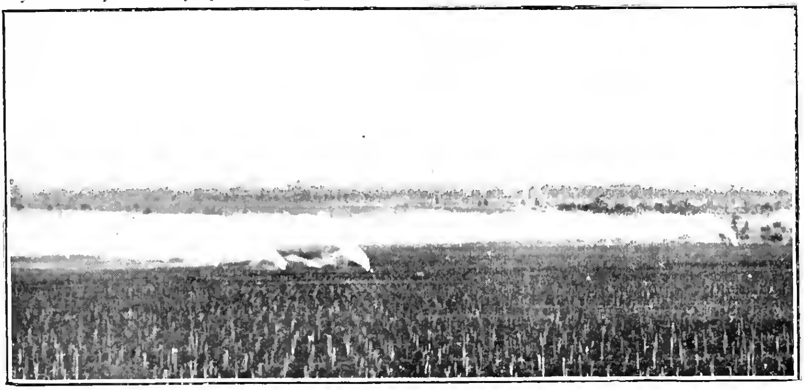
COLORADO FIRE POTS OR ORCHARD HEATERS.

In the 1910 edition of *California Fruits and How to Grow Them*, Professor Wickson refers to orchard heaters, quoting Mr. E. W. Holmes.

Satisfactory results have been gained by the use of soft coal, burned in wire baskets suspended under or beneath the trees. When 20 to 40 of these to the acre were used, we occasionally raised the temperature from 3 to 5 degrees. More has been claimed; but this is all that I am sure has been achieved. However, in a section where the temperature would not go below 25 degrees or 26 degrees for a few hours, this method was ample. The outfit costs about 10 cents a basket, or 4 dollars per acre if 40 baskets are used, and the coal about $2\frac{1}{2}$ dollars per acre per night.

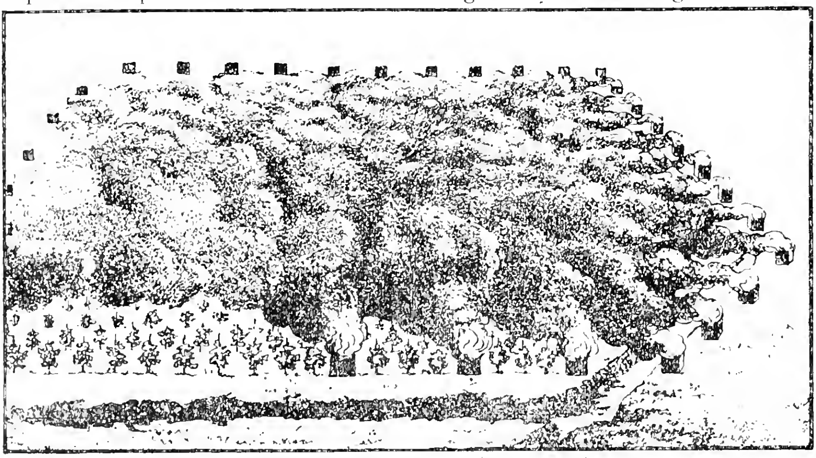
Smudge fires, or artificial clouds, as they are picturesquely termed in French, are not, like the last-mentioned method, in any way a novelty; they have been known and used for many centuries. Pliny recommends them; they were also used in Carthage of old, and even in Peru the natives had recourse to them before the Spanish Conquest. Much valuable information concerning their use will be found in the article by Mr. R. Dubois (Vol. I., p. 877).

Some misconception appears to exist in the minds of a good many persons as to their mode of action. It is often thought, for example, that they merely act by protecting the frozen shoots from the first rays of the



SMUDGE FIRES IN USE AT DOOKIE.

sun—that they only act, in fact, by preventing a rapid thaw. No doubt they exert a very considerable influence in this direction, but, provided they are sufficiently dense, and especially if their production is commenced early enough, they also considerably retard the loss of heat by radiation and keep the temperature of the lower air higher by a few degrees than it



LESTOUT'S "FOYERS" (SMUDGES).

would otherwise be. Frosts do not occur on cloudy nights. The effect of the smoke is to protect from frost in the same way that natural clouds do. It must be remembered that a gain of only a couple of degrees may mean the difference between serious damage and none at all—and such a gain is quite feasible. French authorities consider that this method gives good results provided the temperature does not fall lower than $5\frac{1}{2}$ deg. to 7 deg. below freezing point (32 deg. F.). It naturally follows that best results will be obtained by lighting fires as early as possible; the sooner they are lighted the greater will be the advantage gained. In a general way, they should be started not later than 3 a.m. and kept going until well after sunrise.

Dense smoke may be produced in many different ways. Heaps of damp straw may be rapidly set on fire with the aid of a little coal tar, and, by stirring occasionally with a fork, kept burning for a long time. At the season when frosts are feared it is good policy to have the headlands unploughed—the grass, &c., on them comes in very useful for increasing the volume of smoke, if the straw become too dry. With small heaps of vine cuttings and straw placed handy for the purpose, and a suitable quantity of green grass, the vigneron can easily maintain enough smoke to save his vines in the case of any ordinary white frost, and these are what one most frequently has to deal with. Against a black frost little can be done, but these, fortunately, are of rare occurrence in the spring. The photograph on page 602 was taken at Château Dookie in October, 1900, about an hour after sunrise. The smoke, which was by that time much less dense than previously, had been kept going since 3 a.m. in the lower part of the vineyard—the only portion liable to damage. In spite of a pretty severe white frost very little damage was done, thanks to the measures adopted. The photograph shows the way in which the smoke drifts, in spite of the air appearing to be perfectly still. It shows the necessity for preparing all round the vineyard. The line on the lee side need not be lighted. According to Professor Degrully (Montpellier) the fires should be placed right round the vineyard at a distance of fifteen yards apart and lines should run through it at intervals of from 50 to 100 yards, the fires being 40 to 50 yards from each other in the line.

In France, tarry substances are largely used to produce smoke—sometimes coal tar is burnt in iron pots. Specially prepared boxes of resinous substance resembling pitch are put on the market by several manufacturers; some of these are made from the refuse of resin refineries—a by-product from the turpentine industry of the Landes Department. These are very efficacious, but the price at which they can be landed here is almost prohibitive. Lestout's Foyers are of this type. The illustration reproduced from his circular speaks for itself. In France, these cost 1 franc (about 10d. each). They are placed at intervals of 10 yards around the vineyard or orchard and each one burns for four hours. Should wind or clouds remove the danger of frost these "foyers" can be easily extinguished by covering for a moment with an iron box. Being waterproof they can be left exposed to the weather and can be almost instantaneously lighted with a little kerosene and a plug of waste to act as a wick.

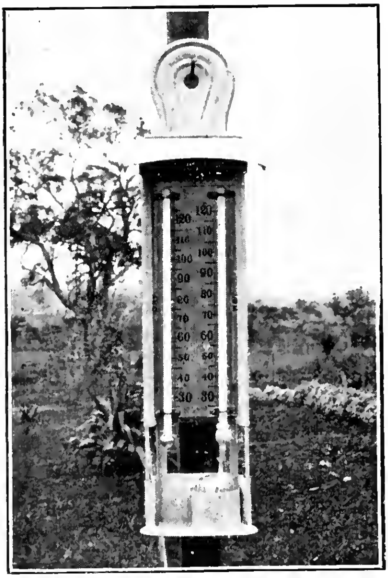
Automatic appliances have been devised which start the fires as soon as the temperature falls to a given point. They are somewhat delicate and, on the whole, seem to be more ingenious than reliable.

Irrigation is a most effectual method of protection against frost. Many of the submersion vineyards of Southern France are thus absolutely saved from frost in low-lying situations where damage from this cause would otherwise be very severe. It is not necessary to completely flood the ground; if this be thoroughly wetted, as in the case of an ordinary watering, damage is prevented even though the temperature in the neighbourhood (where similar protection is not had recourse to) should fall as low as 22 deg. F., or even 20 deg. F.

The application of water in the form of a shower or spray has also been found very effectual. Professor Degrully considers that with large traction spray pumps it would be possible to spray against frost, even on a fairly large scale.

Prediction of Frost.

The direct measures referred to above lead us naturally to the question of frost prediction.



WET AND DRY BULB THERMOMETER.

If one can know the previous evening, with anything like accuracy, what risk there is of a frost the following morning, so that preparations may be made to combat it, one of the principal difficulties is removed. To be obliged to watch the thermometer every night and, more especially, during the early hours of the morning, over a period of several weeks is, to say the least, irksome.

Frost prediction is not only possible, but a comparatively simple matter. The moisture of the air having so important a bearing on the question (see page 598) the determination of the dew point gives very reliable information as to the danger or otherwise of frost.

Instructions as to the determination of dew point by means of the wet and dry bulb thermometer and dew point tables are given in the article by Mr. G. H. Adcock (Vol. II., p. 343).

Should the dew point, according to observations taken about sunset, be in the neighbourhood of 32 deg. F. there will almost certainly be a frost unless a wind springs up, or the sky becomes cloudy.

In order to do away with the necessary calculations a simple table was devised some years ago by a Viennese instrument maker, Mr. H. Kappeler, which so simplifies matters that a slight modification of it is here reproduced, with the Centigrade degrees converted to the Fahrenheit scale. The readings of the wet and dry bulb thermometer, of which there are many makes on the market, are taken. These are referred to in the chart. If the intersection of the thin line from the wet bulb reading, with the thicker one from the dry bulb reading,

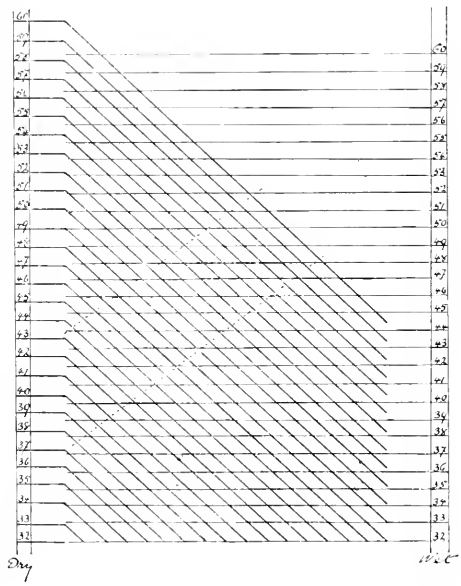


DIAGRAM FOR PREDICTION OF FROST.

falls between the dotted lines, there is danger of frost; if it falls above the upper one there is no danger; whilst, if it falls below the lower one, there is certainty of a frost (unless clouds or winds occur).

Three cases, as examples, will make this clear—

1 Dry bulb, 52 deg.; Wet bulb, 49 deg.—Safety.
2 Dry bulb, 50 deg.; Wet bulb, 45 deg.—Danger.
3 Dry bulb, 50 deg.; Wet bulb, 42 deg.—Certain frost.

The thermometer should be fixed to a stake at a height of 4 or 5 feet from the ground and placed in the shade.

Readings taken when a strong wind is blowing are misleading. The evaporation, being unduly active, the reading of the wet bulb is too low and the danger of frost appears greater than it really is.

Automatic alarm thermometers, which ring an electric bell as soon as the temperature falls to within a couple of degrees of freezing point, are also very useful.

Advantages of Co-operation.

It is hardly necessary to comment on the advantages of co-operation in connexion with the fighting of frosts, as described above, more especially when smudge fires are employed. In valleys where numerous small vineyards are situated in close proximity to one another, as so often occurs, concerted action is particularly effective. The smoke raised by each grower adds its quota to the general total, which thus reaches a considerable volume of much greater density, and therefore, affording more complete protection than can be easily achieved by an isolated vine-grower. Under these conditions, prediction also becomes of special value. If all concerned can be given warning the evening before the frost is expected, steps can be taken such as will render success a practical certainty in the case of any but an unusually severe black frost.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

September is always a busy month in the orchard. Such important works as ploughing; spraying for black spot, leaf curl, peach aphis and other troubles; manuring; and grafting; all require attention, in addition to a number of minor operations.

Cultivation.

It is most important that ploughing should be completed as early as possible. In the past, it has very frequently happened that owing to delaying the ploughing, the orchard and the fruit crop have both suffered very considerably. It is absolutely necessary to cultivate the surface early, to take advantage of the moist surface and consequent easy ploughing; and also to conserve as large an amount of moisture in the soil as possible. The longer the ploughing is delayed, the less moisture is retained in the soil for summer use. Deferred ploughing certainly means dry soil, enfeebled trees, and diminished results. Early ploughing gives exactly opposite results; the earlier the ploughing, the more soil water is conserved.

When the ploughing is completed, the clods should be crushed, and the land harrowed, so that a fine earth mulch may be obtained. The orchard surface should be kept as level as possible, and no irregular ridging or furrows should be allowed.

Manures.

All cover crops planted to supply humus to the soil should now be ploughed in. If the plants are of a leguminous nature, the best time to plough these in is when they are in full flower. If the growth has been at all excessive or rank, the crop may be rolled before ploughing; or it may be mowed or cut with a mowing machine. Every care should be taken that the plants will be well distributed throughout the soil, and large quantities in a mass should not be ploughed under. Artificial and stable manures may also be given to the trees at this time. These should be applied before ploughing.

Some rather remarkable results have been reported from the Woburn Experimental Fruit Farm in England in regard to the results from manuring fruit trees. *The Garden* and the *Gardener's Chronicle*, both English horticultural journals, in recent issues report as a result of some years' experiments, that

> manure, artificial or other, was simply thrown away on orchard trees; that is, apples and pears: the crops from unmanured ground being fully equal to those yielded by the heavily treated soils.

This report has been reprinted in horticultural journals in the State, and it is necessary to direct attention to it. A report was issued from Woburn in the year 1900, in which this report was first published, and until further data comes to hand, it cannot be said whether the above reports refer to these old results, or to the results of later experiments. Regarding this work, two points are absolutely requisite to consider, the soil and its mechanical condition. The soil at Woburn consists of a sandy loam 9 or 10 inches deep, overlying a deep subsoil of clay, in some places 45 feet in depth. The soil is considered to be an average soil in a moderately fertile condition.

The greater part of the orchard is intersected with tile drains, 30 feet apart, three feet below the surface, while provision is made also for surface drainage. The ground was well trenched, *i.e.*, subsoiled, before planting. Thus for these experiments, the soil was prepared in as thoroughly a suitable condition as possible for the reception of the trees.

One of the recognised consequences of subsoiling is an increased feeding area for the roots; and thus, in some instances, manure is not always necessary. Practical fruit-growers in Victoria to-day point to portions of their orchards which have been in full bearing for 9 or 10 years, which were subsoiled before planting, and which have never received an ounce of manure. The fruit crops from such orchards are invariably good, and often in excess of other parts of the orchard, which were not so subsoiled.

Then, to the fruit-grower, an analysis of his soil will be more than ordinarily helpful. If the constituents of the soil are known definitely, the knowledge of the necessity for manure or otherwise is apparent. Owing to the natural soil fertility, there are many orchards in this State which need no manure whatever; yet, in a great many others, owing to the lack of thorough preparation before planting, to bad drainage, or as well to a poor soil, manurial operations are vital.

Thus, growers should not be misled by meagre reports of such experiments, but should consider the question in all its phases. The Woburn experiments have gained for themselves world wide fame, and their results are certainly most valuable to the horticultural world.

Spraying.

The peach aphis will have now made its appearance in orchards which were not sprayed with the red oil emulsion in the winter. The tobacco solution will now be required, and this may be sprayed on as strongly as the grower wishes. If possible, the spraying should be repeated quickly after the first operation, so as to kill any aphides previously protected by the others, or any that may have only been weakened by the first operation.

The time has also arrived when spraying is needful for the prevention of all fungus diseases, such as shothole or scab, black spot, leaf rust, leaf curl, &c. In the case of these pests, " prevention is better than cure " is the invariable rule; and to delay beyond the correct period the application of the necessary sprays, is to court disaster. For black spot of apple and pear, the spraying should be performed as soon as the earliest flowers are opening. For shothole or scab, the time to spray is before the flower petals expand; and the spraying may be repeated, if necessary, after the fruit has set.

For rust and leaf curl the spray should be applied before any sign of trouble appears on the foliage; thus, if the fungus were present during the previous season, it will be necessary to spray early to combat it successfully.

The basis of all successful fungicides is sulphate of copper or bluestone. Bordeaux mixture, a mixture of bluestone, lime, and water, known as the 6—4—40 formula, is used; the materials and quantities being 6 lbs. of bluestone, 4 lbs. of lime, and 40 gallons of water.

Another spray, and in some locations equally as successful in its results as the Bordeaux mixture, is the copper-soda spray; the proportions being 6 lbs. of bluestone, 8 lbs. washing soda, and 50 gallons of water. In each case, the materials should be separately dissolved, and then evenly and simultaneously mixed in a third vessel.

At the Woburn Fruit Farm, previously mentioned, extensive experiments have this year been concluded in the use of fungicides, and the report has just been issued. In addition to the ordinary copper sprays, a new departure in fungicides was tried, in the form of Bordeaux paste. This fungicide was invented by Mr. Spencer Pickering, the manager of the farm, and is now sold on the market as Woburn Bordeaux paste. The paste, so far, has proved very successful, and the report just issued considers that the relative efficiency of this paste to the ordinary Bordeaux mixture is as 12 to 1. If this be the case, then we have one of the most valuable mixtures possible as a fungicide. Still, the use of this paste is as yet in its infancy, and Mr. Pickering himself says that—

> it is only by the extended experience of fruit-growers—using it throughout a number of years, and under varied conditions, that satisfactory evidence will be obtained as to its working, and whether the proportions recommended will require modification.

Other makes of Bordeaux paste are now placed for sale on the market, but until they all are experimented with, it will be impossible to state their value. They are all to be tried in the Burnley orchards during the coming season. Another result recorded from Woburn, and this has been a practice among some Victorian orchardists for many years, is that nicotine or tobacco liquid may be mixed with Bordeaux mixture and Bordeaux paste without detriment. Thus it is valuable to unite these for the late peach aphides.

General.

Grafting should be carried out at once, whether for young trees or for re-working over old ones. In connection with this work, it is wise to cut back the trees some time before the operation is performed. Then when the grafting is carried out, the dead ends may be cut off, and the grafts inserted in the new cuts. If the ground is at all warm, all varieties of citrus trees may be planted. The soil requires to be very sweet, and well drained.

Vegetable Garden.

Tomatoes may be planted out wherever they can be sheltered from the late frosts. For late crops, tomato seeds may still be sown. Later on in the month, plant out also seeds of marrows, pumpkins, melons, cucumbers, French beans, celery, carrots, parsnips, and peas. Potatoes should also be planted.

Where tomatoes have been planted, their energies should be restricted to three or four main growths, and all laterals pinched out, leaving only the flowers and flower buds.

The vegetable garden soil will need frequent hoeings; all clods and lumps should be well broken down, and the hoe kept going constantly. After a watering, as soon as the soil becomes firm, a good hoeing is the means of conserving most of the water that has been given.

Flower Garden.

As in the orchard, so in the flower garden, the work this month will require a lot of attention. The garden area previously dug over, will now be somewhat mellowed and sweetened, and will be ready for the hoe or other cultivators.

Attention is again drawn to the value of the hoe in the garden. The use of the hoe is too often disregarded; yet it is one of the most valuable tools for garden purposes. The use of the hoe will obviate the necessity for a large number of waterings. A loose pulverised soil is far better for garden plants than a continually wet soil. With a fine loose earth mulch, gardening gives greater success than with a heavy, hard and often sodden surface, the result of frequent waterings. Further, excessive water considerably weakens garden plants, and the more water they get, the more they want; in an undrained soil, excessive and constant waterings result in weakened plants, a decaying root system, and loss of good and useful plants.

This is the month for planting out Australian shrubs and trees. In ordinary gardens there is a lamentable absence of our native flora. Every garden should contain a few representative species of such plants; they are easy to grow, require a minimum amount of manure and water, and are quite as effective, and are even as gorgeous and often more so, than ordinary garden shrubs. Our Hakeas, Grevilleas, Prostantheras, Eriostemons, Chorizemas, Melaleucas, Swainsonas, Tecomas, Correa, and many others, in addition to the various useful Acacias and Eucalypts, deserve a place in every garden.

Roses and other growing plants should now be carefully watched for any signs of the usual aphis troubles. These insects considerably enfeeble the young growths, and are productive of considerable loss. Wherever observed, the aphides should receive frequent sprayings and washings with tobacco wash prepared from waste tobacco, or with "Nikoteen," "Pestend," "Soaperine," each preparation being useful for the purpose. For mildew on roses and other plants, frequent and liberal dustings of sulphur will be necessary. All useless shoots on roses and shrubs of all varieties should now be rubbed off, so as to direct the sap into useful and necessary channels.

Chrysanthemums may be planted out for early blooms, but the main planting should be reserved for next month. Any manure that has been supplied to the chrysanthemum area should be well dug into and incorporated with the soil.

Seedlings may now be largely planted out, and seeds of tender annuals planted out. A few seeds of autumn blooming annuals for an early crop of blooms may also be sown.

A few gladioli corms, canna divisions and dahlia tubers may be planted out; if dahlias are to be grown from cuttings, the tubers should now be in the frames, preparing for that purpose.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. ***All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.***

Passion Fruit.—R.W. desires information relative to cultivation of passion fruit vines.

Answer.—Passion vines should be grown on a trellis consisting of posts and wire, similar to a wire fence. A space of from 4 to 6 feet should be allowed between each trellis, planting the vines about 6 to 8 feet apart. Passion fruit comes true from seed, but the seed is often very slow in germinating. The plant requires a good soil, and needs to be fed, and old and straggling shoots pruned out each season. The aspect and locality should be free from frost, which severely affects the vines. Vines continue bearing for a considerable number of years.

Potatoes for Heywood District.—Omicron inquires as to suitable varieties of potatoes for the Heywood district, most of the soil of which is a rich red; he also asks for short description of the Irish Blight.

Answer.—(1) Earliest crop—Early Rose, Early Vermont; second crop—Carman No. 1, Brownell's Beauty; late crop—Carman No. 3, Up-to-date, Snowflake. (2) See *Journal* for November, 1909.

Manuring Potato Fields.—H.H.H. asks whether broadcasting is the best method of applying artificial manures to potato fields.

Answer.—No. Use the ordinary grain drill. If the drill will not put on sufficient at one application, divide the manure into equal quantities and apply one-half lengthwise of the field and the other across.

Chafer Grub in Strawberries.—Omicron asks how to get rid of chafer larvæ in strawberry beds.

Answer.—No treatment is known that will effectually destroy the chafer grub in strawberries. It would be better to plant out in new ground.

Varieties of Rye.—B.E.G. asks whether there is more than one variety of rye.

Answer.—Yes; Winter Rye, Grant Rye, Rye Corn.

Green Manure.—B.E.G. desires to know what he should sow on land having a red clay subsoil, off which he has taken a crop of hay.

Answer.—Dwarf Essex Rape is recommended; sow at the rate of 6 lbs. of seed per acre. Seed may be sown from the first autumn rains to the end of September Preparatory to sowing, the soil should be worked into a fine tilth. This is an excellent crop for green manuring, but when it is sown for grazing purposes Mustard seed at the rate of 1 lb. to the acre should be mixed with the rape to prevent bloating of sheep.

Concrete Silos.—H.H.H. asks what are the comparative advantages of concrete *versus* galvanized iron silos.

Answer.—A concrete silo is better in every way if properly designed and constructed. The difficulties are in obtaining good sand and gravel or metal, and getting skilled labour.

Fattening Pig for Show Purposes.—H.H. wishes to know what is the best method of fattening a pig for show purposes. The animal in question is in good condition but not prime, and although fed with every variety of food in abundance seems to have a small appetite.

Answer.—Crushed barley or crushed wheat soaked in milk, not made too sloppy; give in small quantities as often as the pig will take it. The trough should be thoroughly cleansed after every feeding. Green food of any kind should be avoided during this period.

MALT COMBINGS.—J.R. inquires as to value of malt combings for stock feed.

Answer.—More suitable for cattle than for horses. It should be steamed or damped for a few hours before being mixed with the chaff with which it is being fed.

OATMEAL BRANNING.—H.H.H. inquires as to value of oatmeal branning as a stock food.

Answer.—Analysis shows branning to be about half the nutritive value of bran, *i.e.*, 1 to 7.3.

FEEDING APPLES TO COWS.—A.K.S. asks whether apples should be fed to cows.

Answer.—Apples are deficient in nutritive properties and should not be fed inordinately. A few added to a good ration would not be out of place.

STRANGLES.—V.J.C. writes—"I have a 3-year-old filly which three months ago had a severe attack of strangles. A large swelling appeared on the neck just behind the jaw. When ripe I opened it with a small knife and washed out with an antiseptic every morning for a fortnight, when it apparently healed. About a fortnight later it broke out again, pus and watery matter coming from it. The same trouble keeps recurring after similar intervals."

Answer.—It would appear from the symptoms indicated that the original abscess was not sufficiently opened to allow of free discharge of pus and that the abscess was not sufficiently disinfected. Make a good opening in the abscess and syringe out with a 5 per cent. solution of Carbolic Acid or 5 per cent. Lysol once daily until discharge ceases.

DEATH OF HORSE.—C.F.P. writes—"A young horse (3 years) living in the open, fed on chaff or hay night and morning, rugged, suddenly showed signs of abdominal pains which, though more severe at times, never ceased; bad breath was also noticeable. As soon as noticed (first thing in the morning) an enema was given, but without result; 8 ozs. Magnesia Sulphate (8 ozs.) also given, internally. The symptoms still continuing another enema and one pint of linseed oil were given at night. In the morning the horse was dead and *post-mortem* examination revealed a long portion of the bowel acutely inflamed, also a decided twist in a portion near the stomach which was full. The horse had only been given occasional light work."

Answer.—Mortality was due to inflammation of the bowels. The exact cause in this case is not evident, but possibly it was due to the fact that the animal was given food in quantity quite disproportionate to requirements, considering it had only occasional light work. The giving of purgatives in such cases only increases the severity.

BROKEN WIND.—C.R.J. asks what is the matter with his pony. The symptoms are:—Breathing difficult; worse in frosty weather; wheezing can be heard distinctly when pulling hard or going up-hill; always has a cough, more or less worse in cold weather—in fact, very little sign of trouble in hot weather unless worked heavily.

Answer.—It is apparently a case of "broken wind" due to chronic asthma. Treatment can only be palliative. Avoid over-loading stomach, excessive pulling, and always give the drinking water previous to feeding.

SHEEP LICK.—H. F. writes—"Last March we put about 1,400 strong young wethers on our land (Wimmera District). All were in good condition, and also when they were mustered recently; but on being molested a number took what appeared to be fits. They turned round and round, eventually falling dead and frothing at the mouth. On *post-mortem* examination the "bible" was found to be very hard and dry. The remainder of the sheep when brought on to green food for a few days resumed their usual health.

Answer.—The trouble is due to some deficiency in the soil and herbage. Try giving a lick composed of Sulphate of Iron 2 lbs., Superphosphate 20 lbs., Slaked Lime 20 lbs., Salt 20 lbs. This should be placed in boxes in the paddocks and protected from the weather.

PARALYSIS.—A.K.S. states that her horse has been ailing for a fortnight off and on, is now down and cannot be got up. In other respects he seems right.

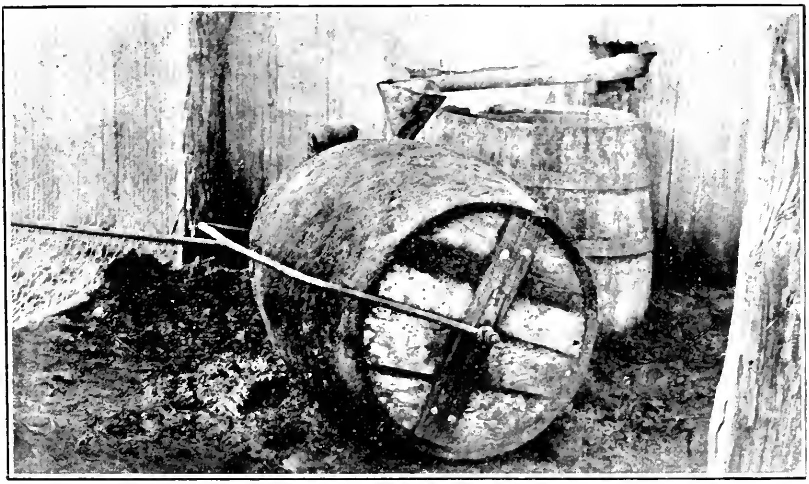
Answer.—Your horse is suffering from paralysis caused by injury or pressure of the spinal cord, and should be placed in a sling and blister applied to the loins.

A LABOUR-SAVING CONTRIVANCE.

E. A. Ryland, Dairy Supervisor.

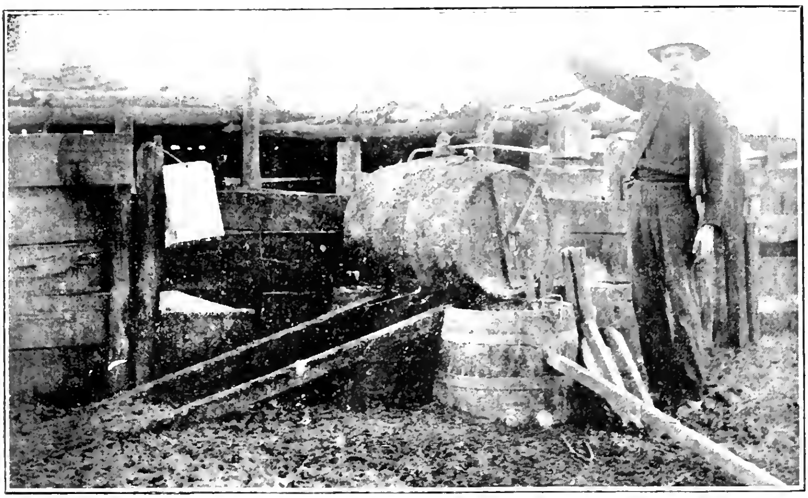
The accompanying illustrations are those of an ordinary barrel converted to the use of carrying skim milk from the separator room to the piggery on the farm of Mr. H. Cheyne, of Lake Boga. The barrel was purchased for 5s., and, for a similar amount, the local blacksmith fixed the ironwork which forms the handle for pulling or pushing.

The total cost is very little compared with that of other vehicles used elsewhere for the same purpose. Moreover, the barrel is far ahead, as a labour-saving contrivance, of the battered kerosene tins very often used for carrying milk to the pigs.



FILLING.

The barrel is filled direct from the separator, and rolled to the piggery. It is then pulled up the inclined plane where the milk runs into either of two casks partly sunk in the ground. While it is being emptied a second small bung-hole is opened for the entrance of air.



EMPTYING AT PIGGERY.

Cleansing can be carried out by partly filling the barrel with warm water and rolling it. Where steam is available, it could be used to advantage in keeping the barrel sweet.

Perishable and Frozen Produce.

Description of Produce.		Exports from State (Oversea).		Deliveries from Government Cool Stores.	
		Quarter ended 30.6.1910.	Quarter ended 30.6.1909.	Quarter ended 30.6.1910.	Quarter ended 30.6.1909.
Butter	lbs.	1,373,408	976,964	895,944	603,568
Milk and Cream ...	cases	226	50	...	50
Cheese	lbs.	13,080	18,840	24,280	19,620
Ham and Bacon ...	"	...	720	...	...
Poultry	head	390	1,545	1,015	319
Eggs...	dozen	...	..	27,898	21,155
Mutton and Lamb	carcases	209,637	16,274	37,279	75
Beef	quarters	6,519	1,305	1,007	...
Veal	carcases	916	552	75	30
Pork...	"	103	...	267	...
Rabbits and Hares ...	pairs	168,930	308,556	44,637	120,186
Sundries	lbs.	...	...	14,560	385

R. CROWE, *Superintendent of Exports.*

Fruit, Plants, Bulbs, Grain, &c.

Description of Produce.	Imports.		Exports.	
	Inter-State.	Oversea.	Inter-State.	Oversea.
Apples ...	682	1	19,824	46,296
Apples, Custard	45	—	—	—
Apricots ..	—	—	1	—
Bananas, bs.	77,197	18,194	—	—
Bananas, cs.	5,233	3,646	1,898	20
Barley ..	17,471	—	—	—
Beans ...	247	436	—	—
Blackberries	65	—	—	—
Bulbs ...	7	104	73	—
Chillies ...	—	86	—	—
Cocoa beans	1	1,651	—	—
Cocoanuts..	124	197	30	—
Coffee beans	—	3,524	—	—
Copra ...	173	—	—	—
Currants ...	—	2 027	—	—
Dates ...	—	4,881	—	—
Figs ...		3	1	—
Fruit—				
Canned...	—	—	—	2,106
Dried ...	—	253	—	1,751
Mixed ...	4	—	11	—
Grapes ...	21	—	857	331
Grasses ...	—	49	—	—
Green ginger	43	1,014	10	—
Hops .	5	161	—	—
Jams, Sauces, &c.	—	—	—	1,301
Lemons ...	11,083	610	189	1,461
Lentils ...	—	22	—	—
Linseed ...	—	1,035	—	—
Mace ...	—	76	—	—
Maize ...	1,382	1	—	—
Totals ...	113,783	37,971	22,894	53,266

Description of Produce.	Imports.		Exports.	
	Inter-State.	Oversea.	Inter-State.	Oversea.
Mangoes .	—	6	—	—
Melons ...	1	—	16	3
Millet ...	44	—	—	—
Nutmegs .	—	204	—	—
Nuts ...	61	2,215	45	3
Oats ...	36,949	1,190	—	—
Olives ...	34	—	—	3
Oranges ...	79,290	3,024	1,521	43
Passion fruit	2,188	—	456	9
Paw-Paws...	8	—	—	—
Peaches ...	—	—	206	25
Pears ..	7	—	23,082	978
Peas, Dried	11,755	345	—	—
Pepper ...	—	760	—	—
Persimmons	423	—	—	—
Pineapples	12,852	—	729	177
Plums ...	—	—	343	—
Plants, Trees, &c.	266	595	1,022	472
Pomegranates	1	—	—	—
Potatoes ..	32	—	—	—
Prunes .	—	1,560	—	—
Quinces ..	1	—	1,118	6
Raisins ...	—	4,214	—	—
Rice ...	4,377	94,471	—	—
Seeds ...	1,347	11,918	—	—
Spice ...	—	56	—	—
Strawberries	3	—	—	—
Tomatoes ...	—	—	2	12
Vegetables	1,994	100	2	—
Wheat ...	2	102	—	—
Yams ...	406	285	11	—
Grand Totals	265,824	159,016	51,447	54,997

Total number of packages inspected for quarter ending 30th June, 1910 = 531,284.

J. G. TURNER, *Senior Inspector, Fruit Exports and Imports.*

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A. T. SHARP, Editor.

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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. VIII. Part 10. 10th October, 1910.

THE POSITION OF APICULTURE AMONGST THE RURAL INDUSTRIES.*

R. Beuhne, President, Victorian Apiarists' Association.

The position of bee culture in its relationship to other industries has undergone several changes since bees were first introduced into Victoria. It commenced as a side issue of other occupations, developed into a separate calling but is now again gradually, to some extent, reverting to the first position.

Thirty to forty years ago bees in box hives were found on almost every farm and bees' nests in trees were very plentiful. Bee-keeping was then entirely a side issue. All that was necessary in keeping bees was to hive swarms into any odd boxes and when these were full of honey to drum the bees out into an empty box, cut out the combs, put them after crushing into bags and hang these up to drain. The honey which at times contained the juices of young bee larvæ sold readily at from 20s. to 25s. per kerosene tin. The drained comb remaining in the bags, as well as any dark comb containing but little honey, was often spread out on the grass for the bees to clean up, with the idea of giving the robbed bees a fresh start. This usually resulted in fighting amongst the bees and often the stinging of man and beast in the neighbourhood, but as no diseases were in existence then no other serious results followed.

There were bee-keepers even then who had from 100 hives upwards. These were usually placed on stands in long rows and the more hives there were the closer they stood together. The aggregation of large numbers permanently on one spot of stock of any kind often results in outbreaks of disease, or at any rate the rapid spread of disease when accidently introduced; thus, when foul brood made its appearance amongst bees, it spread rapidly from hive to hive and from one apiary to another, the chief medium of dissemination being the honey containing disease germs.

* Paper read at the Convention of the Victorian Chamber of Agriculture, held at Ballarat.

which was either carelessly left about or else designedly left to the bees with the laudable object of helping them to make a fresh start.

The strain of bees also had degenerated; not so much through in-breeding, as some bee-keepers think, but as a result of always robbing, often repeatedly, the heaviest hives. The last robbing took place so late in the season that the bees could not gather sufficient stores to carry them through the winter, with the result that colonies which would have been most valuable as stud stock were exterminated, while the increase in the following season consisted of the swarms from the colonies which were too poor to be worth robbing. Much of the deterioration of the common black bee is due to this cause. Moreover, the hives, usually in gin or kerosene cases, being too small for good, strong colonies of bees in a climate such as ours, and with such honey yielding flora as the Eucalypts, the natural swarming impulse was developed to excess and the normal strength of stocks declined much in consequence.

About 25 years ago, the bar-frame hive was adopted by a number of bee-keepers, and Italian bees introduced about the same time. The frame hive permits of an easy examination of combs and with watchfulness foul brood is detected in its first stages when a prescribed treatment will effect a cure. It was also found that Italian bees resisted the disease better than the common black bees. There was, however, so much disease amongst bees in box hives and bee trees that apiaries of frame hives became repeatedly re-infected from outside sources. Only those bee-keepers who could give all or most of their time could cope with the disease, while others, who either had not the time or the inclination for constant supervision, gave up bees altogether. The use of the honey extractor and new methods of management enabled the specialist to produce much larger quantities of honey than had been obtained before, while the honey itself was of better quality. As a result of increased production, prices declined while the improvement in quality made so-called bush honey at times quite unsaleable. The number of bee-keepers decreased while, at the same time, the total number of hives steadily increased. Bee-keeping had, to a great extent, become a special independent calling.

With a number of people giving their whole time and thought to this business new ways of overcoming difficulties were discovered, and new appliances invented, which reduced labour and thus cheapened production, so that the lower price was amply compensated for by the larger yields obtained. With the reduction in price, the consumption of honey increased rapidly, and notwithstanding the fact that the annual production has doubled in a few years, we still fail to supply the whole of the demand in Victoria. Importations from other States still come in, excepting in certain seasons of very heavy yields, when owing to the absence of any system of regulating the supply an occasional glut occurs at auction rooms.

To illustrate the difference between bee-keeping of the early days and that of the present, compare the work of a bee-keeper 30 years ago with that of the modern apiarist. Swarming time was then a lively time; bees would swarm and swarm again and again and sometimes, in spite of the most vigorous tin-kettling, abscond to parts unknown. At robbing time there was much hammering of boxes and, notwithstanding the most elaborate precautions in coverings of head and limbs, there were swollen faces and limbs and honey everywhere. Rows of bags containing the bruised combs were suspended over milk dishes or buckets out in the sun, or indoors near the fire. What remained of the combs after the bags ceased dripping was punched into one bag, a stone tied to it, and sunk in a copper where it was boiled for hours like a pudding. If there was much old comb, only from 25 to 50 per cent. of the wax was obtained and the rest, still incorporated with the refuse, thrown away. Even to this day immense quantities of wax are wasted in this manner.

To-day, swarming is controlled by the apiarist. He swarms his bees artificially when it suits him, or he prevents swarming by division and reuniting later on. He clips the wings of his queens to prevent absconding. He breeds his young queens from colonies which give a maximum of honey with a minimum of swarming, or no swarming at all. In this way the natural swarming impulse is to a great extent eliminated. In my own apiaries I had but two swarms from 240 colonies last season, and only one from the same number the season before, and that without having recourse to any of the methods for preventing swarming, such as destroying queen-cells, dividing, or artificial swarming.

Coming now to the taking of honey the bee-keeper to-day does not rob his hives. He extracts the honey and returns the empty combs to the surplus boxes put on during the honey flow. From the hive proper, that is, the brood-chamber, he does not extract, so that, no matter how late in the season he extracts, his bees always have an ample stock of food for the winter. In extracting, the combs are taken to the honey house. The outer covering of the combs is sliced off, and the honey removed by inserting the frames of comb into the wire baskets of a reel, which revolves rapidly inside a metal can, the honey being thrown out of the cells by centrifugal force. From the extractor the honey passes through a heating apparatus which raises its temperature to 150 degrees. This enables the use of a very fine strainer through which cold thick honey cannot pass and also retards the granulation or candying of the honey for a considerable time.

The uncapping of the combs is done over an apparatus which melts the cappings and separates honey from wax and wax from refuse, or they are allowed to fall into a draining box from which they are removed to the solar wax extractor, where the melting takes place by the heat of the sun under a glass cover. When it is desired to obtain the wax from old black combs they are boiled with water and, in a press somewhat resembling a cheese press, the wax is forced out of the refuse by pressure. This is bee-keeping as a special business.

With the evolution of this system of working, the principles upon which success depends have become more clearly defined. While foul brood in bees has lost much of the virulence it had years ago, the methods of dealing with this disease have also become simpler, till now an apiarist regards foul brood of little consequence, excepting when the source of infection is outside his apiary where he cannot deal with it. We have, however, the assurance of the Hon. the Minister of Agriculture that legislation will be introduced during the present session which will enable owners of bees to deal with the disease.

The methods of management of bees evolved by the specialist, the appliances invented, and the improved race of bees, are now available, and I see no reason why bee-keeping should not again become a profitable addition to other rural occupations. The formidable list of rather expensive apparatus and appliances are not essential to bee-keeping as a side issue. They are the labour-saving devices of bee-keeping on a large scale. There are some fair-sized apiaries in which the whole outfit, apart from hives, consists of extractor, honey knives, and smoker.

Bee culture combines well with almost any rural industry, provided the man has the natural aptitude and inclination for it and the surroundings are at all suitable. I am convinced that, with the advent of closer settlement, especially irrigation settlement, in bee-keeping will be found a way of augmenting the settler's income. There are also many dwellers of cities who, for health reasons, would prefer country life but have not the means to employ paid labour, nor the physical strength to engage in heavy manual labour. To such, bee culture offers country life in combination with a profitable and interesting occupation. That bees are not more generally kept in Victoria is largely due to the absence of facilities for obtaining knowledge and instruction. The prospects of the industry were never better than they are now. With the ruling prices, and even lower ones, bee-keeping is now more profitable than it was years ago. We have a demand for honey from abroad now, and we cannot supply it, although there are vast tracts of suitable country in the Eastern part of Victoria yet untouched by bee-keeping. Even the much objected to Eucalyptus flavour seems likely to be of assistance in opening up outside markets, as some of the inquiries which have lately come to hand are for honey with that flavour.

THE ADVANTAGES OF GOOD COMBS IN THE PRODUCTION OF HONEY.

R. Beuhne, President, Victorian Apiarists' Association,

In the production of honey as a special business, or as a profitable side issue of other rural occupations, the frame hive is now in general use. The advantages it offers over the common box hive are, however, not availed of by a large number of bee-keepers to anything like the fullest extent, and the best possible return is therefore not obtained.

To get the maximum yield of honey it is essential to have a good strain of bees, good management and good combs. The importance of the latter is often quite ignored by otherwise up-to-date bee-keepers. Perfect combs for the brood chamber, as well as for extracting, cannot be obtained profitably from starters, but only from full sheets of foundation in properly wired frames and drawn out by the bees in the super of the hive when conditions are favourable.

It is admitted that good combs can be obtained from starters in limited numbers under certain conditions, but these conditions rarely exist for a sufficient length of time in our variable climate. The building of the combs by the bees requires so much supervision and attention by the bee-keeper, that they are really more expensive than combs from full sheets of foundation, notwithstanding that the first cost of the latter is about eight times that of one-inch starters.

One of our largest apiarists, when asked whether he used full sheets or starters, replied "that he could not afford to use starters." The average bee-keeper who uses starters gets a considerable amount of drone comb built in his frames. As drones are consumers, instead of producers, he occasionally cuts it out, compelling the bees to build it in again, which they usually do with drone cells. When the heads of the drone brood are shaved off with the honey knife, the bees remove the drones and the queen again deposits drone eggs in the cells.

A worker cell measures 1-5 inch in diameter, and a drone cell $\frac{1}{4}$ inch. There are thus 25 worker cells or 16 drone cells in a square inch of comb. As a comb has two faces 32 drones are raised in the space which should produce 50 workers. The food used, and the labour of the bees involved in raising the former, are wasted, while the presence of drone comb in the hive is a check on the development of the colony in early spring and an inducement to swarming later on.

Beginners in bee-keeping usually shrink from the expense of full sheets of foundation. They buy well made hives and frames but use starters, raise enormous numbers of drones, lose a large portion of the honey yield in consequence, and then have combs which are liable to melt down in hot weather or break in the extractor. If economy is necessary it would be better to use home-made makeshift hives for a start, but good frames and full sheets of foundation. When the bees have earned new hives it is easier to effect the change than to replace the brood nest.

A frame of fully built out all worker comb is worth 1s. to the bee-keeper; one largely consisting of drone cells is only worth the value of the wax it contains—about 3d. But the use of full sheets of foundation results in good combs only when due attention is paid by the bee-keeper to several details.

Combs, whether for brood-rearing or the storing of honey, should be perfectly straight and built on to the frame on each of the four sides. To insure these qualities the frame should be properly wired and the foundation cut, so as to allow for expansion under the influence of the heat of the hive and the weight of the bees hanging on the sheet; further, it should not be given to the bees till the conditions are such that it will be worked on at once.

There are several different ways of wiring frames—horizontal, vertical, diagonal, W., M., &c. After trying them all I have found four horizontal wires the best for keeping the foundation straight without drawing in the top and bottom bar, as in vertical wiring, or leaving large unsupported surfaces of foundation, as in some of the other methods.

When four horizontal wires are used the bottom one should not be more than $\frac{1}{2}$ inch from the bottom bar. The sheet of foundation should be less than the inside measurements of the frame by $\frac{3}{8}$ inch in length and width. The exact dimensions cannot be given as they vary according to the different thicknesses of the bars of the various styles of frames. Fastening the foundation to the top bar and embedding the wires should be done when the foundation is warm and pliable, otherwise buckling is sure to result and the sheet will come away from the wires in places when the wax expands with the warmth in the hive. The board on which the frame is laid to embed the wires should be kept wet to prevent the foundation adhering. The bottom wire is embedded last and drawn upwards as far as it will allow, so as to form a low arch; the other wires are, however, kept straight. In this way a slight strain is kept on the foundation which will take up any subsequent expansion of the wax.

The trade size of foundation is such that the sheets are large enough for simplicity frames with $\frac{1}{2}$ inch top and $\frac{1}{4}$ inch bottom bars. In the case of frames with thicker bars the foundation should be reduced in width to leave a clear $\frac{3}{8}$ inch between the edge of the sheet and the bottom bar. Badly buckled combs may, however, result even when all these points have been observed, if the foundation is poorly made. Quite a number of bee-keepers have roller mills and manufacture their own foundation; but, in many instances, the sheets turned out are little more than marked with the rollers and good straight combs cannot be expected from them. Well brought up foundation differs from that which is flat, in the same way as corrugated iron does from plain. In both instances, the flat sheet is less rigid and expands more under the influence of a rise of temperature.

The necessity of having straight combs for brood, as well as for extracting, is so self evident that it is surprising so many poor combs are found in the majority of apiaries. It does not involve extra labour to produce good combs, but only the same amount done in a different way.

The disadvantages of crooked combs are:—A reduction of the brood capacity of the combs, brace combs, difficulty in handling of frames, loss of time in uncapping when extracting, and breakage of combs in the extractor.

The reduction of the brood capacity resulting from crooked combs amounts in bad cases to one quarter of the total comb surface of the brood nest. Only when combs are quite straight is the whole of the comb surface available for the raising of brood. The normal spacing of brood frames is $1\frac{3}{8}$ inch from centre to centre. This distance has been arrived at as the average of many measurements of the worker-combs of bees built in a state of nature. Left to their own devices, as in box hives, bees will rarely build their combs in straight lines, but, whatever their shape, there is always a space just sufficient for the purpose between opposite faces of brood combs.

It is different in the case of combs in frames. The placing of crooked combs between straight ones or bent the reverse way, brings the surfaces in places so close together that one side cannot be occupied by brood or, if containing brood already, it will be removed by the bees to produce the required space. Large patches of vacant cells are thereby created, spreading the raising of brood over a larger surface, or restricting development of the colony in early spring owing to insufficient animal heat for the larger space. Apart from the blanks referred to, there are, in combs built on buckled foundation, a considerable number of cells which cannot be used for worker brood. The cells on the convex side of the curve of the comb are too large, while on the concave they are too small.

The greatest drawback of crooked combs, however, is the difficulty of, and waste of time, in uncapping the combs for the extractor. A straight comb can be uncapped with one cut of a 12-inch honey knife, while a crooked one requires a number of cuts at different levels. During this operation the structure of the comb is more or less damaged and the comb weakened, resulting in fractures in the comb baskets of the extractor. Combs are in use for many years. I have some twenty years old. It is therefore good economy to get them as nearly perfect as possible in the first instance and save the time wasted in handling bad combs. The labour of the bees is also put to the best use in the raising of brood.

CLOSER SETTLEMENT STUDIES.

II.—A Metropolitan Dairy Farm.

J. M. B. Connor, Agricultural Superintendent.

That dairy farmers in Victoria can engage in intense culture as successfully as farmers in other parts of the world is clearly demonstrated on the farm owned by Mr. J. A. Higgins, situated at Denby-street, Middle Brighton, and within 8 miles of Melbourne. The farm contains 11 acres of land, subdivided into six paddocks; 2½ acres are occupied by homestead, yards and exercise paddocks, leaving 8½ acres for intense culture.

What a practical object lesson in wealth production, secured by industrious and intelligent labour, these 8½ acres of tilled land afford. Owing to its close proximity to the city and the sea, land in this locality is rapidly being cut up into building allotments and is becoming of such high value that it is absolutely imperative that the most shall be obtained from it when utilized for dairying purposes. This farm does not stand alone, as there are many instances throughout the Brighton district, amongst the market gardeners and dairymen on small areas of land, which should cause owners of rich land to consider whether it would not be more profitable to do with half their present acreage. By introducing a thorough system of rotation of crops and intensively farming the smaller area, they would, at the end of twelve months, be in a better financial position than when they held the larger area.

The soil consists of a sandy loam with a clay subsoil and responds readily to cultivation and suitable manures. A good deal of the success attendant on the working of small holdings, like the one under review, depends in no small measure, on the stamp of man and his methods as to whether the undertaking will spell success or failure. One cannot come into contact with Mr. Higgins without recognising his practicability, systematic methods, and knowledge of the underlying principles of the agricultural work carried out on the farm.

The first illustration is that of a windmill and pump made and erected by the owner. As this is the only means adopted on the farm for irrigation purposes some difficulty has been experienced in supplying the higher ground with sufficient water. Mr. Higgins recognises that by increasing his present pumping plant he will obtain even better fodder crops than at present. However plentiful plant food may be in these sandy soils, the presence of water is necessary:—

1. To dissolve the available plant food in the soil and thereby enable it to enter the plant.
2. To contribute to the building of the plant tissue and to the maintenance of the life of the plant.

Rotation of Crops Essential.—The farm when taken up by Mr. Higgins' father some 45 years ago was timbered with wattle and gum trees, and has been in continuous cultivation ever since. At the present time, by rotation of crops and conservation of the solid and liquid manure on the farm, the ground is in a better mechanical and physical condition than it was 40 years ago—instead of producing one crop each year it yields three. The soil is in good heart and its producing capabilities are increasing instead of getting poorer.

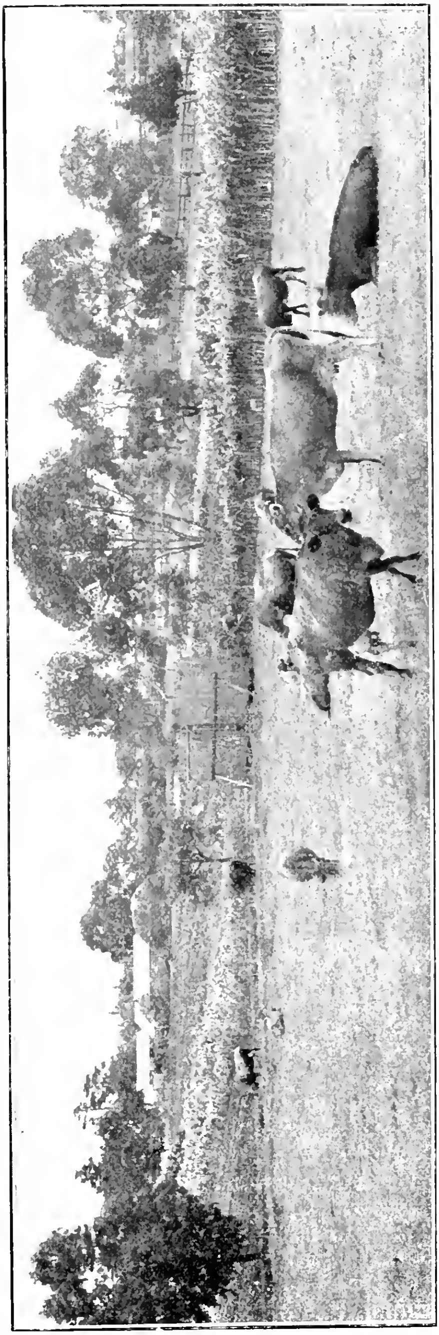
Drainage.—To obtain these results the land had to be properly drained. Open drains or furrows often serve to carry off surface water, but when intense culture is carried out, they are failures. Mr. Higgins' method has been to dig the drains 1 chain apart, sinking to the clay, and removing the latter to a depth of 8 inches by 15 inches wide. They are then filled with clinkers or gravel, then brushwood for 4 inches, then clay shovelled on the top, and the soil levelled up. These drains have been in existence for years and have never shown any signs of choking The rainfall or irrigation water sinks into the soil and it is removed only when the level of the free water rises to the level of the drain, thereby giving the roots of growing crops feeding space, and increasing the depth of the soil in which the plant can grow and assisting aeration. Mr. Higgins lays great stress on the good results he has, from time to time, obtained from draining this sandy soil, and considers that he could not have grown such heavy crops if the land were not kept sweet and free from being waterlogged. The carrying out of the underground drainage required a good

IRRIGATION CHANNEL.

deal of consideration before starting the work, but the results obtained from the first area completed so justified the cost involved that the whole farm to-day is under-drained.

Cultivation Methods.—The initial work to be done in the enrichment of unproductive land, when first cultivated, is to improve its physical condition by means of careful and thorough pulverization, by the addition of humus in the way of farmyard manure, and by keeping the land free from weeds. No crop is sown on this farm until the owner is thoroughly satisfied that he has the soil worked to such a fine tilth that the seed bed is suitable for an onion crop. All the ploughing is done with a single furrow plough with a three pronged subsoiler attached; the latter works the soil from 6 to 9 inches deeper than the actual ploughing. Although the owner says this requires more strength in the team of horses, the result pays handsomely; he has repeatedly observed that, after rain or irrigation, the soil retains the moisture for a longer period in dry weather, besides providing a larger root feeding area for the growing crops.

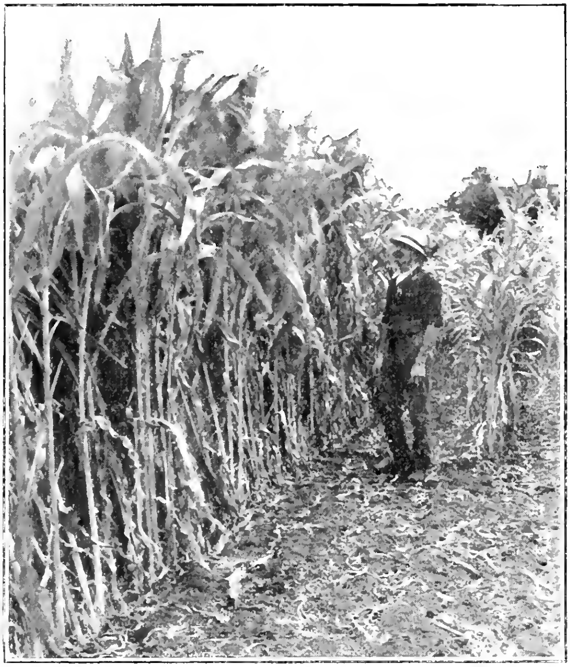
The Crops.—At the time of my visit (20th February), maize was the bulk crop being fed to the dairy herd. There was also a splendid demonstration maize plot under the supervision of the Department of Agriculture. A section of Yellow Moruya is illustrated on page 622. The other varieties were Hickory King, Sandford White Flint, Silvermine and Funk's Yellow Dent, but the first-named and Yellow Moruya were showing the most luxuriant growth. The maize and root crops are all sown in drills $2\frac{1}{2}$ feet apart and kept constantly cultivated between the rows, thereby forming a fine sand mulch and conserving the moisture in the soil.



GENERAL VIEW OF THE FARM.

The root crops grown in the season throughout the year are so numerous that hardly a day passes when there is not some succulent fodder crop chaffed or pulped for the dairy herd. Mr. Higgins states that his main stock crops are, broadly speaking, maize for summer, stout white oats for spring; mangolds, carrots, soya beans, Whip-poor-Will, black and white cow peas, are also grown to supplement the main fodder crops. No crop is grown twice in the same ground but a thorough system of rotation of crops is carried on throughout the year. The owner estimates that the $8\frac{1}{2}$ acres yield 400 tons of green fodder for the dairy herd per annum. The oat crops average about 9 tons of green fodder or 3 tons if kept for hay; maize, when irrigated, about 45 tons, and unirrigated about 25 tons per acre; carrots about 15 tons; and mangolds 25 to 30 tons to the acre.

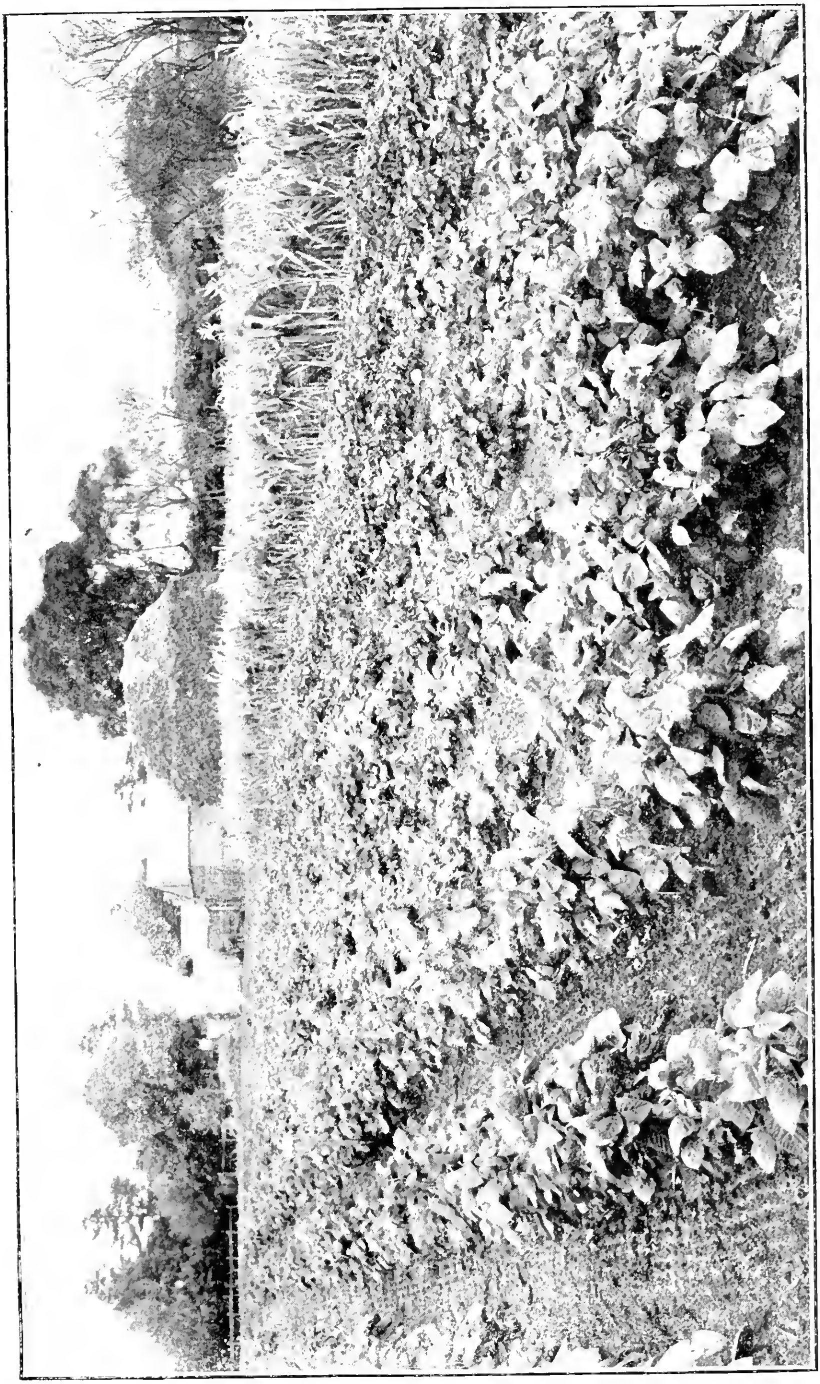
Manure Conservation.—The whole of the solid and liquid manure from the cow byre and stable is conserved in an earthen hole, situated about half a chain distant, where it is mixed and turned over at intervals until required for use on the cultivation paddocks. The cultivated land is manured at the rate of from 15 to 40 loads of stable manure per acre, care being taken that it is turned in without delay. By this means, the soil is continuously supplied with beneficial micro-organisms and is kept in a good mechanical and physical condition and replenished with any plant food taken out by the preceding crop. The cereal crops are manured at the rate of 15 to 20 loads per acre, whilst the root crops are supplied with a heavier dressing, 35 to 40 loads per acre. When the oats are sown for hay, the manure is broadcasted and scarified in before starting to plough, and, by this means, it is more evenly distributed through the soil. If the cereal crops show any backward growth, nitrate of soda at the rate of 30 lbs. per acre is sown broadcast with wonderfully stimulating effect, care being taken to apply it previous to rain. In addition to the farmyard manure the humus of the soil is gradually increased year by year by the ploughing in of green crops.



YELLOW MORUYA MAIZE PLOT.

The Dairy Herd.—Some members of the dairy herd of 24 Jersey cows will be seen in the photograph on page 621, and represent a type of cow rarely met with. Some 30 years ago, the owner's father formed the nucleus of the present herd by purchasing some Alderney cows from Mr. Thomas Crisp. The first bull used the Alderney bull "Prince," bred from imported stock on both sides—was awarded the first silver medal given at the show of the National Agricultural Society of Victoria in 1875. Although the herd has not been bred true to type, having been continuously crossed with the Jersey bull, still there is, even now, evidence of the Alderney strain in the silver markings around the eyes and muzzle, and in the richness of skin.

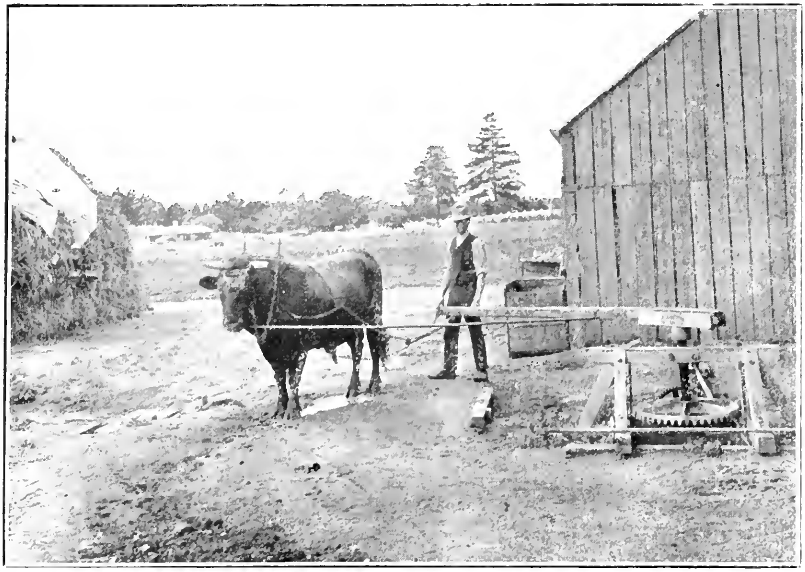
Mr. Higgins is working on safe lines in being such a strong advocate and lover of the Jersey breed for town purposes. His herd is evidence of judicious culling for years past, and the result is that there is not a cow in it that will not yield from 15 to 20 quarts of milk daily just after calving. Mr. Higgins takes pride in producing official tests by the Board of Public Health of samples taken from the carts, when on their daily



SOYA BEANS, COW PEAS, AND SILVERMINE MAIZE.

round, representing from 5 per cent. to 6.4 per cent. butter fat. As a rule, the cows are milked for twelve months and then turned out for two months. The daily yield of milk is kept fairly uniform by arranging that about an equal number of the dairy cows come in each month. At the time of inspection there were eighteen cows in milk, yielding 146 quarts at 4d. per quart, equal to a daily return of £2 8s. 8d. The average number of cows in milk throughout the year ranges from fifteen to eighteen. The milk is retailed by carts around Brighton and also on the premises, and the Misses Higgins, who take great interest in the dairy and herd produce, with pardonable pride, letters from mothers forwarding photographs of healthy babies reared on the product from this farm.

Until last year, the bull used in the herd has been a pure Jersey of a known milking strain. The one on the farm at present was bred from one of Messrs. Ralph Brothers' famous deep-milking Ayrshire cows. This bull is stable fed, and as the owner believes in making everything kept on



A GOOD SUBSTITUTE FOR HORSE POWER.

the farm earn its food. "Billy" is daily harnessed up in the horse works, and made to cut chaff or green stuff or crush corn. The owner considers that by this system he prolongs the vitality of the bull and keeps him from becoming wild and at the same time saves a horse.

Feeding Operations.—The cows are fed in a scrupulously clean shed open to the east. The udders and teats are washed and dried before milking operations. Each cow has her own stall and all are docile and contented in their habits. They are hand-fed morning and night throughout the whole year. When the grass is plentiful, each cow is given two kerosene tinfuls of chaffed mixed fodder daily, according to the crops growing at the time, and the quantity is increased as the outside grass supply decreases, or during very cold nights.

All fodders grown on the farm are either pulped, chaffed or crushed, and changed as often as practicable. It is bad policy to allow a cow to become sick through continuously eating the same food, whereas, by a little judicious re-arrangement of the ration, the yield can very often be increased and the health of the herds maintained. Chaff and green maize are mostly mixed in the proportion of one of the former to three of the latter. Bran and grains are the only concentrated foodstuffs purchased.

THE HANDLING OF EGGS.

H. V. Hawkins, Poultry Expert.

The summer is fast approaching and unless proper steps are taken, inferior eggs will be coming into the city from all parts of the State.

As the breeding season is past, the stud bird should now be kept by himself so that the eggs will be sterile—they keep fresher, will pickle better, and will turn out well after being in cool storage. The surplus cockerels should be fattened and disposed of without delay. The layers should have every care and attention, and the best food available, including at least one-third of greenstuff. Fresh water should be given daily and kept in the shade.

Present methods of preserving eggs are far from satisfactory. For any purpose, a pickled egg is a poor substitute for a fresh egg, and, at the prices which pickled eggs command, is a dear article of food. Neither have cool storage eggs been as satisfactory as one would wish.

The experiments which have been carried out in Australia in connexion with the cool storage of eggs have, in many instances, not been successful, because they have been merely speculative, and the selection and packing of the eggs unscientific. The eggs stored have been packed for early sale in the ordinary haphazard method adopted by many, and put in the stores, with other produce, when they were fertile or already stale, to await a rise in price.

Such eggs are generally packed in a more or less warm and moist atmosphere. When they are put in storage the temperature of the air that is included in the packing and surrounding the eggs in the case, is probably not less than 60 degrees, and this is reduced in the cool chambers to 40 or under. Air at 40 degrees can hold only about half the amount of moisture it can contain at 60; consequently, when the temperature is reduced, condensation takes place, and the surplus moisture is deposited on the eggs, making them cold and clammy to the touch, dulling the shell, and setting up changes which lead to rapid deterioration when exposed to the ordinary atmosphere.

When cool storage is universal, not only in the cities, but also in the districts where the eggs are produced, then we may expect fewer losses, but the producer must do his part in collecting regularly and placing the sterile eggs in the various depôts. In the meantime, it is necessary that cooler trucks should be provided by the Railway Department and special days arranged for the quick despatch of eggs; and not as at present, with other consignments, such as kerosene, rabbits, &c. Eggs are very sensitive to bad odours.

It is highly desirable that an egg market should be established, where the produce would be sold daily at auction, by quality and weight. The careful farmer would then get the best price for best goods, which, under the present system, does not always obtain.

DAIRYING IN THE SHIRE OF GLENELG.

Report on First Inspection of Dairies and Dairy Farms.

P. B. O'Keefe, Dairy Supervisor.

The Shire of Glenelg embraces an area of 1,456 square miles or 941,840 acres. About 155,000 acres, say, one-sixth, is admirably adapted to dairy farming, being rich undulating country with a good depth of dark-grey and black soil over, for the most part, a yellow clay subsoil not too close in texture. Of the latter area about 40,000 acres are occupied by some 280 dairy farmers owning 2,800 dairy cows. The cultivated area on these farms totals 5,741 acres, as follows:—

	acres.		acres.
Oats	4,164	Rape	42
Wheat	576	Peas	14
Cape Barley ...	517	Millet	6
Lucerne	192	Carrots	2
Maize	136	Mangolds	2
Potatoes	89	Pumpkins	1

Practically all the produce off the cultivated area is sold, rather than fed to the dairy herds. This I consider is largely responsible for the very low average return per head, viz., £6. With the knowledge that some farmers in this Shire obtain as much as £10 10s. per head from cream alone, without any special care of the stock, I am safe in stating that on any of these farms, with judicious culling, intelligent feeding and satisfactory housing the latter result could be achieved.

In bright contrast with the neglect to supply a sufficiency of suitable fodder during the lean months of the year, is the trouble and expense to which most farmers have gone in providing a clean and abundant water supply; springs and dams have been fenced in, to prevent stock wading into and fouling them with their droppings, wells have been sunk with windmills and troughs with ball taps attached. In this aspect, however, one matter of some importance has been neglected; that is, easy accessibility of the water to the stock—in many cases the herd travels a considerable distance to and from the water.

The pastures generally are laid down in rye grass; a small amount of cocksfoot was also noticeable. Clovers, however, with the exception of some which have been introduced accidentally, are conspicuous by their absence. It is a matter of regret that two varieties in particular, viz., Strawberry and Bird's-foot, are absent from the very wet river flats. The former is especially valuable on such land where it would grow luxuriantly and thus increase its carrying capacity, and general fertility.

The growing of fodder for the lean months of winter and summer is carried out on a very small scale. For the former season, rye, Cape barley and oats are the chief crops grown. In some cases the lastnamed is sown early and grazed a couple of times during the winter months, then closed up in early spring and allowed to mature for hay. The prevailing idea among farmers is that this is an economical way of feeding the greenstuff to the herd. Although this system may be satisfactory on suitable land in a reasonably dry season, the saving of labour is more than counterbalanced by the injurious effects as the puddling by the cows tends to make the land sticky, waterlogged, rough for harvesting operations, and exceedingly difficult to plough the following season.

On some farms oaten hay chaff is fed to the herd during winter but, although this is a step in the right direction much more requires to be done in the way of growing greenstuff in the form of rye, Cape barley and early oats in company with legumes such as peas, beans, lupins, vetches, &c., to be fed in conjunction with chaff, mangolds, carrots, and chou moellier. All of the latter good dairy fodders have been successfully grown on a small scale by comparatively few farmers.

The growing of summer fodders has also been successful, as far as it has been undertaken, lucerne, maize, and millet especially so. From lucerne plots as much as six cuttings were obtained last season. The great advantage of increasing the area under this form of fodder was pointed out to several of the farmers, whilst going through their duplicate slips from the butter factory. The amounts received by them commence to decrease early in December and by the end of January had dropped to practically one-third of the November returns. The figures were so striking that these farmers have now decided on laying down lucerne plots and also on growing maize during the coming season.

The type of cow kept is very inferior indeed, having chiefly originated from the beef breeds prevalent in the district. There are, however, some ten or twelve very good herds in the Shire and the Jersey breed of bull is used on most farms, so that there should be a noticeable improvement in the progeny. It is a fact worthy of mention that, on the farms where the better type of cow is met with, the owners have for a number of years practised some form of culling. In some cases, they have kept the cream from individual cows separate from the bulk and churned it; in others, the test flask, similar to those used on the Babcock tester, has been used, merely allowing the milk to stand in the flask and the cream to rise and so getting a rough idea of the cream productiveness of the cow. Others again, have had tests made at the local butter factory. All of these farmers would welcome demonstrations and instructions in the use of the Babcock tester, and I hope during the coming season to be able to give such instruction.

On some farms excellent shelter has been provided by planting breaks of ornamental trees along the different dividing fences. The chief varieties grown so far are sugar gums, tree lucerne, and pines. The sugar gum is the most popular on account of its quick growth; when grown from seed it produces a reasonably good winter break in two years. The enthusiasts in this direction, however, are few in number, but I hope, by constant reference to the subject, and by pointing out the advantages gained by those who have sown down shelter belts, to gradually bring home to all the advisability of acting likewise.

The health of the dairy herds is remarkably good, udder affections being practically absent. Some cows were found to be tuberculous. These being comparatively few in number and always likely to infect other members of the herd, also calves and pigs which partake of skim milk from them, apart from the danger to the owner's family, farmers generally were grateful for the opinion of the veterinary officer as to the soundness or otherwise of doubtful cows, and they were more than compensated for any loss they may have sustained in this way by having any diseased cows out of the herd.

There is another disease, about which most farmers know very little, viz.:—Contagious abortion. This, apparently, existed on six dairy farms, and to show the loss sustained through its prevalence a few figures may be given with advantage. The total number of cows milked on these particular farms was 268, or about 45 cows on each. The cows produced £7 10s. per head per year for cream, but as 34 of them were out of production through slipping their calves, the owners sustained an annual loss of £255 or £42 10s. per farm. On the other hand, the average cost of supervision of the cows to the owner was £1 2s. 6d. per farm. Thus, if by inspection nothing more was done than the eradication of such diseases, the boon to the farming community would more than warrant the expenditure incurred.

The cowsheds and dairies are for the most part old and dilapidated, straw roofed and earth floored. Taking into account the exceedingly wet winters sometimes experienced, the sites were in most cases fairly suitable for drainage purposes, consideration from a central position standpoint in some cases having to be foregone for the reason given.

Farmyard manure in large heaps is met with on most of the farms, but the general tendency appears to be to conserve it too long in this manner. This practice causes it to ferment and certain of the fertilizing elements to become broken down and to escape by evaporation. This could be prevented to some extent by the use of gypsum in the stables, bail-drains, &c.; also by covering the manure heap with earth, but the proper plan is to cart out and plough under regularly, thus doing away with the insanitariness and unsightliness of the larger heap, and at the same time securing in the soil the whole fertility of the manure. The farmer's argument against this method is that the undigested seeds sprout and foul the land, but weeds can be kept in check by a proper system of tillage and, furthermore, lying in the manure heap does not necessarily destroy the germinating power of the seeds.

SHEEP DIPPING.

(Continued from page 543.)

H. W. Ham, Sheep Expert.

The general enforcement of the *Sheep Dipping Act* throughout the State will gradually bring about greater freedom from lice and ticks. This will mean better wool, and more of it, from flocks which up to the present have been undipped; and, what is still more important, better lambs from the ewe flocks, for the mothers when clean will give more milk. Further, the lambs will be free from ticks and lice, another factor towards better quality, for both ticks and lice begin to go from the ewes to the lambs while the latter are only a few weeks old. In spring weather ticks and lice come to the outside of the fleece. They are usually thickest at the flanks, just where the lamb goes when sucking; also behind the arm and under the neck where lambs rub and run under when yarded.

There are three classes of sheep owners who do not take kindly to dipping:—

The owner who has not previously dipped and therefore does not know the benefit.

The small farmer who has dipped in unwieldy station baths and has lost a percentage by severe handling and adverse weather.

The dealer who, having bought for delivery off-shears, knows that for a few weeks after dipping, sheep do not show to advantage, often losing condition and looking dry and common, thereby spoiling immediate sale at a profit.

It has been the custom with many sheep owners to leave undipped all sheep intended for sale as fats or those sold for delivery off-shears. Sheep in good condition are sometimes set back fully three weeks by rough dipping, and the fact of their being dipped has not meant any extra value when selling off-shears. Sheep owners by not dipping them have saved men's time and cost of sheep dip. This, however, will be altered now that dipping is general throughout the State.

Lice are very small insects, and are the colour of the yolk they live in. Ticks are many times larger and much more easily detected. The latter discolour the wool, and this stain cannot always be taken out in the scouring. Both irritate the sheep, causing them to rub and thereby destroy the fleece; yet ticks do not cause the same loss as lice, for the latter work in thick patches, and cause the sheep to pull the wool from themselves with their teeth, as well as rub.

The eggs of the tick are not always destroyed at dipping. It is in cases of this kind where the effect of a powder preparation is evident. The young ticks on hatching come into a fleece throughout which the powder is spread.

There is a skin disease not yet thoroughly understood which appears during periods of droughts, and which can be kept partially in check by the use of powder dips, but not liquid dips. Closely allied with this trouble is ill-breeding, and then follows ill-health. The presence of glandular cysts appears to have relation to this skin trouble, which is mostly seen in merinoes that are bad doers, rarely in crossbreds. Besides these there are other ill-bred sheep of all breeds that will benefit little in the wool through dipping and some seasons, even in the best bred flocks, a few may be found so inferior in fleece that it will be difficult to believe that they have been dipped.

Compulsory dipping will assist such breeds as English and Border Leicester, Romney Marsh, Shropshire and Southdown, for at their best they are behind our Merinoes and Lincolns from a wool point of view. The latter breeds, even when affected with ticks and lice, will cut a fair amount of wool, but the others when dirty, next to nothing. They will, if well bred, now produce better wool than it has been customary to find, especially among farmers' flocks.

It is generally stated that crossbreds are more subject to ticks and lice than merinoes, but open-woolled merinoes and comebacks are just as susceptible as the coarser breeds. It is the denser class of merinoes that offer less favourable conditions for the rapid increase of these pests. When dense merinoes do become affected with ticks, the latter are found thickest in the most open portions of the fleece; viz., the flank, behind the arm, and under the neck, which is evidence that they prefer the open wool to get about in.

Some merino breeders aver that their densest merinoes do not suffer from ticks and lice. They claim that the fleece is so closely packed on that they cannot get about in it. There is sufficient only in this argument to show that density is a deterrent to vermin breeding rapidly. Of course, crossbreds and all British breeds of sheep poke into corners and through fences, often picking up vermin left by other sheep. Four to six weeks' growth of wool should be on crossbreds at the time of dipping.

In the case of liquid dips, ticks and lice are destroyed by the liquid soaking into them. With powder dips they are killed mainly by coming into contact with the small particles of finely ground arsenic distributed throughout the wool after the water has evaporated.

Mixing powder and liquid dips means giving a little more lasting effect to the liquid dip, but it is so little, that it is better to go the whole way and use a powder right out. The powder and liquid dips referred to are mostly arsenical preparations. There are other mixtures, phenolic and carbolic, that do their work well and are fairly lasting. It does not pay to make home-made dips.

Powder dips are called "Poisonous" and liquid dips "Non-Poisonous." They are, however, both poisonous. The one is mainly arsenic in fine powder; the other is usually arsenic in solution. Either in its undiluted state is deadly. If they were not poisonous what would be the use of them? Manufacturers recommend powder dips, in preference to the so-called non-poisonous liquid dips; but many farmers have a dread of poisons, and, again, powder dips are more expensive. When one firm put the cheaper so-called non-poisonous dip on the market others had to do the same in order to do business.

Many wool-growers, especially merino breeders, are, however, satisfied with liquid dips. If they meet favourable weather immediately after the first dipping, all parasites are certainly killed, and if no others are caught from infested sheep they keep clean for the year. Very little trouble is then required to keep them in a satisfactory condition, especially if the property is well fenced and neighbours' sheep clean. Some owners using powder dips have found it unnecessary in the case of merinoes to dip more often than once in two years. This is not, however, generally advocated, but it shows the beneficial effects of powder dips.

Arsenical liquid dips kill more quickly than powder dips and some sheep owners are led by this fact to think that the former are the best. While a powder dip may be slower to kill, it is by far the most lasting in its effects.

Warm weather, even a hot windy day, is ideal for dipping; the sheep immediately dry and this means death to all vermin, and comfort to the sheep.

The sooner a sheep dries after dipping the more effectual the poisoning of parasites, as well as lessening the chance of losses in the sheep themselves. If sheep meet rain after being dipped and before having a chance to dry, the strength of the preparation they have carried out with them is weakened. Ticks and lice will, in such cases, often recover.

Covers over draining pens are often advocated. Whilst beneficial, they are not really necessary.

Should severe conditions such as cold wind and rain follow immediately after dipping, serious losses as a rule will be experienced. In some cases, severe bruising is more responsible for deaths than even adverse weather. Driving sheep long distances to the dip, and putting them through immediately while over-heated, is also a common cause of loss, and break in the wool. Sheep should stand over night and be put through early next day if the weather appears promising.

There is danger in dipping sheep or lambs if over an inch of wool is on them; a rather weaker solution is then necessary. The temptation with many is to put them through quickly, thinking that it means a weak dipping, but it leaves patches which are not soaked. The strength of the bath should be weakened down, and time taken. If a full strength bath be used on woolly sheep or lambs it causes the skin to crack within a few days. This is accentuated if they are driven long distances, or even driven rapidly for two or three miles and dipped when over-heated.

It is claimed for dips that they improve the wool. They do so indirectly. The killing of all vermin means, first of all, cleaner wool, and the increased comfort and general good health mean more wool. Then, coupled with good breeding and good feeding, the sheep produces wool and flesh at its best. But if the sheep are not bred and fed to grow good wool, the mere fact of dipping will not produce it.

The action of most sheep dips on what little wool there is after being shorn is, to a certain degree, harmful. Anything that will destroy large strong ticks in an hour or two also dries the yolk and affects the sheep's skin. Any contraction of the skin affects the wool fibres. The action of liquid dips, arsenical especially, also renders the wool harsh and dry. This is partially corrected by warm weather dissolving the new yolk. But these slight defects are not worth considering in the light of the good that follows later.

It is claimed by some firms that they add natural sheep's yolk to their dips, thus giving the fleece a nice tip, and additional softness. Others declare that their dips give the sheep a closely protected tip keeping out dust. But "black" tip, "blocky" tip, "rape seed" tip, "cauliflower" top, "broad" top, &c., and softness, are all a matter of breeding and feeding in areas of medium rainfall.

By dipping, general comfort and discontinuance of rubbing are secured. Then the healthy nature of a well bred and judiciously fed sheep under favourable climate begins to act. The yolk is secreted steadily and rises to the surface; there the slight dust in medium rainfall districts is collected on the outside where it is held by the yolk. Dark tip is simply dust collected by the yolk. In light rainfall districts, with sheep, such as crossbreds, that secrete too little yolk for such a climate, this dust settles down into the fleece. In heavy rainfall areas the winter rains wash the dust out.

In a recent issue of *The Journal of the Board of Agriculture, England*, the following notes on dipping are given:—

1. Average period of immersion for sheep to be not less than half a minute.

2. Where a number of sheep are to be dipped the bath must be cleaned out from time to time, otherwise the efficacy of the dipping may be impaired.

3. It is inadvisable to make up the dip bath by mixing two or more dips containing different ingredients, even in cases where each dip has been approved for use by itself. For example, to mix carbolic and arsenic dips may result in destroying the efficacy of both ingredients, and even the mixing of dips containing the same ingredients may result in the bath being below standard. In some cases also the use of mixed dips may injure the sheep.

(*Note.*—English sheep are all open woolled breeds.)

An interesting case relative to mixing different preparations lately came under my personal notice. A farmer was given permission to use a dip in which was 1,500 gallons of a leading powder wash left over from a previous dipping. He came with another powder dip and could not bring himself to empty the dip, so he added the required water, mixed the two lots and commenced. After dipping for some hours he then found he would not have sufficient bath to finish, so he decided to add a tin of liquid dip of still another firm that had been left unopened by others. He then dipped the remainder of his sheep. After shearing he remarked that his sheep were never freer from ticks. The wool, however, especially on the weaners that went through last, had a very decided break half an inch from the tip, which is worse than a break half way.

The latter defect is sometimes caused when dipping with a powder dip. A scum often lies on the surface of a newly mixed bath and if sheep carry this out on their backs the skin will be affected, causing a break in the wool. This scum should be removed before commencing dipping, especially if stud or show sheep are to go through while the water is clean; or a few ration sheep can be put through first, and then there will be no danger. It can be avoided to a great extent by soaking the powder over night; it is always worse when mixed hastily.

FATTY DISEASE OF THE LIVER IN PREGNANT EWES.

J. A. Gilruth, D.V.Sc., M.R.C.V.S., Professor of Veterinary Science, Melbourne University.

In New Zealand for a number of years there has been experienced a considerable annual loss by flock-owners of ewes in good condition, heavy in lamb, just prior to the termination of the period of gestation.

This condition was fully investigated by me when occupying the position of Chief Veterinarian of the Dominion, and it is gratifying to be able to record that the preventive measures recommended as the result of inquiry have, wherever intelligently applied, been completely successful. The condition now becomes interesting to Australian stock-owners as the disease appeared in at least one flock in Victoria during the past year.

The following symptoms, pathological changes, causes, &c., of the disease are taken from a bulletin written by me for the New Zealand Department of Agriculture:—

ANTE-PARTUM PARALYSIS.

"This disease of pregnant ewes, originally investigated by me in Canterbury, is found to exist throughout the Dominion, although more prevalent in the South. The disease is associated with circumstances tending to a general grossness of condition. There is always intense fatty infiltration of the liver, the kidneys and other organs being also more or less fatty.

"This complaint is particularly common amongst ewes fed on dry food, whether in the form of chaff, hay, or simply dry nourishing herbage, which explains why it is experienced more in the South than in the North.

Cause.

"The disease is undoubtedly due to dietetic influences, and is associated with a plethoric condition of the system, particularly the fatty infiltration of the liver, kidneys, and other organs of the body, following the inordinate, rapid, and continuous formation of fat. There is no question of contagious disease, or of any organic lesion from which an animal may not recover, provided the necessary measures are adopted in time.

Predisposing Causes.

"These may be summed up as any condition which predisposes to the accumulation and deposition of fatty tissue, such as breeding for mutton purposes, an over-supply of fat-forming food during pregnancy, the facility of securing food, twin lambs borne in the womb, &c. In fact, all pregnant ewes of the heavier types are inherently liable to this condition, especially in this country; becoming heavy in lamb they naturally only take what exercise is absolutely necessary to secure their daily food, and, that being generally readily found, often supplied by hand, an extraordinarily fatty condition is easily produced.

"Several marked instances have come under my observation proving the truth of these contentions, of which the following may be cited:—

"One farmer who had lost forty-seven out of a thousand ewes before the lambing was far advanced had been feeding with chaff and hay, the sheep being allowed to eat what quantity they pleased. As a result, many of the heaviest and largest ewes never moved far from the feed-boxes, and took practically no exercise. However, after a welcome rainfall the sheep were changed to a pasture of young grass, and the mortality quickly ceased. Another large sheep-owner lost in his flock of stud ewes, which were highly fed, up to 25 per cent., whilst his ordinary flock, which lambed later and had no supplementary feed, remained healthy.

"Again, I visited two adjoining farms, one of which had a large mortality; the other had none. Both these farms were portions of the same estate, recently subdivided, having each the same class of soil and subsoil, with the same water supply. One farmer expected to lose a considerable number of his sheep, as he had no artificial food for them, and consequently they approached the lambing season in comparatively poor condition. He lost none of his flock of seven hundred ewes. His neighbour, however, who had been feeding with hay, turnips, and chaff, was losing considerably till the rain came, when, the ewes being supplied with succulent grass, the mortality ceased.

Symptoms.

"Premonitory symptoms will only be noted by the careful observer. In a good, well-conditioned flock of ewes, from ten to twenty days before lambing, one or more, evidently heavy in lamb, may be observed to be dull, off feed, and away from the rest of the flock. If approached, little or no notice is taken, and when actively disturbed the affected animal will only move off very slowly and in an aimless manner. Later on, she will be found standing stupidly, will be with difficulty moved, will not start at the approach of the shepherd, and may not even pay any attention to dogs; the mouth is clammy, the eyes apparently sightless, and the animal only semi-conscious. Soon after this she will be found lying down, and if raised to her feet will only stand listlessly, while, if forced to move, will stagger a few paces and then probably fall; the eyes are sightless, there is grinding of the teeth, and probably the wool is found to readily come out. Even in this condition the animal may live for from two to three days. From the time the first symptoms are exhibited until death supervenes a period of from two to eight days may elapse. In the vast majority of cases the disease is only observed when the animal is in the later stages, consequently the course of the malady generally appears much shorter than is really the case.

Post-mortem Appearances.

"The carcase is always in good condition. True, there may be at the time of death little fat along the region of the back, but this is greatly attributable to the absorption of that fat during the period of illness. In the abdominal regions the fatty deposit is usually very great, especially what are known as the "kidney" and "caul" fats being large in quantity. That much of this internal fat has also been absorbed during the illness is evidenced by its peculiar watery, boiled-looking appearance. The liver is abnormally fatty. It is enlarged and of a pale-yellow colour, very friable, and readily broken down by the fingers. On breaking up the liver in the hands each microscopical lobule stands out distinctly, and the knife used for cutting the organ shows a distinctly oily coating. The kidney is also frequently pale and fatty, while even the muscle of the heart itself may be more or less similarly affected. In 95 per cent. of cases twin lambs are found in the womb, but both these and the womb are healthy.

Treatment.

"Unless in the earliest stages, curative treatment is of no value. If exhibiting the first symptoms a strong dose of Epsom salts may be of some assistance, but when evidences of insensibility have set in medicines are of little utility, and the attention of the owner is better directed to preventing the recurrence of the disease amongst the remainder of the flock.

Prevention.

"This is fortunately a simple matter. When in-lamb ewes have come through the winter well, and especially if they have been fed on dry and artificial food, a careful outlook should be kept for the first evidences of the disease. I recommend strongly that such ewes should be kept comparatively bare of feed during the last month of pregnancy, or, rather, on such pasture that they require to travel for their food, and thus obtain each day that amount of exercise necessary to their complete health. Should, however, this not have been possible, immediately on the appearance of the disease in the flock prompt measures should be taken. I find that the best preventive measure is to muster the ewes carefully once a day towards midday, and travel them for a distance of half a mile to a mile to some young succulent pasture, as, for instance, young oats, or even clean young spring grass. Permit them to depasture thereon for an hour, and return the flock afterwards to the original paddock. This treatment is at once simple and effective. The exercise produces that stimulus to the muscles and to the liver which is wanted, and the limited quantity of stimulating food acts on the alimentary tract and so relieves that tendency to constipation which is usually present.

"As to the effect of this preventive treatment, especially the benefit of the exercise combined with the stimulating young feed, I have received the testimony of many sheep-farmers. They have found that on following out this procedure the appearance of further cases immediately ceased, and now they are able to look forward to the lambing season with equanimity."

. . . .

The disease is in no way contagious, is not due to any specific microbe, but simply arises from a disturbance of physiological functions consequent on the excessive deposition of fat within the liver. A certain amount of fat is found normally within the liver cells towards the termination of the period of gestation, and it is only when it becomes excessive and abnormal in amount that it may be termed a diseased condition.

The cases which occurred in Victoria were investigated by Mr. J. Lyons, M.R.C.V.S., of the Stock and Dairy Supervision Branch of the Department of Agriculture, who had had considerable experience of similar cases while in New Zealand. The following are the particulars as supplied by him when sending portions of liver to me for microscopical examination, which showed the cells to be almost entirely converted into fat:—

"*Re* Specimens of Sheep's liver forwarded for your examination. The following is a history of the case. At Messrs. ——'s request I visited their farm and found that 8 or 10 ewes had died within a fortnight previous to my arrival and 4 or 5 others were in a dying condition. The animals were pure bred Shropshires.

I made a *post-mortem* examination on an animal that had been dead for 24 hours and also on two others which I had slaughtered for the purpose. The *post-mortem* appearances were identical in each case. The ewes were exceedingly fat; on opening the abdominal cavity layers of fat several inches thick could be seen. The liver was slightly enlarged and very friable. In one case the liver tissue broke down when the organ was being removed from the abdominal cavity. Constipation was also present in each case. All the animals showing symptoms of the disease and those which had died were close up to lambing and in each case the *post mortem* examination revealed large twin lambs. The portions of liver forwarded to you were taken from a slaughtered animal.

The animals were on very good feed (Cocksfoot, about 5 or 6 inches high) and the owner informed me that they had been on similar feed for the previous 12 months.

In company with the owner I went through the remainder of the flock and noticed that nearly all of them were lying down. When made to rise they would walk leisurely for a few yards and then lie down again. In fact, such an abundance of feed existed that the animals could get all they required within a few surrounding yards, consequently no exercise was taken in looking for their feed.

A number of cross-bred ewes in the adjoining paddock were in perfect health. This paddock was the same as the one in which the Shropshire ewes were running in every particular, with the exception that it was heavily stocked and the feed eaten bare.

As to treatment, I recommended that the animals should be removed to a pasture where the feed was not so luxuriant, eaten bare in fact, and that a certain amount of exercise should be given daily."

Later on, Mr. Lyons advised me that the owners reported that, acting under his instructions, they lost no more except those that were actually suffering at the time of his examination.

EDUCATIONAL FACILITIES AT THE VITICULTURAL COLLEGE.

G. H. Adcock, F.L.S., Principal.

In response to a request for some account of the educational facilities afforded the boys in training at the Viticultural College, the following particulars are submitted for such readers of the *Journal* as are interested in the work undertaken by the Agricultural Department at this institution.

Dexterity in the practical work of the various branches, is, of course, the ideal aimed at. The boys learn by doing, and "practice makes perfect." In the vineyard, nursery, and farm, all seasonable work is carried out largely by the boys under competent supervision. Expertness in pruning, disbudding and tying, budding and grafting, comes readily to the deft fingers of most of the lads. Let a few figures from the current season's grafting tallies speak of the celerity and ability shown in this important operation. The "ringer of the shed" is an old boy, (Holmquest) who was kept on after attaining the age of 18. His highest daily tally is 2,099, a record that it will be hard to beat. Taking those lads who are still learners, the following are the highest daily numbers of all engaged in actual grafting during the season. It must be distinctly remembered that only first class grafts count. These are the records:—Hogan, 1,754; Walker, 1,579; Palethorpe, 1,431; Church, 1,385; Nash, 1,062; Dudderidge, 940; Clover, 878; Giroud, 752. The daily averages throughout the season were:—Hogan, 1,442; Walker, 1,334; Palethorpe,

VITICULTURAL COLLEGE, RUTHERGLEN.

1,303; Church, 1,081; Nash, 892; Dudderidge, 828; Clover, 746; Giroud, 676. For the whole shed the highest daily average was that of A. Deas, with 1,459, which was put up with the most difficult wood to operate on.

To enable us to attain these results the grading of the wood is carefully carried out by juniors, by means of an original and useful device. Most of the boys engaged in grafting are 15 and 16 years of age. Two turned 17 just as grafting finished. Some have been with us but a few months. Though in their first season they already show promise of quickness and skill. Mr. H. Wilkinson may well be proud of these results which speak so eloquently of his training.

The extensive dairy work on the farm, too, is all done by the boys. They do the milking, separating and butter-making. They also take a prominent part in the making of silage and hay, and, in fact, in all the duties on the farm.

To supplement this practical training, and make clear the reasons for the various practices, lectures are regularly given. At these the lantern and microscope are freely used, experiments are conducted, and no pains are spared to make the lectures thoroughly practical as well as instructive and interesting. By such means practice and theory are blended with the happiest results, and the information is kept up to date. The time has long passed when agriculture could be conducted on a mere rule of thumb basis. The intelligent grower wants a more cogent reason for his operations than "What was good enough for my father and grandfather is good enough for me." Neither has the world to-day any use for the man who farms on paper. But with the happy combination of sound theory and intelligent practice we have many evidences of success. Here it is aimed to give the boys both aspects, and theory and practice go hand in hand.

In the agricultural section the importance of this branch of industry is emphasized. It was the earliest as it still is one of the noblest of professions. Have we not the highest authority for saying "The King himself is served by the field?" We undertake an elementary study of the soil. Without dipping too deeply into the geological aspect of the question, this subject can be made intensely interesting. The decomposition of rocks and formation of soil are going on under our very eyes, and we note the process on the College farm, especially in certain exposed portions of rock that rapidly weather. The agencies that help to the formation of soil are thus seen at work. The accumulation of humus is noted. The question of plant food follows. Experiments are always interesting and should be valuable. The active portions of the soil are discovered. Demonstrations of osmosis show how the plant takes up some of its food.

The importance and value of drainage, the necessity of thorough cultivation, the imperative need of providing fodder crops, and conserving them in the form of silage are not overlooked. Victoria is already the richer for her attention to the latter, and will be richer still when she thoroughly realizes its importance. Manuring, rotation of crops and fallowing are of course practised as they should be on every farm, and the results of our experimental plots are studied. These and other subjects, in their turn, are treated in the lecture room, and are followed with keen interest by the boys. Other lectures deal with the secretion, composition, and treatment of milk. Even the weeds are studied. Calculations of areas, computation of the capacity of a tank or dam, setting out an orchard or vineyard, all receive due attention and are very necessary information for a farmer. Often the boys themselves suggest the subject of their lecture, either by furnishing a topic, or obtaining specimens. One brought eggs of the Bot fly, which he had secured from one of the farm-horses. Another got Fluke from the liver of a sheep. Regarding their "finds" the discoverers asked for information, which is always given. Both these topics served in their turn for lectures and essays, when the respective life stories of these two widely different pests were worked out.

In viticulture the complex life history of Phylloxera is taken as one of our important topics. Either the microscope or the micro-attachment of the lantern is used to display the various stages—all of which from the winter egg to the winged insect, are shown from original specimens. Other insect pests of the vine, *e.g.*, Cut-worms, White Ants, Vine Moths, &c., are similarly dealt with.

The structure and special qualities of the different American vines and their hybrids, as well as the physiology of the graft, are particularly studied and illustrated by an original and unique set of micro-slides.

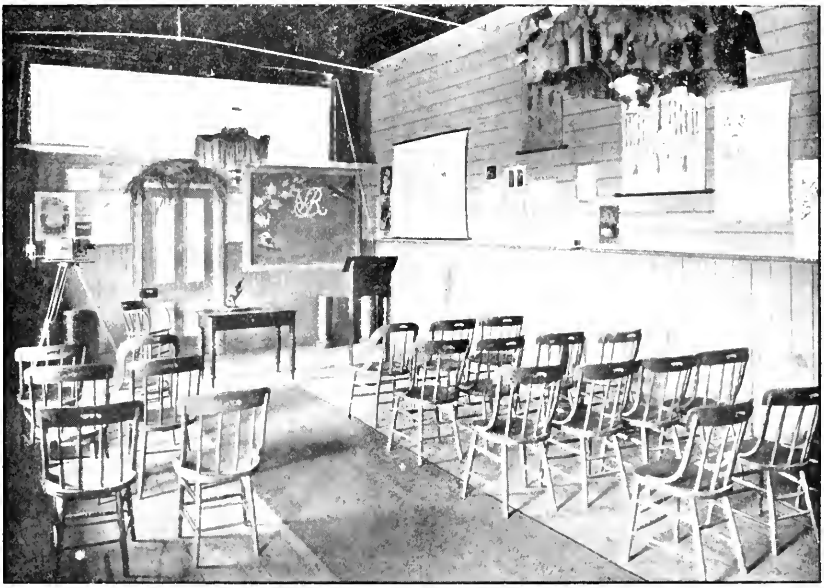
DISBUDDING RESISTANT STOCKS.

Fungus diseases are dealt with in a similar manner. Actual specimens are invariably used in the lecture room, and thus familiarity with their appearance, as well as a knowledge of their effects and treatment in the vineyard, are both secured. A strong point is made of taking for each lecture some seasonable subject. Erinose formed the theme of an evening's instruction very soon after its discovery in our State. So fungus diseases and insect pests are dealt with as they appear, and the various agricultural and viticultural practices are discussed as they are being carried out in the field.

To understand the growth of crops some idea of plant life is necessary. Agricultural botany is treated in a practical, and as far as possible in a popular manner so that facts are learned without burdensome phraseology. Root structure, and the methods by which a plant obtains its food and grows, are studied and the necessity of securing pure, clean and good seed is demonstrated. In economic entomology the same methods are adopted. Specimens are secured. Their life history and habits are traced. A knowledge of these is indispensable to enable us to contend successfully with the numerous destructive insects. The best methods of preventing and coping with these pests are described in the lecture hall, and practically demonstrated in the field.

Popular among the boys are the evenings set apart periodically for either Question Box or Specimen night. For the former, every lad is armed with at least one written question, while one or more specimens that have caught his eye and excited his curiosity are submitted for the latter. He must provide one—more if he likes. Both these methods are useful educational factors. The boy asks for definite information on a subject that has probably been puzzling him, and he gets the very help he wants. Specimens having served their purpose for instruction are, if worthy, placed in the College museum for permanent reference.

All the subjects treated have some direct bearing on the daily work. Birds, insects and plants are studied in their relation to the producer. In



LECTURE HALL.

connexion with the former it may be stated that five years ago no bird except the ubiquitous sparrow dared show itself near the buildings. Now wrens and robins, fly-catchers and thrushes, and many others actually hop on the verandahs. Many of the lads are pledged members of the Gould League of Bird-lovers. Not only do these feathered visitors repay us with their confidence for our kindness, but they render incalculable service by destroying innumerable insect pests.

Besides the special subjects enumerated general education is not overlooked. The aim is to provide the boys with the mental equipment and practical training that will best fit them for life, with all that means, as trained workers and good citizens.

Every Sunday evening there is choir practice and an address bearing on conduct and duty. Special prizes—inaugurated by one who has now gone—are given every few months for the best written account of one of these. The difficulty of the moral training cannot here be touched on. Let it suffice to say that great importance is attached to this essential matter.

To give an idea of the work of the boys some of their essays are submitted. One on Green Manuring has already appeared. That they are crude will be readily admitted. But when one considers the raw material we have to work on, and the disadvantage so many of the boys have had to contend with, these will perhaps appear in a newer and more favourable light. They are the unassisted productions of the lads themselves from notes of the addresses. Mr. G. G. Nevill kindly prints one from time to time in *The Miner*. The successful essayist is given a copy of the issue containing his first literary effort, and is proud to post it to some relative or friend who is equally proud to receive it. From what has been written it will be seen that "Eye gate" is the chief thoroughfare used for supplying our boys with useful agricultural and viticultural knowledge, and their quick fingers readily adapt themselves and become skilful in the many practical operations taught. Handicapped as we are in so many ways it is very gratifying to know that so many turn out well. A practical agriculturist who has had considerable experience with the boys trained here says it is really remarkable how well they turn out.

DRAINAGE.

A. Bower, age 17.

Drainage, as we know, is the foundation of all land improvement. Where the land has a good slope it is naturally drained, but in low-lying land drainage must take place before the land can give good returns.

By draining we gain many advantages. We remove any standing and stagnant water from the surface. After this has been done air takes the place of water, sweetening and improving the soil very much. We also remove the excess of water from the subsoil, which gives better drainage to the land.

Some plants live in the water, but they are of no use to the farm. Crops, for instance, cannot live in ever saturated soil, as the fibrous hair-like roots become too weak, and cannot provide the plant with the nourishing food that it requires.

Drainage deepens the available soil, giving the roots a wider range to secure plant food, and they go deeper and so do not feel the drought. By draining we are able to work our ground more easily and earlier. The heavy, sticky patches become easier cultivated every season, and the moisture is more equally distributed in the soil by drainage. By drainage and good cultivation the soil becomes several degrees warmer than it would be if not drained. Warmth is very necessary to growth, and is mostly required at the beginning of spring to make growth, and also to cause the seed to germinate.

The fertility of the soil is increased by the weather turning the dormant parts into active, which is ready plant food. Draining helps this, and allows the rain to carry the particles of plant food to the roots, and helps the manure to increase the crop. By drainage, fungus diseases such as root rot of the vine, are prevented, and better crops and larger yields are obtained.

ROTATION OF CROPS.

E. Walker, age 15.

Rotation is a word which is derived from a Latin word, *Rota*, meaning a wheel. A rotation of crops is a series of different crops sown in the same ground. If crops are sown in the same ground year after year, they will in time render the ground unprofitable, in spite of the manure that is put upon it. Nature shows us rotation, by providing her seeds with wings, hooks, &c., so that they will be conveyed into different ground. Every crop takes the material it gathers while growing from the soil it is growing in, and all plants feed differently. They each take different proportions of plant food from the soil. The roots of plants, too, vary greatly: some have shallow roots, like the turnip, and others have long roots like the wheat.

Land will not produce if the same crop is grown continually upon it, because the available part of the crop's particular food has been used up. The fertility of the soil is gauged by the necessary part of plant food that is scarcest. There are many advantages gained by rotation. Some of these results are:—You get better crops, and the land does not become exhausted; also, insect pests, fungus diseases, weeds, &c., are checked. The change of crop prevents any particular ingredient from being used up, and the plant food is economised, and therefore less manure is needed. Pod-bearing plants grown in the rotation enrich the soil and put the land in better order for the next crop, and with these advantages the stock get better food and more variety. Each plant uses up a certain proportion of a particular substance, and some use much more than others. A good crop to grow on land is a fallow crop such as rape; next a cereal crop, such as wheat, then a pod-bearing crop, such as peas, and after that another cereal crop. By this means the ground will be kept in good trim year in and year out.

THE FLUKE.

J. Turner, age 14.

The scientific name of the fluke means two-mouthed. This disease was long thought a mystery. In the olden days the people thought it was caused by witches, or by the want of good food. If there was plenty of good food they would say it was not the right sort. In Egypt a man was thinking it out, and he thought it was caused by the sheep eating a kind of rush. In the year 1855 a man in Victoria imported some prize rams from Germany. When he got these rams they looked all right, but he found they were fluky, and that is how it got introduced into Victoria. In England one million sheep die every year of this parasite.

The fluke must have favourable moist seasons or else it would not be able to live. In salt marshes it does not appear, because it cannot live where there is salt. In Egypt, when the Nile went down, there would be lovely green grass, and the sheep used to go there because all the other grass was dry. While the sheep were eating this green grass the fluke would be on it, and would pass down into the sheep's stomach.

The full size of the fluke is about 1 inch long, ½ inch wide and 1-16th of an inch thick. If we were to place 200 eggs end to end they would equal about an inch. When the young fluke enters the liver it is about 1-24th of an inch long. A man tried if the eggs would hurt the sheep, but he found it did not affect them.

If the fluke wants to live it must be near water and find a shellfish. It swims about in the water for one or two days and tries to find a host. If it finds one, and it gets in and finds another fluke, both of them may die and the shellfish too. If it gets in all right, it burrows into the lung cavity and goes through two changes. Then it gets into the water again and loses its tail. After that it forms a cyst over itself and then sticks on to the grass. The sheep come along and eat the grass, and the cyst dissolves. This sets the fluke free and it goes to the liver.

To get rid of this creature the best thing to be done is to drain the land, and give the sheep licks of salt and iron. The birds are a great help too, as they eat the snails, without which the fluke could not increase.

SPRAYING.

T. Dudderidge, age 15.

Spraying means applying some liquid that will destroy pests without injuring the crop or plant. Every plant is the natural food of some insect, or the host of some fungus. A person may say, "Why do you destroy insects"? Well, it is this way. If we were to let the insects go on in their own way, they would eat the best of the crop, and the grower could only have what was left.

To cope with these destructive creatures we must know a little of their life history. We must know by what means these insects get their food, or we would most likely use the wrong liquid with which we spray. All insects are not destructive. Some insects such as the mantis, ladybird, and lace-wing, are very useful. There are two classes of insects, and if we are going to spray our plants we must know how to deal with them. The two classes are:—

1. *Gnawing.*—The gnawing insects have jaws, and to kill them we must poison their food, by using Paris-green or arsenic; then their first meal will be their last.

2. Sucking.—The sucking insects have beaks, and we cannot kill them by poisoning their food, because instead of eating the crop or fruit, they bury their beaks in it and suck their food by means of this beak. We must use something that will kill them by contact or smother them, such as tobacco, kerosene emulsion or resin wash.

Pests introduced into new lands are generally the worst, because they have not got their enemies to contend against, and therefore they increase very fast.

Fungus diseases destroy the plant cells. The first spray was a whisk, which was used by the French, who went around their vines with their bucket of spraying liquid, sprinkling them with the whisk. In France the townspeople used to come down to the country and take what grapes they wanted and then go back again. One year a certain man, who owned one of these large vineyards, got some copper salt and sprinkled all the outside vines with this poisonous liquid and put up a sign to say that the grapes were poisoned. That same year the fungus disease was very bad, and all the vines around the district but these few were badly injured. In this way they found by accident a good mixture for killing fungus disease. This was afterwards called Bordeaux mixture. Dry sprays, such as sulphur, are used for vines, and for wet sprays we use the spray pump. We must apply the spray as fine as a mist to be any good at all.

ERINOSE.

A. Williamson, age 14.

Ticks and mites are related to the spider family. They got their family name from a lady who was turned into a spider. This lady's name was Arachne. These small animals are remarkable for their structure, the great number of kinds, and their breathing arrangements. Some plants, especially vines, are attacked by red spider, red mites and gall mites.

Erinose is another disease on the leaf of a vine. It is from a Greek word meaning woolly. This disease is caused by the gall mite, also called the blister mite. Gall mites blister the leaves of some plants in places, and it looks as if it had been burnt or toasted. This is why the name Phytoptus was given to the tiny mite causing this. White hairs in a mass, like felt, grow on the underside of the blister. The colour changes to white, yellow and brown. People thought the felt hairs were caused by a fungus, but after a while they found they were inhabited by very small animals 1-250th of an inch in length and 1-800th of an inch in width. That is, it would take 250 of them put end to end to make an inch. These peculiar animals have lost their third and fourth pairs of legs. They have two piercing organs with which they pierce the leaf and suck out the juice.

It is not very serious unless the flower is attacked. Some vines are more subject than others. The best thing to do is to spray the vines attacked with sulphur.

PHYLLOXERA.

J. Wade, age 17.

The word Phylloxera is composed of two Greek words—*Phyllon*, meaning a leaf; and *xeros*, meaning dry or withered, from the appearance of the plant attacked. The life history of Phylloxera is very interesting. The first stage is the winter egg. This is laid on the spurs or the older wood. Nearly all creatures do what their ancestors have done, and the phylloxera is no exception to this rule. Some lay on the young and some on the old wood. Those which are laid on the young wood get cut off when pruning. In pruning we cut off nearly all the year's growth. The reason why these eggs are called winter eggs is because they can stand very cold weather. A peculiar thing about the eggs is that they will not hatch out till the warm weather comes. If this insect comes out on an American vine, it goes to the leaves as soon as it is hatched, and forms a gall on them. But if it hatches out on a European vine it goes straight to the roots, and sets up its work of destruction.

The phylloxera is a kind of aphis. It has a beak, and drives this beak into the root, sucking up the food that should go to the plant, and, worse than this, it causes mortification of the tissue. It cannot do much harm to the American vine roots, because they are protected with a corky kind of covering, but if the phylloxera gets through this, the vine can just throw off the injury, and it does the vine no harm. After they have been in the root form for a time, nature seems to tell them that food is getting scarce, or that the vine is beginning to die. Then they turn into nymphs. They go through a few moults, and then come to the surface as winged insects.

The winged insect has large wings for the size of its body. They cannot fly very well, but they spread their wings, and the wind catches them, and they go a fair distance. If she drops down in a gum tree paddock she dies very quickly, as, luckily for us, phylloxera cannot live on anything but vines, though in some parts of the world they have one that lives on oak trees.

But we will suppose she drops into a vineyard safely. She goes to a vine, where her instinct leads her. She lays two different sized eggs; a larger one from which the female hatches, and a smaller one out of which the male comes. Soon after they hatch they mate, and the male dies immediately. The female only lives long enough to lay the winter eggs. This completes the cycle, and brings us to our starting point. The life history of the phylloxera was very hard to find out, because not only are they so small, but they spend nearly all their life under the soil.

Artificial Manures Acts.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACTS.

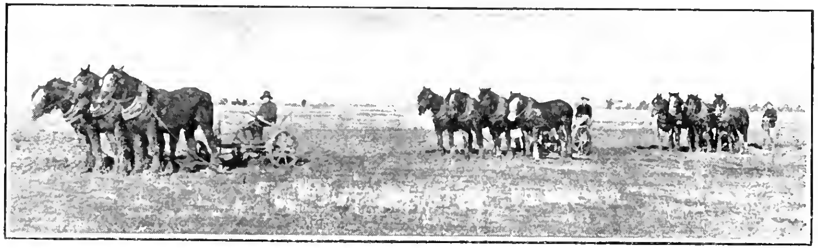
Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.								Potash.		Estimated Value of the Manure per Ton.
						Water Soluble.		Citrate Soluble.		Insoluble.		Total.				
			Found.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
			%	%	%	%	%	%	%	%	%	%	%	%	%	£ s. d.
725	Blood Manure ..	Wischer and Co., Melbourne ..	7·85	7·17	7·30	..	..	..	..	..	..	..	..	..	..	7 2 5
718	Nitro Superphosphate ..	Cuming, Smith, and Co., Melbourne	10·08	1·68	1·39	15·18	14·28	0·83	0·84	4·64	2·22	20·65	17·34	..	..	5 4 6
719	,, ,, ..	,, ,, ,, ,,	10·14	1·42	1·39	15·04	14·28	0·81	0·84	5·50	2·22	21·35	17·34	..	..	5 3 0
730	,, ..	J. Kitchen and Sons, Melbourne ..	9·98	1·35	1·39	12·55	13·17	3·17	1·50	3·03	2·67	18·75	17·34	..	..	4 13 7
723	Bonedust and Superphosphate ..	Australian Explosives and Chemical Co., Melbourne	3·98	0·79	0·75	15·55	12·75	0·90	0·75	4·35	6·00	20·80	19·50	..	..	4 15 1
716	,, ,, ..	Cuming, Smith, and Co., Melbourne	7·51	0·63	0·75	13·27	12·75	1·99	0·75	6·81	6·00	22·07	19·50	..	..	4 13 10
721	,, ,, ..	,, ,, ,, ,,	6·60	0·81	0·75	14·13	12·75	1·60	0·75	6·69	6·00	22·42	19·50	..	..	4 18 1
733	,, ,, ..	,, ,, ,, ,,	9·18	1·63	1·50	10·81	8·50	1·90	0·50	7·76	10·00	20·47	19·00	..	..	4 17 1
735	,, ,, ..	J. Kitchen and Sons, Melbourne ..	8·64	1·37	1·00	7·10	11·33	5·02	1·83	8·38	5·84	20·50	19·00	..	..	4 11 6
709	,, ,, ..	Mt. Lyell M. and R. Co., Melbourne	5·52	2·29	2·50	8·90	8·50	1·69	1·00	5·76	5·50	16·35	15·50	..	..	4 10 1
737	,, ,, ..	,, ,, ,, ,,	6·85	1·40	1·50	9·52	8·50	1·85	1·50	10·23	9·00	21·60	19·00	..	..	4 15 1
714	,, ,, ..	Wischer and Co., Melbourne ..	5·42	1·27	1·50	11·01	8·50	1·34	0·50	7·70	10·00	20·05	19·00	..	..	4 11 3
747	,, ,, ..	,, ,, ,, ..	9·74	1·52	1·50	12·28	8·50	1·99	0·50	3·43	10·00	17·70	19·00	..	..	4 11 0
707	Thomas' Phosphate and Superphosphate	Mt. Lyell M. and R. Co., Melbourne	2·55	..	..	0·86	5·00	9·94	11·00	7·68	1·50	18·48	17·50	..	..	3 4 6
738	Bone Fertilizer, "Sickle" ..	Cuming, Smith, and Co., Melbourne	7·67	2·73	3·00	..	..	5·54	3·50	11·20	14·50	16·74	18·00	..	..	4 5 8
744	,, ,, "Special" ..	,, ,, ,, ,,	8·03	4·34	5·00	..	..	4·74	3·00	12·64	13·00	17·38	16·00	..	..	5 5 10
717	,, ,, "Sickle" ..	,, ,, ,, ,,	6·05	3·24	3·00	..	..	5·62	3·50	13·59	14·50	19·21	18·00	..	..	4 18 8
742	,, ,, ,, ..	,, ,, ,, ,,	7·73	2·86	3·00	..	..	5·04	3·50	12·06	14·50	18·00	18·00	..	..	4 11 4
727	,, ,, "Kensington" ..	J. Kitchen and Sons, Melbourne ..	8·91	3·62	3·50	..	..	4·08	3·50	13·65	15·50	17·73	19·00	..	..	4 17 3
728	,, ,, "Opollo" ..	,, ,, ,, ,, ..	5·51	4·85	5·00	..	..	4·17	3·00	12·83	13·50	17·00	16·50	..	..	5 10 1
736	,, ,, "Waddell" ..	,, ,, ,, ,, ..	6·30	3·07	3·00	..	..	3·07	3·50	16·89	14·50	19·96	18·00	..	..	4 15 6
746	,, ,, "Wischer's" ..	Wischer and Co., Melbourne ..	9·05	3·52	3·00	..	..	6·42	3·50	12·70	14·50	19·12	18·00	..	..	5 2 10
724	Grain Manure, Special ..	Australian Explosives and Chemical Co., Melbourne	5·54	..	..	15·57	16·50	1·90	1·00	2·08	2·00	19·55	19·50	0·20	0·75	4 4 4
739	Rape Manure ..	Cuming, Smith, and Co., Melbourne	10·00	1·25	1·39	16·57	14·28	0·56	0·84	3·72	2·22	20·85	17·34	..	..	4 6 11
741	Potato Manure ..	Mt. Lyell M. and R. Co., Melbourne	7·07	1·48	1·05	8·83	8·50	1·95	0·50	6·54	7·30	17·32	16·30	7·20	8·80	5 3 9

List Showing Results of Analyses of Samples of Artificial Manures Collected in Victoria under the Provisions of the Artificial Manures Acts—*continued*.

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture found.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.				Estimated Value of the Manure per ton.
								Fine.		Coarse.		
				Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
			%	%	%	%	%	%	%	%	%	£ s. d.
711	Bonedust	P. Rohs, Bendigo	5·64	4·06	4·03	19·42	21·25	67·50	68·50	32·50	31·50	5 18 5
748	,, ...	,, ,, ...	11·66	3·73	4·03	20·89	21·25	57·00	68·50	43·00	31·50	5 17 0

Government Laboratory,
Melbourne, 19th August, 1910.

P. RANKIN SCOTT,
Chemist for Agriculture.



THE INFLUENCE OF STUBBLE BURNING ON THE FERTILITY OF THE SOIL.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in the Melbourne University.

The statement is frequently made that burning off the stubble after a grain crop improves the fertility of the soil and favours the growth of the succeeding crop. This effect is generally ascribed to the alkaline ashes left behind after burning, but since these ashes are no greater in amount than what is returned to the soil when the stubble is ploughed in, the only difference could lie in the fact of their being immediately available for absorption by the plant, instead of being slowly set free as the stubble decomposed in the soil.

The experience of others has led them to deny either that stubble burning does improve the fertility of the soil, or that if there is any effect, it can be due to the ashes of the crop. Mr. Herbert (*Journal of Agriculture of South Australia*, 1910, page 791) compared the effects of scattering ashes over one plot and burning rubbish on another. The experiment, though a very crude one, showed in favour of the latter plot. In the same Journal, page 967, the explanation is suggested that where stubble burning exercises a beneficial effect on the succeeding crop, this may be due to the effect of the partial sterilization of the soil by heat. Recent investigations have shown that steaming soil, or heating it to 180° Fahrenheit, temporarily destroys the minute animal organisms which feed upon the nitrate-producing and nitrogen-fixing organisms in the soil. As the result, the bacteria increase in numbers and make more nitrogen available for the use of the crop.

As against this explanation, we have the fact that burning off stubble only heats the immediate surface of the soil and does not appreciably affect the temperature of the deeper layers below the surface inch or two. Even in burning off dense scrub, it is surprising to how small an extent, the soil below the surface layers becomes heated. It is only when thick roots smoulder away underground, or when the soil contains so much peat or humus as to burn itself, that it becomes strongly heated to any depth. The explanation therefore, though ingenious, cannot be regarded as definitely established without further proof.

It should be remembered that three classes of bacteria, which render nitrogen available for the use of the plant, exist in the soil. The first group, which we may generally term Nitrate bacteria, are concerned in converting the organic nitrogen of the humus in the soil (which ordinary plants cannot use), into nitrates, chiefly of Calcium and Potassium, which they can freely absorb. This action can only go on when alkaline or alkaline earth bases are present such as Calcium, Potassium, Magnesium, &c. The addition of such substances in the form of ashes, even if the amount was slight, might temporarily increase the production of nitrates, particularly in acid soils. At the same time, this means that more humus is oxidized and the nitrogen capital of the soil reduced. Further, it is only where the soil contains nitrogenous humus, that any such action is possible. Hence, stubble burning not only decreases the amount of humus returned to the soil, but also accelerates the exhaustion of that already present in it. Owing to their high mean temperature, the oxidation of humus is already sufficiently rapid in most Victorian soils.

The second and third classes of bacteria bring the nitrogen of the air, which is useless to the ordinary plant, into combinations which are, or become, available for the plant's use as nitrogenous food. Of these nitrogen-fixing bacteria, one is that which grows in the root-tubercles of *Leguminosæ* and which gives to these plants their special value for enriching the soil with nitrogen. The third group, of which the best known is perhaps the form called Azotobacter, grows free in the soil and is in part responsible for the maintenance or increase of the nitrogen content in virgin soils. The nitrogen-fixing bacteria, which grow free in the soil, can, however, only flourish when they are supplied with carbohydrates such as are provided under natural conditions by the slow decomposition of the plant-remains returned to the soil. If the soil is cropped and, still more, if the stubble is burnt, the supply of humus soon becomes so small that these nitrogen-fixing soil organisms diminish to a minimum and the soil loses more nitrogen by waste and drainage, than it gains from the air.

In this case also, therefore, burning off the stubble is bound ultimately to produce a diminution in the amount of nitrogen added to the soil by these nitrogen-fixing soil organisms, since it decreases the supply of carbohydrate material on which they live. Steam sterilization by destroying the small animal organisms which eat these bacteria along with others, might temporarily increase their activity, but such treatment is not of course practicable on a large scale. When steam sterilization is used by horticulturalists for destroying weed seeds in manure and potting soil, it appears to cause an increase of nitrogen available for the plant's use and this may be sufficient to cause excessive leafy growth. Apparently, this is the result of an increase in the bacteria which produce nitrates from humus, and not in the nitrogen-fixing bacteria. Hence, the action will be best shown where large quantities of humus are present, as in stable manure or rich garden soil. Here, a little waste of humus is a comparatively small matter, whereas on an agricultural scale, maintenance of the humus content of the soil is one of the most important factors in preserving its fertility.

The burning of the stubble destroys a few weed seeds but, at the same time, the warmth and the resulting ash favour the germination of any hard seeds present in the soil and also provides precisely those conditions which aid in the spread of fire weeds, some of which easily become troublesome. It makes the impoverishment of virgin soils cropped without manuring take place more rapidly than would otherwise be the case, and it does this without producing any commensurate increase in the crop to compensate for the loss of the capital stored in the soil in the form of nitrogenous plant-food while it was in a virgin condition. It is the act of a spendthrift to burn away in a year or two the capital which was accumulated for him by nature without any effort on his own part, and which might, when properly husbanded, have lasted him his whole lifetime.

The use of fire to clear the ground in preparation for cultivation is common among all savage races who practise a more or less rudimentary kind of agriculture, but with the scientific advance of agriculture fire plays less and less part in its daily doings. Even in a garden, the less the amount of "rubbish" that is burnt, instead of being rotted wherever sufficiently soft and free from weed seeds, the less the amount of manure that will need to be carted in to keep up its fertility. Precisely the same thing applies on a large scale, and to an even greater extent, to Agriculture.

BUILDING HINTS FOR SETTLERS.

XII. FARM SANITATION.

C. H. Wright, Instructor in Plumbing, Eastern Suburbs Technical College.

The climatic conditions of Victoria are such that, naturally, no unhealthy district exists throughout the whole State. Seventy years ago our rivers and creeks were of pure running water, while the earth's surface was undisturbed by miners, woodmen, farmers, manufacturers, and others. Generally speaking, such is the case now, but not everywhere; for to-day one can visit many farms and country dwellings, where the occupants, instead of enjoying the best of God's good gifts, are placed, through their own neglect and ignorance, in a condition of life far worse than the city dwellers. For in towns and cities, public bodies look after matters relating to water supply, sewage, and garbage disposal; whereas the farm and country dweller has to do the best he can, and, in many cases, it is among his least concerns.

Pure air, pure soil, and pure food are necessary to a healthy life. In choosing a site for a home, avoid a clay soil. Build on gravel or porous, light soil, which will allow water to filter through; clay always retains a certain amount of water. Dampness in the air is caused by evaporation of moisture, and damp surroundings have a bad effect on the occupants of a house so situated.

Let the source of the domestic water supply be pure—a spring or deep well for preference. Contaminated rivers, creeks, and shallow wells should be avoided. Each room should be ventilated, and a free current of air allowed to pass through the house, while the maxim that "Sunshine is God's scavenger" must not be held too lightly.

The following points should be remembered:—

That it is quite possible for a thinking man, with limited means at his disposal, to build a house high enough to allow the air to pass underneath.

That domestic conveniences, such as sinks, wash-troughs, bath, &c., may be fitted up for domestic use.

That a scullery sink with a waste-pipe is a great improvement on the habit of throwing waste water just outside the door.

That to be able to turn on a tap over these fittings is far more convenient than to carry buckets of water from the tank or pump.

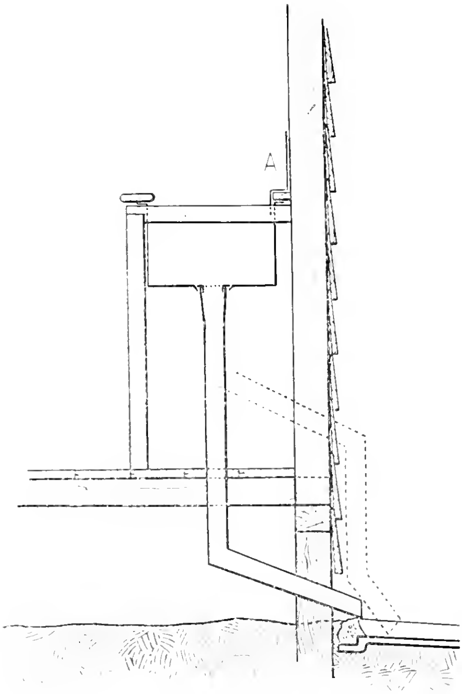
That to have a decent bath at one's disposal is often appreciable.

That a drainage system free from smells is a guard against ill-health.

That the closet should not be an abomination.

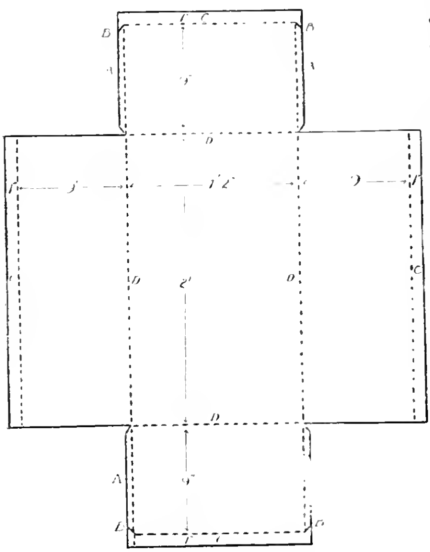
Physicians may cure disease; but perfect sanitary conditions will prevent it. As sanitary science has now reached a stage that provides the same domestic comforts for country residents as for town folk, the following instructions will enable readers to effect improvements themselves, or encourage them to design, in a simple and complete manner, what they require, and supervise the work should it be done by others.

Scullery Sink.—Sinks may be purchased in cast iron, enamelled stamped steel, or fire-clay. They may also be made in sheet copper or galvanized iron. Illustration No. 15 shows a pattern for one with the sizes marked. If thinking of making one of these, and you are not used to the work, first set it out on paper as shown; if correct, mark it on a sheet of 24-gauge plain iron 36 inches wide. Allow about $\frac{1}{2}$-inch at the corners marked A to turn round. Make a cut with the snips on the bevel as shown at B. The rim (C) is 1 inch wide, and, when turned outwards, the cut (B) will provide corner pieces and strengthen the whole sink when it is soldered up.



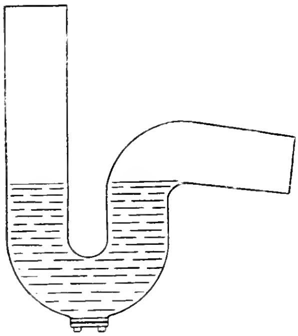
14. SCULLERY SINK.

Before this is done, turn up the four sides along the dotted lines marked D. First place a piece of sharp-edged hard wood along the line and pull up the iron. Keep the wood in a firm position and beat the sink into shape with a dresser. When that is done, turn up the other side. With a shorter piece of wood now turn up the ends. See that all is square and true, and solder after the manner already described in the previous article. Then make a stand out of 3 x 2 timber, and a frame to go around the rim, the back of which can be nailed to the wall, while the front rests on two legs as shown. If the timber is dressed the space under the sink need not be closed in, which is better. The rim of the sink is covered with 1-inch capping. A piece of plain iron placed against the wall at A and turned down into the sink as shown will prevent any splashing finding its way between the sink and the wall.

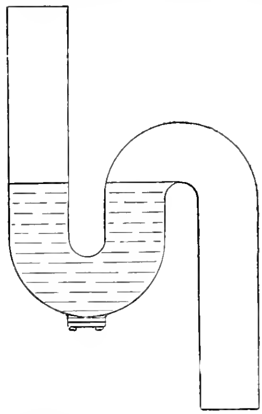


15. PATTERN FOR SCULLERY SINK.

The waste-pipe is made of 2-inch galvanized iron down-pipe; and if the room containing the sink is disconnected from living rooms, it need not have a trap. But if not, a trap with a water seal as illustrated in Nos. 16 and 17 will be required to prevent any smell entering the room. The waste-pipe should enter at one end of the sink, and, if a little fall be given, the water will drain to it. To do this, cut a hole the right size and solder the waste-pipe to it. A plug and washer with a grating should also be fixed, when the iron around the outlet should be tapped down so that the sink bottom will be flush with the top of the washer. The waste may be kept above the floor and discharge through the wall into the drain (as shown by dotted lines in the drawing), but in that case three elbows are required instead of one. But it has this advantage, that the whole of the waste is exposed; and in case of a leak it is detected at once. In any case, should it be necessary

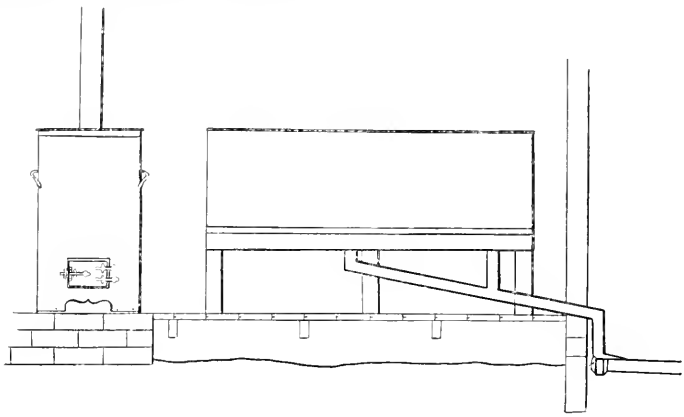


16. 2-INCH LEAD "P" TRAP.



17. 2-INCH LEAD "S" TRAP.

to make the waste in more than one piece, use a slip joint; that is, a joint giving about 3 inches of lap that you can slip together in its place and solder after fixing. Let the waste-pipe discharge into a half-round stoneware drain. Should the closed drains be used, let the length between them and the waste-pipe be a half-round open drain. This will form a disconnection and prevent the drain ventilating into the house, to a far lesser extent than it otherwise would.



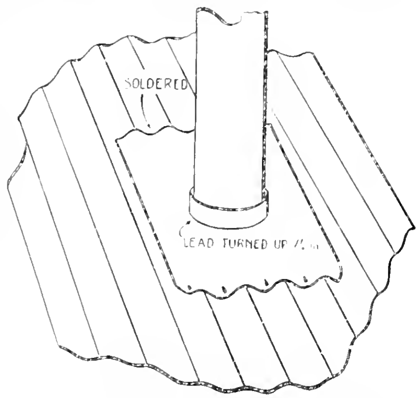
18. COPPER AND WASH TROUGHS.

In cases where septic tanks, sewerage system, &c., are in use, special disconnecting traps must be used, and they play a very important part in preventing sewer gas from finding its way into the dwelling. This, however, need not be considered, unless it is intended to instal a septic tank system; then, by all means, have the waste pipes completely trapped and disconnected.

Wash Troughs.—Any one who has had a set of wash troughs knows what a convenience they are. It is indeed a very poor tenement within a city boundary that does not possess them, and their use and benefits would be none the less appreciated in the country. No. 18 shows a set of troughs and a portable copper fixed in position. They may be placed in any outbuilding. The copper should stand on an earthern or brick floor, and the flue pass through the roof. A portable copper will last much longer under cover than if exposed in the open. The flue hole may be made watertight as in No. 19, the lead being dressed around the pipe as shown.

Wash troughs in kauri timber or galvanized iron may be purchased. Timber troughs should be kept full of water to prevent them splitting. Iron troughs will answer very well, if they are wiped out, and not allowed to rust. It is desirable that there should be a wooden floor for the person using them to stand on.

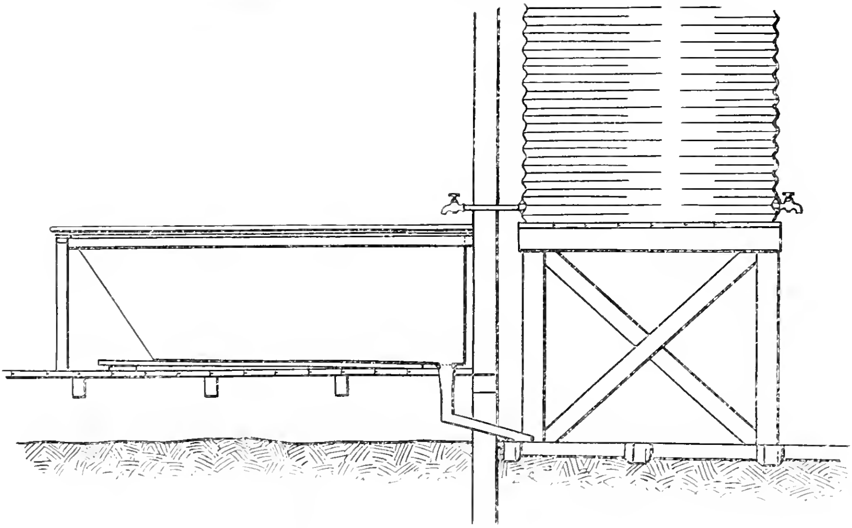
The troughs can be placed in position in like manner to the sink, with a piece of iron flashing fixed against the back, and the water pipe in front of this. The waste-pipe can be made similarly to that of the sink; but a branch is required for the extra trough. To make and fix a waste to the trough, first solder a tapered socket to the brass washer. In all purchased iron troughs this should be already fixed. Then make an elbow on a length of pipe with a suitable fall. Next mark the position of the branch on the waste-pipe after you have temporarily placed it in position. Remove the pipe, cut out the branch hole and solder as previously directed. Then finally solder the sockets, washers and pipes in position. Fix any clips on the pipes that may be required to keep them firm. If these troughs are in a detached building, they will not require trapping. For ordinary work, down-pipe may be used for wastes, but if a first-class job is wanted, lead or wrought iron must be used, and this can only be handled by expert tradesmen.



19. FLASHING TO COPPER CHIMNEY.

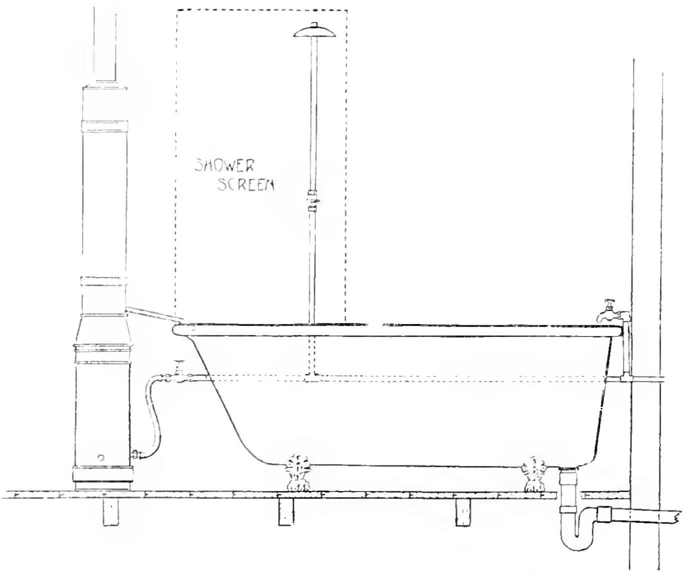
Baths and Bathrooms.—The bathing of the body is necessary if one wishes to keep in good health. The luxury of bathing is not monopolized by the rich; it is within the reach of all who have the planning and designing of the farm homestead or country residence in their own hands. They can have a bathroom fitted up, ranging from the simplest type to the twentieth century bath, which embraces a plunge, hip-spray, and other luxuries.

A common galvanized iron bath with a 2-inch galvanized iron waste discharging into a 4-inch half-round drain is illustrated on page 652. The water supply is drawn from an outside tank, and, in this case, would be limited; care should therefore be used to avoid waste. In common with the usual practice this bath is encased in woodwork and has a fall of about ½-inch to the outlet. The rim is covered by a capping, and flashing should be fixed over this and against any wall the bath adjoins. The waste-pipe in this case goes under the floor, and, if entirely disconnected from the living rooms, a trap is not necessary. This waste can also be



20. GALVANIZED IRON BATH AND WASTE.

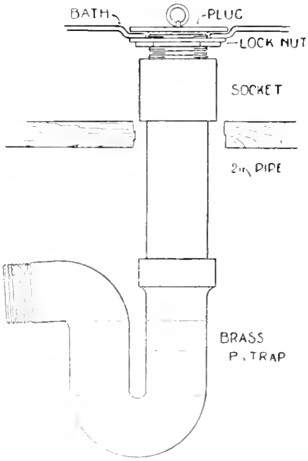
made in 2-inch down-pipe with the usual sheet iron socket, and grating and plug to fit. The plug should be fastened to a chain to prevent it getting lost.



21. ROLLED-EDGE BATH AND WATER-HEATER.

A rolled-edge porcelain enamelled bath and a water-heater (wood fuel) in position are given in No. 21. Baths of this type are best fixed without being enclosed with woodwork. If the bathroom opens into a living room, a brass trap can be used, provided you see that the thread in the plug and waste fitting is of 1½-inch or 2-inch wrought iron-pipe thread. The brass trap can then be attached to this and the outlet extended as shown in No. 20.

When selecting a water heater (wood fuel) ask the maker to supply a lead connection and union to fit $\frac{1}{2}$-inch or $\frac{3}{4}$-inch iron pipe; also any lead or compo pipe that may be necessary for delivering the hot water into the bath. Also ask to have all outlet unions soldered on to the lead pipes. Select a convenient position for the heater to stand in, making sure that the water supply, if from a tank, is high enough to keep the heater full. Then place the heater in position, carry the flue pipe through the roof, as described for the copper chimney, cutting the wood lining of the ceiling 3 inches clear of the flue, and keep from touching any woodwork by sheet iron cut to fit. Next extend the wrought iron water pipe from the bath tap to a convenient position for the heater stop tap. Then connect up with the lead connection already mentioned. Finally, continue the discharge pipe from the heater to the bath, working from the union end first and cutting off the surplus pipe.

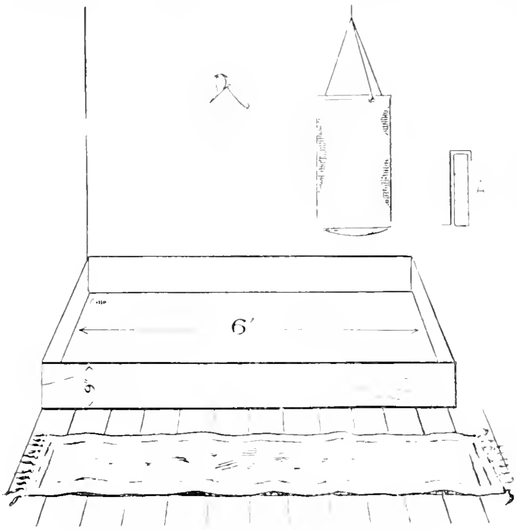


22. WASTE TO ROLLED-EDGE BATH.

Makers supply a card giving complete instructions for fitting up the heater supplied.

"How can the water supply for the fittings mentioned be obtained?" may be asked. Well, there is first the roof catchment; that may be stored without loss. Then there is the excavated or bore well supply which may be tapped. Or, if resident in hilly districts, it may be possible to take advantage of springs or running creeks. Generally speaking, Victoria enjoys a good average rainfall compared with the other States, and there are natural water resources which only need to be taken advantage of.

Bathing Tray.—For many reasons it may not be convenient to have a plunge bath fitted up. But it is quite possible to have a bath without one. Throughout India there are thousands of bathrooms after the style illustrated in No. 23.



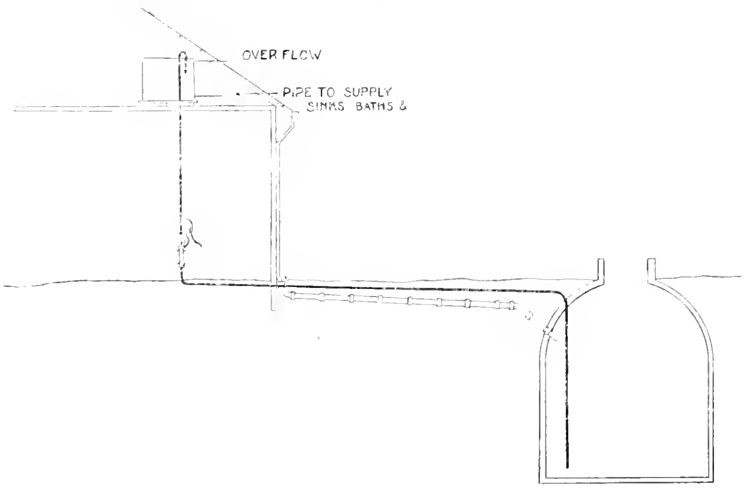
23. SIMPLE BATHING TRAY.

The bath is simply a tray made of timber, cement or brickwork. If in the city it is supplied with a bib-tap and shower; but if away from the water supply, the water is stored in large jars and dipped out and poured over the body by the bather. In No. 23 a canvas bag is shown which will give very cold water, and the contents of a few dippers poured over the body will prove most refreshing. The tray can be made of galvanized iron by the same method as the sink, with the top edge turned over the outside timber as shown in the marginal sketch A. The outlet is at the corner. Where water is scarce, this style of bathing could be made to fill a great want and be adapted to suit requirements of homes, permanent or temporary.

Water Supply.—In the days of primitive man, those living in the vicinity of rivers drew water above and returned it, after use, along with sewage and other refuse, to the stream below their habitation, to contaminate the water for their neighbours lower down. This sort of thing still goes on. Old wells will become polluted by surface or underground drainage, containing sewage or other objectionable matter, if the site has not been carefully selected.

The following paragraph is extracted from a recent issue of the *Age* :—

Mr. H. H., of Bordertown, was seriously poisoned through drinking water from a well which had been sunk into an old discarded station dip, used 40 years ago. Two of his sons were slightly poisoned through the same cause.



24. ROOF CISTERN AND UNDERGROUND STORAGE TANK.

Surface drainage should be kept out of wells and underground tanks by brick and cement work. Bored or drill wells are better and safer than excavated wells, as a greater depth can be secured at far less cost.

Smaller and poorer farmers might do better if they would only consider the difference between bucket and hand pump work, and the up-to-date windmill. A small mill with stand, pump and 30 feet of pipe, capable of pumping 900 gallons per day, can be purchased for about £12, and an 8-ft. mill, capable of pumping water from a well 100 feet deep and delivering 900 gallons per day, for about £23. So great has been the demand for Australian-made mills that one Melbourne maker in 1909 turned out 1,800, many of which went to Queensland and Western Australia.

Illustration No. 24 shows how roof water may be conveyed into a watertight underground tank, where it can be kept cool; and from thence pumped up into a small tank on the roof which need not hold more than

100 gallons. The water can then be conveyed by pipes to any household fitting, such as sink, bath, troughs, filters, &c. The top of the underground tank should be lighted, vented and guarded, and the contents kept pure, for typhoid, cholera or dysentery may result from drinking impure water. Beware of the old style dripstone germ-breeding filters; there are many up-to-date and safe filters now on the market.

A few remarks on closed drains for domestic use may not be out of place. They should not be larger than actually necessary for the duty they have to perform; and should have a fall from 1 in 30 to 1 in 60. If foul, the interior of a drain often smells more offensively than the matter passing through it; therefore, see that they are kept clean. Never lay them inside an inhabited building if it is possible to get them outside. Always use Y junctions for connecting branches to main drains. The pipes should be laid perfectly straight from point to point, and an air current should be constantly passing through them; and all joints must be made water-tight. If a septic tank is in use, all waste pipes from baths, sinks, troughs, &c., should enter the drain through a disconnecting trap.

Disposal of Garbage.—Constantinople relies on its dogs as scavengers; India depends on kites and crows; while the aborigines of Australia simply move their camp to a clean spot. As already mentioned, city authorities in Victoria deal with the disposal of the garbage, and, in many cases, it gives them grave concern. To throw refuse into a running creek is little short of criminal, and to leave it about until the dogs, &c., remove it is to descend to the level of the Asiatic. A good plan is to have a tightly covered barrel or large oil drum near the house, and into this all refuse may be dumped. This receptacle can be carried away when full; and the contents trenched into the garden. Household slops should also be treated in the same way, and many experienced gardeners can testify to their manurial value.

Ventilation.—Every compartment of a building should be separately ventilated. The outlets should be through the outside wall close to the ceiling line, and protected on the outside by a small plain iron cover, and finished on the inside by a plaster print, which will allow a free circulation through the house all the year round.

Closets.—A clean and well kept earth closet is the best available substitute for the sewered water closet. Below the seat is placed a box holding earth or ashes. A hinged door at the back of the building permits the frequent removal of the box, which is set upon wheels so as to be easily drawn away to the fields. Ventilation and light are most important in building a closet; and the site should be selected so as to insure a certain amount of privacy.

Sewage Disposal by Biological Treatment.—This system has of late years rapidly advanced. Before sewage can be thoroughly purified by this process it must undergo two changes: first the ærobic bacterial treatment which liquefies the solids, then the further anærobic bacterial treatment which finally converts it into harmless elements. The result of their combined work is an effluent free from danger.

This system can be installed in any country home or farm, large or small, where there is an adequate water supply, and brings the latest sanitary water closets within reach of those whose lot it is to develop the resources of the country. But it is a system amateurs should not attempt to carry out. A competent sanitary engineer or plumber who completely understands this class of work should be employed, and whatever reasonable expense is undertaken, the result will justify the outlay.

THE CHESTNUT.

F. de Castella, Government Viticulturist.

The Sweet, or Spanish Chestnut, *Castanea vesca*, as it is chiefly known to botanists, is one of those numerous valuable trees which are as yet unfamiliar to the majority of Victorians.

That some trees are grown here and there, is evidenced by the chestnuts to be occasionally seen exposed for sale at different fruit shops in the city. In fact, according to the latest returns of the Victorian Government Statist, 5,003 lbs. were harvested this year, an increase of 1,648 lbs. on the previous year's crop, though in 1908 5,000 lbs. were also harvested.

Attention has already been drawn by the writer to several other neglected but valuable trees such as the Olive, the Cork Oak, and the Carob.

CHESTNUTS NEAR ANDUZE, FRANCE.

The suitability of both the climate and soils of fully one-half of this State for the subject of the present article is so marked that it is well to once more draw attention to its claims, in spite of their having been frequently urged in the past, notably by the late Baron von Mueller, several witnesses before the Royal Commission on Vegetable Products, and more recently still by Messrs. Crooke and Blackburne of the Forests Department, who include it among the trees they recommend for street planting.

The chestnut is well worth cultivating as an orchard tree, and is recommended as such by no less an authority than Professor Wickson, of California University. It would then, of course, be submitted to intense culture, and, in consequence, capable of giving abundant returns, but there is another purpose for which it is well worthy of attention.

Shelter trees are becoming a vital necessity with us. Wholesale, and often ill-considered, clearing, has turned immense areas of what were once sparse forests into open country, rendering the use of breakwinds and shelter belts a more and more widely acknowledged necessity every year. In the planting of these it is well that preference should be given to trees which, while providing shelter, should also be productive. Many fine shelter trees are now being planted, notably our own eucalypts, the rapid growth of which renders them special favourites in this country, where we are usually in a hurry. Eucalypts, unfortunately, apart from their timber value, bring in no revenue.

As a tree, which, in addition to providing abundant shelter, also yields valuable crops, few have more to recommend them than the chestnut. The tree itself is too well-known for much description to be necessary. It attains a height of 50 feet, and its graceful and characteristic habit of growth makes it one of the most ornamental of deciduous trees. The photographs reproduced of chestnuts at Anduze, department of Gard, France, will give some idea of the general appearance. Its abundant

CHESTNUTS NEAR ANDUZE.

foliage, composed of large, bright green, lanceolate, sharply-toothed leaves, similar in shape to those of the Loquat, though finer in texture and lighter in colour, enable it to provide dense shade. Coming into leaf early in spring it blossoms about November, the nuts ripening in March or April.

As regards climate, its requirements are very similar to those of the vine, with, perhaps, not quite such a wide range; whilst it will thrive in regions rather too cold for this plant to be profitably grown. The warmer portions of Victoria, such as the Murray and Mallee, where the vine does so well, are rather too warm for it. In Spain, it is in the northern provinces—from Cataluña right across to Galicia—that it is most frequently met with, being scarcer in warmer parts such as Valencia and Murcia; whilst in France, it is the cooler parts of the south, such as the flanks of the Cevennes Mountains and the Pyrenees, where it finds itself most at home, although it also does remarkably well in Corsica.

It is not difficult to please, as regards soil, provided this be neither stiff, swampy, nor too rich in lime. Its powerful, deeply plunging roots enable it to thrive in poor and rocky land. Granitic, as well as loamy soils of schistose origin, so abundant in Victoria, are particularly suitable for it.

The Chestnut in France.

The following notes collected recently in southern and south central France, in many districts of which the chestnut has for thousands of years been the main source of food, both for man and beast, will serve as a reminder and also, it is hoped, as a plea for greater attention being given to this tree than it has yet received in Australia.

Though commonly known as the Spanish chestnut and cultivated on an enormous scale in Italy, as well as in most southern European countries, it was in France that my viticultural investigations brought me most in contact with it. Even in southern France its area of usefulness is limited, being specialized in certain districts, and this for reasons which are of special interest to Victorians. So far as climate is concerned, the greater part of France is eminently suited for it. It is peculiarities of French soils which limit its adaptation to certain localities.

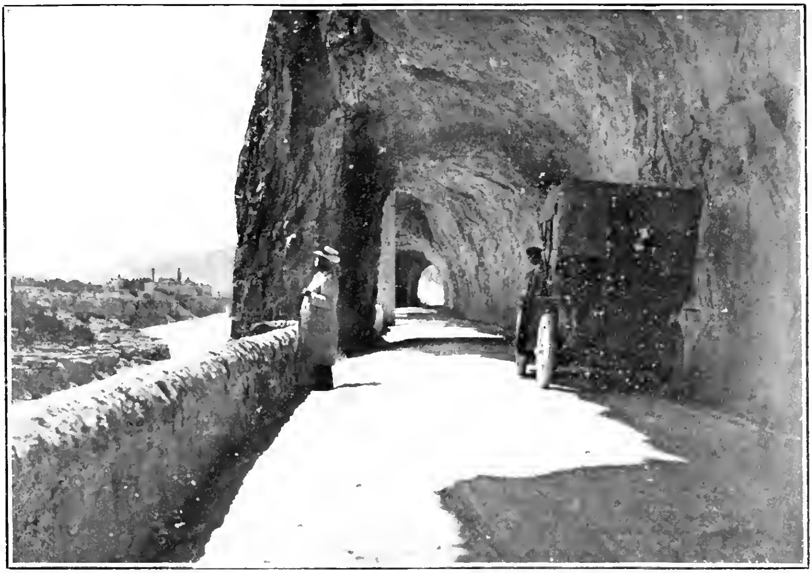
The fundamental difference between the soils of France and those of Victoria lies in their respective lime contents. The vast extent of limestone formations to be met with in France strikes the Australian visitor very forcibly. The chestnut will only do well in soils free from lime; should the percentage of this element, calculated as carbonate, exceed 4 per cent., it will not thrive. Now soils containing less than this proportion are as scarce in France as they are plentiful in Victoria—they are, in fact, in that country, limited to certain regions. Wherever such regions occur, however, one finds the chestnut asserting itself and becoming the main standby of the inhabitants. In such districts as the Cevennes, many parts of the Central Plateau, and the Pyrenees, this is more particularly the case; so much so, that in the Cevennes it is often referred to as *l'arbre à pain* (bread tree).

Other factors, no doubt, also contribute to its popularity, notably its rusticity, which enables it to thrive in soils too poor for other crops. In mountainous regions large tracts of poor, stony, uncultivable land are to be met with, on which, prior to modern transport facilities, the inhabitants largely depended on the chestnut tree for their sustenance. Of later years cereals and potatoes have taken its place as human food, so it no longer occupies the position it once did in this respect.

In 1881, the seven most important chestnut-growing departments of France, viz., Dordogne, Gard, Lot, Ardèche, Aveyron, Corrèze and Tarn, included, between them, 645,000 acres under chestnuts. In Corsica and other parts the tree is likewise very largely grown, so that, if we allow a rather lesser acreage for the remaining 79 departments of France, a very moderate estimate, we find that the total area occupied by it cannot be short of a million acres.

The Ardèche department is one of those where this tree is to be found in great abundance, and where, in former times, it formed the main support of the population. Large areas of rocky land, too poor and too rough for any form of agriculture, can thus be utilized. Accustomed, as Victorians are, to the large expanses of excellent land, almost every acre of which is fit for the plough, it is not easy to realize this sort of country. Nor is it easy to represent it pictorially—nevertheless, the photograph taken near Rioms, on the road from Aubenas to Vallon, which it has been necessary to tunnel out of the rock, will give some idea of what rough country this really is. In the Cevennes and other parts of the flanks of the central plateau of France, thousands of square miles of this kind of country have for centuries past supported a fairly dense population—hardy, happy, and contented, in spite of the difficulties of raising the necessary food supplies.

It is such districts as this which are the home of the chestnut. Wherever the lime percentage of the soil is sufficiently low to permit of satisfactory growth, and the underlying rock is at all penetrable, plantations are to be seen in abundance, becoming the main feature of the landscape. As well as supplying food for man and beast, its powerful roots bind the scanty soil together on the steep hillsides, counteracting the erosion of heavy winter rains which would otherwise most certainly have long since transformed the greater part of the country into a rocky desert. In the department of Ardèche alone it is estimated that 82,000



ROAD NEAR RIOMS, FRANCE.

acres are occupied by chestnuts, an area considerably less than what it was a few years ago for reasons that we shall consider presently.

In Victoria, apart from our mountain regions, we have little country of the same type as that above referred to. Even in our poorer districts the hillsides are usually covered with soil, hiding the rock, the presence of which in a bare state, as a leading feature of the landscape, strikes the Australian visitor to Europe very forcibly in many hilly regions, especially where timber is scarce. Nevertheless, there are thousands of acres of our mountain valleys too steep for the plough, and, as a means of utilizing these and, in fact, any odd bits of waste land, this neglected tree will no doubt some day have its value thoroughly recognised and be largely planted. In the valleys of the North-east district of Victoria, running right up into the high mountains, are enormous areas, much of which is too steep for any form of agriculture. In any such land, and more particularly where the soil is supported by fissured rock, as is very often the case, the chestnut tree will thrive, and in such cases enable profitable use to be made of otherwise valueless land. Its value for preventing erosion would be equal to the disappearing eucalypts, which we have so largely to thank for the absence of bare rock referred to above.

So far as climate is concerned,the greater part of Victoria is admirably suited for it, perhaps excepting the warmer parts such as the Murray valley, the Mallee and Wimmera. As regards soil, the freedom from excess of lime of almost the whole of the eastern half of the State should render this tree of special interest.

Variety of Its Products.

Though known chiefly in this State on account of its fruit, this is by no means its only utility. In the past, no doubt, it has been mainly grown for this purpose, which is the one which has earned it the name of bread tree in many parts of France. Though, as a staple article of human food, it has no longer the importance it once had, good quality chestnuts will always be in demand. The bulk of the trees to be found in France are ungrafted seedlings, most of which produce fruit of poor quality. High grade fruit is yielded by trees grafted with better sorts such as Marron, Sardonne, Combale, Merle, Marcols, &c., the produce of which meets with a ready sale. In fact, the demand for high grade chestnuts is on the increase in France for cooking and roasting, as well as for confectionery—the manufacture of *Marrons Glacés*, the well-known French sweet, constituting an important and increasing industry. For these purposes, in 1881 Paris alone consumed 6,000 tons of chestnuts. M. J. Farcy (*Revue de Viticulture*, 3rd September, 1908) estimates that over a ton of chestnuts can be obtained from an acre of trees (in this case receiving some slight cultivation), worth about £5 after deducting about 35s. for cost of gathering. Under these conditions, the tree would be worth treating as an orchard tree and not only as a forest or shelter tree. This is a higher yield than the ordinary run of plantations of poorer sorts, the average yield of which would amount to about one-third of the above estimate.

The higher grade chestnuts, such as are in demand at present, are always consumed in the fresh state, for which they keep for a period of several months. In districts where they constituted the food of the people they were dried, in which condition they could be kept almost indefinitely. Sometimes the dried nuts were ground into flour, which is still a marketable commodity in many chestnut-growing countries.

As feed for pigs the chestnut has a high value. In the department of Ardèche poor grade fruit is often utilized for this purpose, the better quality being used for human food, whilst the best grade is sold in the neighbouring towns at good prices. For fattening pigs, picking is of course unnecessary; the animals can feed on the fruit as it drops from the tree in the same way as on acorns in the Portuguese oak woods. As food for almost any domestic animals, the chestnut has a high value. Horses are fed on it in Spain, in which country even the burrs are fed to cattle. As food for poultry it is highly esteemed, both in France and Spain. In the chestnut regions of France the foliage is used both for fodder and bedding.

As a timber tree, it is of great value; for this purpose alone, it is worthy of consideration. Its wood lasts particularly well under water. It is, after oak, the best European timber for coopering purposes and is largely used in countries where readily obtainable, more especially for the construction of large casks. In the armazens of Portugal, in particular, the writer frequently met with storage casks made of this wood. Its high tannin contents cause it to be esteemed for the storage of young wines, on which this substance exerts its well-known preservative action.

This high tannin percentage brings us to the most recent use of the chestnut tree in Southern Europe, a use which bids fair to lead to the ultimate extermination of this beautiful tree in many, at least, of the regions where, since time immemorial, it has been the main supporter of the population. Unlike so many tannin plants, in which the bark is the portion containing tannin, as is the case with our own wattles, the whole wood of the tree is rich in this substance, varying a good deal according to circumstances. The older the tree, the richer the wood in tannin—up to about forty or fifty years. Young wood contains comparatively little.

According to analyses made by M. Muntz,* the percentage varied between 8 per cent. and 16.17 per cent. in the wood; in the only analysis of bark given it was 6.6 per cent. The highest proportion of tannin was contained by the heart wood. So far as tannin contents are concerned, it seems to be second only to the South American *Quebracho* (*Aspidiospermum Quebracho*), which contains from 16 to 23 per cent. of tannin.† The average percentage of tannin in the chestnut wood treated in French factories is between 8 and 10 per cent. The wood is cut, against the grain, into thin shavings, from which the tannin is extracted by water.

The preparation of this extract is now a very considerable industry in France, where numerous factories have recently been established. In the department of Ardèche alone, with its 82,000 acres of chestnut trees, there are five factories which between them treat 150 tons of wood per day. In order to supply this it is necessary to cut down no less than 750 acres of plantations every year. In most of the chestnut-growing departments, the same destructive agency is at work, and it is feared that the tendency is towards even greater activity if one can judge by the price paid for wood, which has rapidly risen from 11s. 2d. to 13s. 7d., and even 14s. 5d. per ton.

The Decline of the Chestnut in France.

It is thus evident that, in spite of its many precious qualities, the area under chestnuts is gradually declining; nor is this due to any fault of the tree itself. It cannot, of course, claim to yield anything like the profits to be expected from most of our fruit trees and other plants usually submitted to intense culture. No doubt, some French plantations have been established in rich soil and in these, now that means of communication have been opened up, other products giving higher returns per acre are being substituted for it, but this would not account for anything like the areas which are yearly being grubbed out. It is the recent impetus given to the tannin extraction industry which is the main cause of the decline. Apparently the poor quality of the fruit produced by many of the trees is responsible for the willingness of their owners to thus sacrifice them. M. Farcy points out the desirability of planting only trees grafted with better varieties, leaving the old and faulty ones for tannin extraction.

There is also another cause, in the shape of a disease of somewhat recent origin, which is in some districts working considerable havoc and which is causing many owners of trees to sell them to the tannin factories.

These different causes are responsible for a decline concerning which French agricultural journals are loud in their lamentations.

* L. Mangin, *Revue de Viticulture*, 18th February, 1904.

† L. Mangin, *Revue de Viticulture*, 31st December, 1903.

It would appear that the depopulation of some of the poor rocky districts of the central plateau of France, where scarcely any form of agriculture is possible, is directly due to the disappearance of this tree.

M. J. Farcy, writing in *la Revue de Viticulture*, 3rd September, 1908, says :—

Meanwhile, Ardèche is advancing at a rapid rate towards its ruin and its depopulation. The chestnut is, in fact, an extremely precious tree for the peasant of our mountains, and one which it is difficult to see how he will ever be able to do without. It furnishes him with food for himself and his pigs, leaves for winter feed for his goats and sheep, firewood to warm himself with, and now gold (louis d'or) by sale to the factories.

After going into the question of the value per acre thus realized, which he estimates at about 1,100 f. per hectare (£17 12s. per acre), he continues :—

This is, as one can see, a fairly low price, but the seller, often pressed for want of money, only sees the 1,100 francs immediately within his reach and does not consider that he is about to kill the goose that lays the golden eggs.

The national importance of chestnut culture is also recognised in Italy, the Government of which country is taking active steps to encourage replantation. Between 1890 and 1900 over 3,000,000 grafted chestnut trees were distributed to farmers.

The Chestnut Disease.

About the middle of last century a somewhat mysterious malady made its appearance in the chestnut plantations of Southern Europe. Up to date it has caused the destruction of some 25,000 acres of plantations; not a very large proportion of the whole, perhaps, but nevertheless sufficient to cause alarm in districts where the tree is of really capital importance.

Known popularly as *la maladie de l'encre* (ink disease), its true nature has given rise to much discussion, and even now authorities are not unanimous as to its cause. It is fortunately a slow spreading disease.

According to M. L. Mangin‡ :—

It is . . . contagious, spreading gradually like an oil mark (*tache d'huile*) around each diseased patch and causing the disappearance of all trees old or young, in rich as well as in poor soil. . . . I have shown that the seat of the disease is localized in the smallest roots of the chestnut tree which are invaded by a fungus parasite *Mycelophagus Castaneæ*. This parasite progressively destroys the absorbing organs of the tree, the foliage turns yellow, the leaves become dry, and the tree dies in two or three years, sometimes more, often less.

In order to combat the disease no cure has yet been found. The case is a similar one to that of the Phylloxera of the vine. The principal means of checking its spread is by the extinction method, consisting in the eradication of attacked areas. The slow spread of the disease renders this practicable and also profitable, as the trees eradicated are utilized for the manufacture of tannin. Recently, another solution has been suggested which continues still further the parallelism with vine phylloxera referred to above, viz., grafting on resistant stocks.

Several other species of Castanea, notably *C. crenata*, indigenous to Japan and *C. dentata*, an American species, were said to be resistant, and have been experimented with. *C. crenata*, after seven years' trial, replanted in the same place where ordinary European trees had succumbed, has proved its power of resisting the disease. The American species has not, however, been found a success.

‡ *Revue de Viticulture*, vol. XXI., p. 19.

To use the resistant Japanese chestnut as a stock on which to graft the old varieties of Europe appears to be the logical solution of the question. Other stocks, such as various species of oak, have also been suggested but, owing to insufficient affinity, they appear to be less satisfactory.* Though the Japanese tree is smaller than the European (30 feet against 50 feet) it is possible that, when used as a stock, it may reduce but little the size of the scion. Grafting on resistant stock is quite a recent departure, and one which does not directly interest us in this country, where the chestnut disease does not seem to have made its appearance. Even in France, in districts free from it, plantations are still being made with trees worked on European seedling stock, and therefore non-resistant; so slow is the spread of the disease.

There are numerous varieties of the Japanese species, one in particular, viz., that introduced into France under the name of Tambu, is very highly spoken of in that country.† In fact, so much so that the trial of the best Japanese varieties seems to have much to recommend it in Australia. In all but cases where a very large tree is required, the ungrafted Japanese species is worthy of consideration, for the quality of its fruit and the early age at which it commences to bear.

Practical Hints.

The purpose of these notes is to draw attention to the claims of this valuable tree and its marked suitability for Victorian conditions rather than to give detailed instructions, which can best be found elsewhere; nevertheless, a few practical points may be briefly considered, mainly in connection with propagation and plantation.

In the first place, it must not be forgotten that the chestnut does not come true from seed‡; many seedling trees, in fact, bear empty burrs. Hence the need for grafting seedlings in order to perpetuate valuable and prolific varieties.

They grow readily from nuts planted in August or September, after stratification in moist soil or sand since the commencement of winter. They should be planted about 3 inches deep, either in the nursery or where they are to remain. In the latter case, owing to the tap root not being interfered with, a larger and stronger growing tree will result, a point worthy of consideration for shelter purposes.

According to some authorities, this tree does not readily admit of transplantation; nevertheless, it is very often raised in nurseries—

> Chestnuts can be grown in the nursery until several years old, providing they are lifted at the end of the first year, the tap root cut off, and the trees reset, giving them rather more room than during the first year's growth.—(Wickson).

Grafting can either be performed in the nursery or after planting out. In France, grafted trees five or six years old are worth 1s. 8d. to 2s. each (Farcy). Various styles of grafting and budding may be employed, treatment being much the same as for the fig. If budded, the bud should grow

*Nevertheless, in some cases recently, the oak has been succesfully used as a stock, especially when grafted below ground. Failures have often been recorded with the older method of grafting considerably above ground. It is also hoped that some other species of oak may prove superior to *Quercus robur*, the one which, so far, has been chiefly tried.

†See *Progrès Agricole*, 28th March, 1909.

‡In Corsica a variety of the tree is largely grown which is said to come true from seed. The fruit is, however, only of medium size. Corsican chestnuts being mainly used for drying and milling into chestnut flour, the size of the fruit is not of great consequence.

immediately and not remain dormant. Plantation is executed much as for other fruit trees. Protection from stock is necessary, since animals eat the foliage greedily.

Wide planting is essential. The fruit being produced in clusters on the ends of the shoots, the trees interfere with one another if too close. (This habit of fruiting renders pruning practically unnecessary.) In France, the average number of trees to the acre is 40 (100 per hectare). They are often planted in rows, the intervening space being occupied by other crops or permanent pastures. Thus treated, excellent yields are often obtained.

The following additional extracts from Professor Wickson's latest edition of *California Fruits and How to Grow Them* will no doubt prove of interest:—

> The chestnut is not yet produced in large amount in California and certain quantities of the nuts are annually imported, the American, Italian or Spanish, and Japanese all being found in the San Francisco markets. . . . . . Chestnut trees are readily grown from seed, and thus grown come into bearing in from six to eight years, though the Japanese sometimes bear sooner. (Grafting is next dealt with.) . . . . The chestnut, aside from its desirability as an orchard tree, can be commended as a tree for hillsides or a shade tree for waysides or pastures, and should be more widely planted in California. . . . .

The concluding passage applies with perhaps even greater force to many of the cooler parts of Victoria. The chestnut is essentially a tree for temperate climates, and many of our cooler districts rank among the most temperate in the world. In thousands of situations, mild enough for our Eucalypts yet almost too cool for the vine, it will find its natural home.

Economic reasons render it impossible to ever hope of covering the vast areas of this State which consist of poor deep soil, with vines and fruit trees, for which deep rooting plants they are so admirably adapted. In these situations, the value of such trees as the chestnut and the cork oak, which yield fodder as well as other commercial products, is too obvious to need enlarging on.

THE WINE INDUSTRY IN SOUTHERN FRANCE.

Department of Hérault.

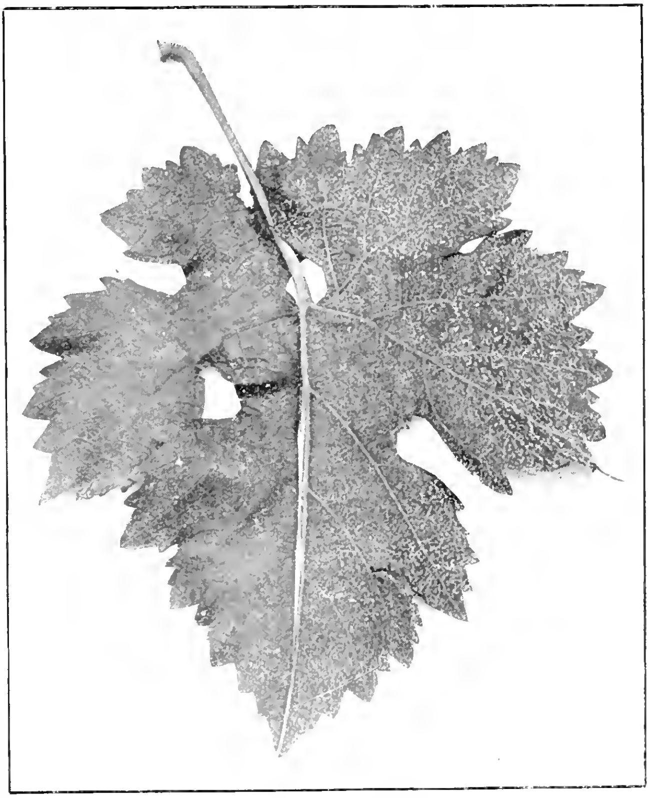
(Continued from page 473.)

F. de Castella, Government Viticulturist.

Scion Varieties (continued).

Carignane, Syn. *Carignan,* and *Monestel,* in France; *Mazuelo,* in Spain, &c. Next in order of importance, we have a vine not unknown in Victoria, and rather frequently to be met with, though known under erroneous names, and almost invariably mixed with other sorts in the same block. Carignane, or Carignan, as it is sometimes also called in France, is, after Aramon, the most important constituent of Vin Ordinaire in the department of Hérault. Like that variety, though not to the same extent, it is a heavy bearer, yielding crops of up to 1,500 gallons per acre in rich land. (Foex.) Like Aramon, it is a variety which responds to richness of soil and to heavy manuring. The wine yielded by it possesses rather more body and colour than that of Aramon, to which it is usually considered superior; in fact Foex states it to be the Hérault variety which combines quality and quantity in the highest degree. When quite new it is rather harsher than Aramon, which is almost immediately fit for consumption (see *Journal,* February, 1910), but, on the other hand, it improves more than it on maturation, and possesses more colour and body, for, as can easily be imagined, with the extraordinarily heavy crops mentioned above, these are qualities which are apt to be found wanting. When grown on poorer soil it enters into the composition of some choicer wines, notably those of Banyouls and Collioure in Roussillon.

The vine itself is a vigorous, semi-erect grower, easily recognised by its very large light-green leaves deeply indented, as shown in the photograph, which is made up of two half leaves in order to compare upper and under surfaces and to show the flakes of cotton present on the latter. A characteristic feature of these leaves, which is also shown, in their goffered or bulgy appearance, especially near the centre. The vine may also be recognised by its splendid autumnal tints, which are rather a brilliant rose colour than the deep vinous red of several other sorts.



LEAF OF CARIGNANE.
Left half, upper surface. Right half, lower surface.
One-third natural size.

This variety does not appear to have been tried separately, in spite of the frequency with which it is met with near Rutherglen. In most of the vineyards of that district one finds blocks of what are called Roussillon.* These vary a good deal from one vineyard to another, but are usually comprised of a number of different varieties, amongst which one almost always finds Carignane in fairly large proportion. Sometimes, these mixed blocks are known as Grenache, an even more misleading error.

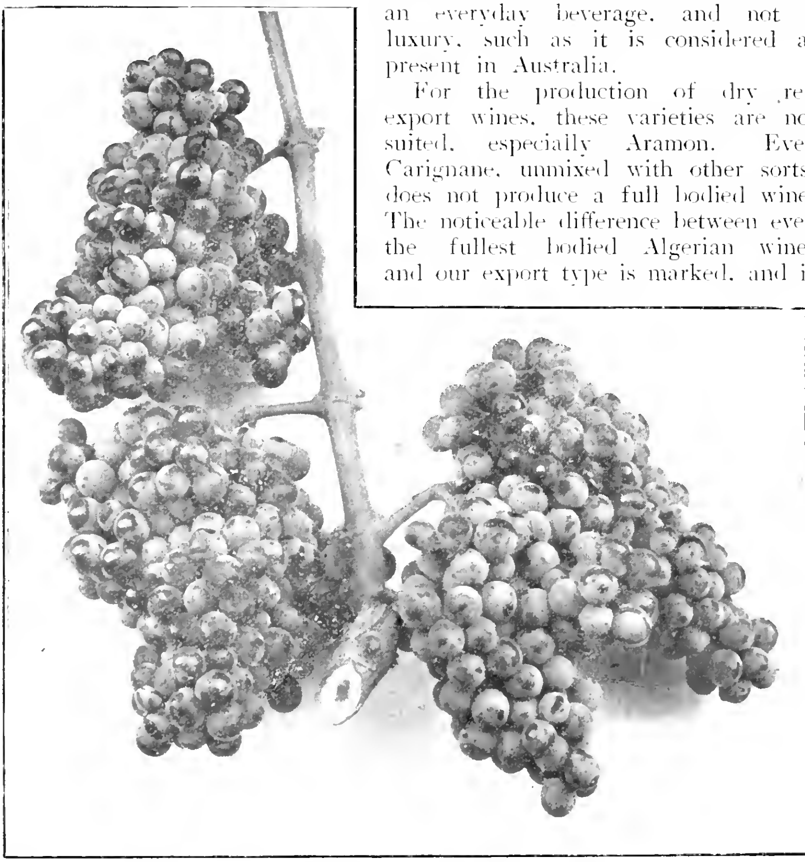
Carignane is a variety which, in my opinion, has in the past been unduly neglected in northern Victoria. In Algiers, where the climate is very similar to ours, it is cultivated on a very large scale, as it also is in northern Spain, of which country it is a native. Its French name is derived

* Roussillon is the name of one of the old French Provinces—what is now the Department of Pyrenees-orientales. There is no vine of that name.

from the town of Cariñena, in Aragon; in its native Spain it is chiefly known as Masuela.

The suitability of these two varieties for Victorian viticulture merit careful consideration. For the production of a very light Vin Ordinaire they are pre-eminently suited, but, unfortunately, this is a beverage the production of which has not yet been seriously undertaken here, and concerning the demand which might arise for it, we are as yet almost entirely in the dark. It is only the use of such heavy bearing sorts which can render possible the selling of wine in bulk at prices which permit of its becoming an everyday beverage, and not a luxury, such as it is considered at present in Australia.

For the production of dry red export wines, these varieties are not suited, especially Aramon. Even Carignane, unmixed with other sorts, does not produce a full bodied wine. The noticeable difference between even the fullest bodied Algerian wines and our export type is marked, and is mainly dependent on the difference in the varieties grown. Nevertheless, the blending in of a certain proportion of these heavy-bearing varieties, especially of Carignane, could possibly be advantageously made at vintage time, without too considerable an alteration in the type of wine made.



BUNCHES OF CARIGNANE.
One-third natural size.

There is another purpose for which these varieties would prove distinctly useful, and that is for reducing the gravity and increasing the acidity of the musts of the sorts we are now in the habit of growing in seasons when such may prove advantageous.

After a dry summer, such as the last one, musts of high gravity are common; whole vineyards cannot be vintaged in a week, and those grapes coming in late yield musts of such gravity as to present practical difficulties in the way of their conversion into dry wine. The admixture of a judiciously calculated proportion of such later ripening sorts as Aramon and Carignane would enable the grower to rectify anomalies and to be master of the situation in spite of adverse climatic conditions. In seasons when not thus required these grapes could be vintaged separately, and used for other purposes, such as distillation, the heavy yields obtained from them enabling the return per acre to equal that of the less prolific varieties we now make our export wines from.

The Bouschet Hybrids.* We must now briefly consider a group of varieties which present more interest, perhaps, in France than in Australia, where lack of colour in the wine is seldom complained of.

With the enormous yields referred to, in connexion with the two last-mentioned sorts, it is certainly not surprising that colour should often prove deficient. In order to correct this defect M. Bouschet de Bernard and his son undertook, in the early fifties of last century, the raising of new varieties, by crossing the different vines of the Midi with the Teinturier du Cher, which differs from most European red sorts by the deep red colour of its juice. All the usual red varieties have colourless juice, the pigment being contained in the skin. Many new vines were thus obtained.

Petit Bouschet is one of the oldest of the group. It is very largely grown in the region on account of its heavy yields and the deep colour of its wine; it is a cross between Aramon and Teinturier, which yields crops of up to 1,000 gallons per acre in rich soils. Apart from its colour and fertility this cross has little to recommend it, its wine being otherwise flat and characterless. It is less susceptible to downy mildew than most Midi varieties.

Alicante Bouschet, also known as Alicante Henri Bouschet, is a cross between the former and Grenache (known in several parts of Southern France as Alicante). This is one of the best of the group. Though not quite such a heavy bearer as Petit Bouschet, it is very prolific, whilst the wine made from it is markedly superior in every way. This sort is worth a trial in Victoria. In Southern France, when grafted on Riparia Grand Glabre, it proved very liable to apoplexy. It appears to give satisfaction on the Riparia × Rupestris hybrids (3306-9, etc.) than on du Lot. It also does well on the Berlandieri hybrid, 420A, etc. (Brunet).

Grand Noir de la Calmette.—Though the quality of its wine is not equal to the last, this wine is very largely grown. It is a heavy bearer and does remarkably well grafted on Rupestris du Lot, this being a favourite "combination" of M. J. Leenhardt-Pomier in his fine vineyard of Verchant (see February, 1910, *Journal*).† At Rutherglen College last season this variety bore a very heavy crop. Its wine has a deep colour.

Aspiran Bouschet, though less prolific than some others of the group, is a heavy bearer, producing a wine of better quality than most of them. According to Foex, its wine is the most highly-coloured grown in France.

Brun Fourca and **Calitor** are heavy bearing varieties, producing wine of poor quality. They are much less cultivated now than formerly, and are not even mentioned in Richter's catalogue.

Terret Bourret, also known as Terret Gris (grey or pink), must not be confounded with Terret Bouschet, one of the Bouschet hybrids. Three varieties of Terret were formerly cultivated, viz., red, pink, and white.

* Though currently termed hybrids this term is not strictly correct—a hybrid is a cross between two distinct species. In the case of the so-called Bouschet hybrids, both parents belong to one species, viz., V. Vinifera

† Pierre Vialla escribes 63 in his monograph *Les Hybrides Bouschet*.

The red Terret, owing chiefly to want of durability, has been almost abandoned, in spite of the quality of the wine made from it and its value as a table grape. The other two yield white wine, and are sports from the red type, which do not share its defects.

Terret Bourret is a very heavy bearer which produces a neutral wine of fair quality, useful for blending purposes and more alcoholic than its heavy crops would lead one to expect. Though it will probably prove of value for the production of neutral dry white wines, it is chiefly as a source of spirit that it is likely to be used in our vineyards. For this purpose it has very much to recommend it. Though not quite so heavy a bearer as Aramon, its wine being more alcoholic, enables an equal yield of spirit to be obtained per acre with less handling and with a lesser expenditure in the way of moisture, an important item in dry climates.

Cinsaut—Syn. *Bourdelès, Boudalès*—In Victoria, *Black Hamburg, Blue Imperial, Black Prince, Grand Turk, Terret,* &c.—It may come as somewhat of a surprise to many Victorian wine-makers to learn that the majority of what are looked upon as choice wine varieties near Montpellier belong rather to the table grape class than what we usually look upon as wine sorts. A notable example is Cinsaut, a grape well known in Victoria, though not by this name. In the Rutherglen district it is known both as Blue Imperial and as Black Hambro', the latter name being especially misleading, since the true Black Hamburg, or Frankelthal, is a totally distinct variety ripening much earlier. At Great Western, Cinsaut is generally known as Black Prince—another misnomer apt to create confusion, since the true Black Prince is an entirely distinct sort. In other parts of the State I have known it to be called by such names as Grand Turk, Terret, &c. Though largely sold in the fresh state for table purposes in Victoria, this grape is also made into wine to no inconsiderable extent. As to its fitness for this purpose the most divergent opinions are expressed by growers who have had experience of it. Some denounce it as producing a watery wine of no value, whilst others hold a far higher opinion of it. Personally, I have known dry red wine of good quality though, perhaps, somewhat lacking in colour, to be made from it on sandy soil near Echuca; whilst on stony hillsides near Rutherglen, I have seen

LEAF OF CINSAUT.
One-third natural size.

it yield really high-class wines absolutely different from the poor quality wine obtained from it on richer land in the same district.

A photograph here reproduced of a typical leaf of this variety will be easily recognised by those familiar with it under other names. The main characteristic is its elegant symmetrical appearance. It may, in fact, be looked upon as the typical heraldic form of vine leaf. Another feature peculiar to it is the very oval and distinctly pointed shape of the berries immediately before they change colour.

In France, Cinsaut is not now so largely grown for wine-making as it was formerly, though it is still extensively grown for table purposes, being shipped in the fresh state to England, Germany, &c. It formerly played a leading part in the well-known vineyard of St. Georges d'Orcques (see p. 220) and others which produced the highest quality red wines in the department of Hérault, but the marked preference for quantity over quality shown by those re-planting, led to this and other choice varieties being replaced mainly by Aramon, Carignane, and the Bouschet hybrids.

The varieties which were formerly grown in conjunction with Cinsaut at St. Georges and other vineyards producing better quality wines were chiefly *Œillade*, *Aspiran* (also known as Spiran), *Piquepoul* (the black variety), and *Terret* (black). *Œillade* is very similar to Cinsaut in many respects, and is often mistaken for it. It is less prolific, as its flowers often set badly. *Aspiran*, a more distinct variety still, has much in common with it, being an excellent table grape and yielding a wine very similar to that of Cinsaut though lighter in colour. The black varieties of Piquepoul and Terret are now but little grown, as they are poor bearers. Cinsaut is at the present time the most extensively grown of the group, since it is the best bearer, whilst not inferior in other respects. Foex gives the yield per acre of Cinsaut as being from 264 to 528 gallons, and that of Aspiran at from 264 to 440 gallons.

Grenache—Syn. *Alicante*, *Bois Jaune*, *&c.*—Though less extensively grown than the foregoing and occupying a position intermediate between the heavy bearing and choicer varieties, Grenache is, nevertheless, one of the important red sorts cultivated in Hérault. Of Spanish origin, and very largely grown in that country under the name of Garnacho, especially in the Priorato and Llansa districts of Cataluña, for the production of Rancio wines, it has long since been introduced into France, where we have already found it to be extensively grown at Banyouls and Collioure and other parts of Roussillon, where some of the few French wines of "Porty" character are grown. In Hérault, these wines are not met with, consequently this variety does not possess the same importance. It is not so well suited for ordinary dry reds as for rancios and special wines. The chief fault is in its colour which, although satisfactory when the wine is quite young, rapidly changes, becoming tawny or *pelure d'oignon* (onion peel), as it is termed in French, often in the course of a few months. For this reason, as well as on account of their heavier yields, Aramon, Carignane, &c., are preferred to it. It is also very susceptible to damage by downy mildew (*Plasmopara*). It is, nevertheless, a good bearer, yielding, according to Foex, from 220 to 572 gallons per acre. The same author states that in Roussillon, where it is made into liqueur (rancio) wines, its musts register from 15 to 20 degrees Beaumé.

In Australia, where there is so large a demand for sweet wine, this variety has much to recommend it. Though the true Port varieties of the Alto Douro (Portugal) will probably ultimateley produce even choicer wines, Grenache will produce, in sufficient quantity, even on poor soils, wines of distinctly porty character which mature rapidly. For the production of ordinary sweet wines, whether white or red, this variety should have a great future before it, whilst in special situations, such as stony schistose hillsides, tawny wines of extra quality will doubtless be obtained as they are in North-eastern Spain and the adjacent Roussillon district of France, where the geological formation is so similar to large areas here.

Strange to say, though it has long been present in some of our vineyards, it has not yet been properly tried—odd vines are to be frequently found mixed with other sorts, so that a thorough test of its value under Victorian conditions is not possible. The utmost confusion has long existed in connexion with this and several other varieties in the past, so much so that in several vineyards the owners have pointed out to me as being planted with Grenache, blocks in which not a single vine of this variety was present.

Grenache is a very distinct vine of erect habit with closely jointed yellow wood. Its leaves are very distinct from the other southern French varieties and very similar, as regards texture especially, with those of he Waltham Cross.

Clairette, Syn. *Blanquette.*—The choicer white varieties of Hérault must now be dealt with. Foremost amongst these we have Clarette, a sort which would appear to have a great future before it in northern Victoria, more especially for the production of full bodied dry, as well as for sweet white wines, whilst as a table grape it is in great favour in the country of its origin, in spite of the small size of its berries. It ripens very late and possesses remarkable keeping power, enabling it to be stored well on into the winter.

This vigorous growing long-lived vine is easily recognised by its erect canes and dark-green leaves the under side of which is covered with a thick white felt. It is, in fact, one of the most cottony varieties in general use in France. The berries are oval, loosely set on the bunch and very agreeable to eat.

This variety is, like the Shiraz, an "excellent scion," possessing great affinity for almost all resistant stocks.

Mataro, which is better known in Hérault under the name of *Espar*, in Provence as *Mourvedre*, and in Cognac, where it is largely grown for distillation, as *Balzac*, is a vine too well known to us in northern Victoria to need description. It is more esteemed in France than it is with us, where it has proved rather disappointing. Possibly, absence of lime in the majority of our soils is responsible for lack of quality. In Provence (France), where it is one of the varieties most extensively grown, it enters into the composition of several wines of good quality.

Morrastel is very similar to Mataro in fact, it is probably often mixed with it in our vineyards. Its wine is rather better than that yielded by Mataro, though it usually bears rather less.

Piquepoul— Syn. *Picpoul.*—Though black Piquepoul has, as we have seen, been abandoned on account of its poor yields, the red or brown form, *Piquepoul gris*, as it is known, is an excellent variety which is looked upon as one of the best sorts for white wine of Hérault.

It thrives remarkably well in sandy soils, and is largely grown on its own roots in the sea sand vineyards where ungrafted viniferas are still grown in spite of Phylloxera. Foex states its yield to be from 176 to 352 gallons per acre.

A white variety is also grown which mainly differs from the last named in the colour of its fruit.

Picardan was the name given to the white form of *Œillade*, formerly largely grown for the production of the full dry white wines known as *Picardan*. This sort has since reconstitution been almost entirely replaced by *Clairette*.

Ugni Blanc, Syn. *Maccabeo*, *St. Emilion*, *Trebbiano*, in Victoria (incorrectly) *White Hermitage*, *Sherry*, &c., sometimes also called *Uni blanc*. Though, strictly speaking, a Provence variety, this is also cultivated in Hérault and deserves mention, as it has long since proved its suitability for northern Victorian conditions, though under an erroneous name. This sort has been cultivated in the Rutherglen district for many years under the name of White Hermitage. How it obtained this name is not known, but the vine is quite distinct from Massanne and Roussanne, the two leading white sorts in the French Hermitage district.

Muscat de Frontignan.—Though much less extensively cultivated now than formerly, in France, it is still grown to some extent for the production of special wines such as the Muscats of Frontignan, Lunel, Rivesaltes, &c. This variety is well known in Victoria and cultivated to the practical exclusion of all others for the production of Muscat wines. It has long since proved its value, and rootlings grafted with it are now being largely planted.

In France, as in Victoria, three variations of it are known, viz., white, grey or rose, and red, the latter being identical with our Brown Muscat. According to Foex, these differ only in the colour of their fruit. In France, the white variety is preferred, and is the one most frequently to be met with, whilst in Victoria the brown or red form is most popular. It is also grown to some extent at Frontignan, the village near Montpellier, from which it derives its name. This has long since been corrupted into *Frontignac*, the error probably originating at the Cape, where this vine is also largely grown, having been, according to Foex, introduced after the revocation of the Edict of Nantes by French Protestant refugees.

Muscats, as a rule, are bad scions, more particularly the larger berried forms which possess poor affinity for the majority of resistant stocks. The Muscat Gordo Blanco is notorious in this respect. Muscat de Frontignan does not appear to possess this defect to anything like the same extent. At Montpellier, it is largely grafted on Rupestris du Lot and the usual Riparia × Rupestris Hybrids.

REVIEW.

We have received the following publication for review :—

A Research on the Pines of Australia, by R. T. Baker, F.L.S., and H. G. Smith, F.C.S., Curator and Assistant Curator respectively of the Technological Museum, Sydney.

This volume deals with the botany, chemistry, economic uses, and commercial possibilities of the Australian pines, and, like that on the Eucalypts by the same authors, cannot be too highly commended. The drawings, photographs, and micro-photographs are of the highest class, and are beautifully reproduced. Scientifically, the work is of great value, and should be studied by all interested in our timber supplies.

ANALYSES OF SAMPLES OF ARSENATE OF LEAD.

P. Rankin Scott, Chemist for Agriculture.

The effectiveness of arsenate of lead as a spray is, each year, becoming better known, and consequently it is displacing the more common arsenical preparations which have been used in the past by fruit-growers. Manufacturers have evidently realized the fact that a demand is assured for this insecticide, and have placed on the market a number of brands which are new to Victorian orchardists. Last year various samples were collected by me, and the analyses were published in the December *Journal* for the guidance of growers.

I have again obtained samples of brands on the Victorian market and the result of the analysis is given below. The locally made article is well represented, and included in the list are preparations made in South Australia, England, Scotland, United States, and Germany. It will be noticed that, although the preparations vary in composition, they are true to name, and I am of opinion that under ordinary circumstances their use will be found to be effective and harmless to foliage. It is important, however, that the best water obtainable be used in mixing. The water should be free from dissolved mineral salts, such as carbonates and chlorides, which, when present in the water, act more or less as a solvent upon the lead arsenic and consequently damage may result to the foliage, by burning. It is therefore safer to use rain water and so avoid the danger referred to.

By the analyses now published the grower is enabled to see that the material with which he is spraying is chemically of good quality. The mechanical condition and the respective merits of the brands can, however, best be judged by the orchardist. He can note points of advantage, such as the property of readily mixing, and whether the solution remains cloudy by retaining the arsenate in suspension after being diluted and prepared for use, thereby rendering the spray capable of being evenly distributed over the foliage.

Sample.	Moisture.	Total Arsenic Oxide.	Total Lead Oxide.	Water Soluble Arsenic Oxide.	Water Soluble other than Arsenic Oxide.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Swift's	41·89	16·00	38·20	0·58	3 72
Ferguson's "Elephant Brand" ...	40·18	14·89	40·70	1·19	3·20
E. De Haen	67·67	10·09	20·93	0·18	1·27
Sherwin-Williams	55·84	10·61	31·80	0·06	2·14
Bickford's "Our Jack"	50·13	13·91	34·11	0·16	1·98
Aus. Exp. and Chem. Co.'s "Federal"	49·50	13·46	31·30	0·72	3·67
Jenkins' "Austral"	21·37	16·35	53·44	0·11	8·85
Blyth's "Bluebell"	44·05	17·98	34·43	0·13	3·50
Vreeland's "Electro"	33·66	20·25	41·89	0·18	1·57
Jaques Fisher and Co.'s "Cobra" ...	43·65	15·58	39·14	0·19	1·64
Edward and McGuinness' "Red Seal"	49·07	15·08	33·02	0·17	1·58
Walter Voss and Co. Ltd. "Carlton"	41·78	17·62	36·69	0·87	3·88

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

Cultivation.

A plentiful rainfall in September has rendered orchard ploughing an easy matter, and the work will be comparatively light. The cultivation should be finished as early as possible, it being remembered that the earlier the ploughing, the larger quantity of soil water is retained for the benefit of the trees. The reason or the object for various operations is very often overlooked. Ploughing is often done because it is the right time, or the customary season for ploughing; the real objects of ploughing—the sweetening of the soil, and the making of an earth mulch for water retention—are forgotten.

Spring ploughing should be very thorough, and all herbage should be completely buried. If this be not done, the weeds will simply grow again, thus giving more work later on, besides becoming reducers and robbers of the soil moisture. The more completely the weed crops, or the cover crops for green manure, are ploughed in, the quicker they will be resolved into organic matter, and the better it will be for the soil. After ploughing, the surface must be cultivated and the general texture reduced to as fine a condition as possible.

Even should the surface not cake in the spring and early summer, frequent harrowings kill any weed seeds that may have germinated.

Spraying.

All spray work for fungus diseases should now be over except for late varieties and late districts. Unless Bordeaux pastes are used, the regulation formula of 6—4—40 (6 lbs. bluestone, 4 lbs. lime, and 40 gallons of water) should be the fungicide.

Spraying for codlin moth will also now receive attention. Previous to this, the trees should be subjected to the usual "spring-cleaning" operations. All crevices, wounds, holes, and loose bark should be cleaned and searched out for the larvæ or the chrysalides, and every rough part smoothed over. Any possible hiding places for future broods should be eradicated.

Additions to the list of brands of arsenate of lead are still being made, and growers now have a wide selection for spraying purposes. On the other hand the feeling is growing that the original formula for this article gives just as good results as the proprietary articles, and many growers have expressed their intention to revert to this. Great care should be exercised both in manufacturing and in spraying with this mixture, and indeed, spraying with any arsenates of lead. The trees should not carry any rain or dew moisture on the foliage while the spray is being applied.

The usual time for the first spray is immediately after the petals have fallen. This is considered by many people to be far too early; and if the trees are sprayed at that time, it is asserted that the spraying is wasted. According to the few records so far published, the first moths generally make their appearance towards the middle of October. This cannot be taken as a fixed time standard, as if the season is early, the moths will emerge early from the chrysalis. The time of the moths is generally coincident with the blossoming of the fruit trees, and so it will be perhaps a safe rule to spray as above indicated. If a fixed rule be observed, regarding the time for spraying, it can be depended upon that better results will accrue, than if the spraying be delayed until the moths or the eggs are observed. There is no necessity to spray when the trees are in full flower, but it will be a safe rule, and particularly so in an early season such as the present, to spray as soon as the blossoms have fallen and the fruit has set. The second spraying should quickly follow the first, and as soon as the expansion of the fruit shows that a further spray covering is necessary.

Where peach aphis is present a strong nicotine solution, followed in a short time by a second spraying, should be given to the trees; the object of the second spray is to kill any aphides that may remain alive after the first application.

The root borer pest should also receive close attention. All traps should be put in good order; and where traps are not in use, the beetles should be collected frequently from the trees.

Vegetable Garden.

Soil stirring, cultivation, destruction of weeds, and watering will all give abundant work during this month. It is especially necessary that all vegetable plots should be kept free from weeds. Under close cultivation conditions, weeds greatly retard the growth of other plants.

Tomato plants may now be largely planted out and staked. Lateral and superabundant growths should be pinched out as they occur.

Transplanting seedlings, and thinning out in the rows will need attention.

Seeds of the melon and pumpkin family may now be planted in the open. The ground for these should be well worked and well manured.

Seeds of all vegetables for autumn and winter use should now be sown, such as carrots, turnips, parsnips, cabbage; peas, French beans, lettuce and radish seeds may also be planted.

Flower Garden.

All herbaceous perennials may now be planted out, if this has not already been done. The crowns should not be allowed to be too compact and crowded. They should be divided or cut up, so as to allow room for expansion and for good growth. Such plants as Delphinium, Perennial Phlox, Rudbeckia, Salvia, Polygonum, &c., come under this class.

All bedding plants may be planted, particularly where protection from frosts is obtainable; these include Alternanthera, Pyretheum, Begonia, Iresine, Lobelia, &c. Bonfire and other scarlet Salvias should be planted: a striking feature in a bed would be an alternate planting of the Bonfire Salvia and the large-fruited Capsicum.

A close watch should be kept on all rose plants for either aphis or mildew. For aphis the bushes should be sprayed according to the directions in last month's *Journal*; and for mildew frequent and liberal dustings with flowers of sulphur should be applied.

Gladioli corms may be planted; and also a few Chrysanthemums and Dahlias for early blooms.

All seeds of tender annuals may be sown.

The surface soil should receive regular and constant cultivation. All clods and rough portions should be well broken up with the hoe; weeds should be kept down rigidly, and this can only be done by frequent stirrings of the surface. If any chemical fertilizers are to be fed to the plants, they should be applied immediately before a cultivation.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. ***All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.***

Vermin Destruction.—P.G. ask for best method of poisoning water with arsenic or strychnine for destruction of rabbits, foxes, &c.

Answer.—The use of poisoned water is not recommended. It is altogether too dangerous, and also the Victorian seasons are usually not dry enough for the purpose. In any case it would be far safer and just as effective if the water was netted off and any of the ordinary rabbit poisons placed outside. Further, arsenic is never used by the Vermin Destruction Branch. It is not effective enough, and it is always dangerous. Being a mineral it will practically last for ever and is consequently a menace and a danger wherever it has been used. Strychnine can be dissolved in a little vinegar.

Cape Weed.—J.R.M. states that his lucerne plot is being smothered with Cape Weed. He asks whether any crop can be put in to overcome it.

Answer.—The land was probably fouled with Cape Weed seed before the lucerne was planted. If the lucerne has been planted in drills the weed is best suppressed by the use of the hoe. It dies without seeding if cut just below the flat leafy crown, and ceases to grow as soon as the warm weather begins. No crop can be planted which would suppress it without recultivating the land and destroying the lucerne. Once the stand is well established it is usually easy to keep Cape Weed under, but if allowed to flourish in spring it will completely suppress the young lucerne seedlings. The use of cold cow manure collected from the fields is often responsible for the sudden abundance of the plant in cultivated land. In fermented manure the seeds are destroyed. Experiments with Cape Weed are in progress, but no chemical or other means of dealing with it have been found practicable.

Orchard Planting—Trees Per Acre.—G.A.B. inquires as to number of trees per acre when planting on the "triangular" system.

Answer.—The "triangular" or "alternate" system of planting gives approximately the same number of trees as the "square" system—17 x 17 feet, 150 per acre; 18 x 18 feet, 134 per acre; 20 x 20 feet, 100 per acre. Allow room for roadway and for turning of plough all round block.

Mouse-proof Stack Site.—G.A.H. asks how to keep mice from hay stacks.

Answer.—Erect enclosure consisting of galvanized iron sheets 2 to 3 feet high around stack, and about 3 feet distance from the walls, directly the building of the stack is completed. See also article in March, 1908, issue of the *Journal*.

Summer Fodder Crops for Echuca District.—H.A. asks which varieties of maize are most suitable for the Echuca district. He also asks about other summer crops.

Answer.—(1) Hickory King or Yellow Moruya at the rate of ½ bushel per acre in drills 3 feet apart; inter-cultivate between the rows during the growing period. (2) Japanese millet is recommended. Mangold seed (Mammoth Long Red variety) may be sown at once at the rate of 4 lbs. of seed per acre in drills 2 feet 6 inches apart. If necessary, it can be irrigated later on in the season.

Fodder Crops, Swan Hill District.—H.C. asks for list of crops to grow in rotation under irrigation and suitable for hand-feeding cows. He has a silo.

Answer.—Sow immediately after first autumn rains the following mixture:—1 bushel of Abundance or Stout White oats, ½ bushel of Cape Barley, 1 bushel of field peas. Manure at the rate of 1 cwt. of superphosphate and ½ cwt. of bonedust per acre. This will be ready under normal conditions to cut for the silo during the month of October. When cut, re-plough and sow with Hickory King maize seed in drills 3 feet apart and at the rate of 20 lbs. of seed per acre. This will be ready for the silo about the latter part of January. Not less than 10 acres should be thoroughly worked into a fine tilth and sown with good sound lucerne seed in drills 7 inches apart and at the rate of 10 lbs. of seed per acre during September. If mangolds, sugar beet, and pumpkins are sown in season with the crops already mentioned an abundant supply of nutritious and succulent fodder should always be in reserve in the silo throughout the year. If farmyard manure is available the land should be manured before sowing with maize, at the rate of 20 loads to the acre.

MAIZE FOR HEYWOOD DISTRICT.—O.A.R. inquires as to varieties suitable for Heywood district. Rainfall, heavy; but district subject to long dry spells in summer. Frosts, fairly prevalent. He also asks quantity of seed required per acre and where it may be obtained. He proposes to plant in "checks" 3 feet apart, allowing three or four seeds to each hole.

Answer.—(1) Hickory King or Eclipse. (2) 15 lbs. of sound seed. (3) From any of the leading seedsmen. Messrs F. H. Brunning Pty. Ltd., Elizabeth-street, Melbourne, and Messrs. Law, Somner & Co., Swanston-street, Melbourne, have each recently issued a special maize pamphlet.

RELATIVE VALUES OF FODDER GROWN ON RICH AND POOR LAND.—J.F. writes —"I have noticed that stock eat hay and chaff grown on rich land better than that off poor land. What is the reason?"

Answer.—The greatest difference between both oats and straw grown on rich land as compared with poor land is of course in quantity, but variation in quality has also been found on analysis as well as in feeding results. Oats grown on land deficient in phosphoric acid will contain a less than average percentage of phosphoric acid, although the sample in appearance will give no indication of the deficiency. The same difference in quality has been observed in grasses grown on different soils, but identical in other respects.

STIFFNESS IN LAMBS' HINDQUARTERS.—J. McI. writes, "Some of my lambs are showing signs of stiffness of hindquarters and legs. None have died but they are falling off quickly."

Answer.—The changing of them to dissimilar pastures, if possible, and the providing of a lick composed of sheep salt and sterilized bone meal equal parts, is recommended.

RUPTURED PENIS.—F.J.A. states that his draught horse has a ruptured penis. There is a swelling on the organ which prevents it going back into the sheath. The horse, which was gelded when a foal, is aged and has been bad for two years.

Answer.—Amputation above the affected part is the only remedy, and this would require to be done by a veterinary surgeon.

IMPACTION.—J.P. writes: "I have a cow that appears to be suffering from impaction. She has been feeding on oaten hay and has also had access to a grass paddock. The symptoms are—she lies down, throws head back to flank occasionally, moans, drinks a great deal, has poor appetite. I have been treating her with bicarbonate of soda and Epsom salts but without any beneficial result. She is due to calve in about five weeks."

Answer.—From the description of the case it is difficult to say exactly what the trouble is. If it be Impaction it has reached a stage where it is beyond treatment. On the other hand, it may be that there is some parturient trouble, seeing that the cow is far advanced in pregnancy. Under the circumstances, the giving of drugs is attended with some risk.

DEATH OF MARES.—S.M.D. writes relative to the death of two mares which occurred suddenly during the same week. In the first case, when first noticed, there was severe swelling on both sides of the throat, the breathing was heavy, but apparently not much pain. The following morning she was found dead in the box, and on opening the throat it was very much inflamed and of a yellow jelly colour. The second death occurred under practically similar circumstances.

Answer.—The deaths were apparently due to a malignant sore throat, a variety of anthrax, which is decidedly contagious. At all events, it would be a wise precaution to thoroughly scald the manger and feed boxes with boiling water and soda; also to thoroughly cleanse and lime-wash the stall and stable. If there is any further trouble of the same character notify the Chief Veterinary Officer at once.

LAMENESS.—H.G. writes—"Two months ago a draught horse of mine became suddenly lame in the hind leg. The leg immediately became swollen and very hot. It was bathed well with hot water and turpentine; poultices of bran with a little turpentine added were then applied and brought away a little pus from around the top of the hoof, breaking out in small holes. Further treatment has been given but the trouble still continues."

Answer.—This is probably a case of lymphangitis commonly called "Weed," "Shot of grease," or "Monday morning disease." It usually affects draught horses on full feed after a day's rest. Treatment should comprise almost continuous fomentations with very warm water and the giving internally of a dose of Epsom salts, followed by dram doses of potassium iodide in soft bran mashes three times a day. The swelling usually becomes chronic and incapable of being reduced. Horses are liable to further attacks, with increase of the thickening each time until the condition known as "Elephantiasis" is brought about. H.G.'s letter was received too late to answer in the September issue. If name and address had been furnished reply would have been sent by post as soon as available.

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Vol. VIII. POTATO EXPERIMENTAL FIELDS. Part 11.

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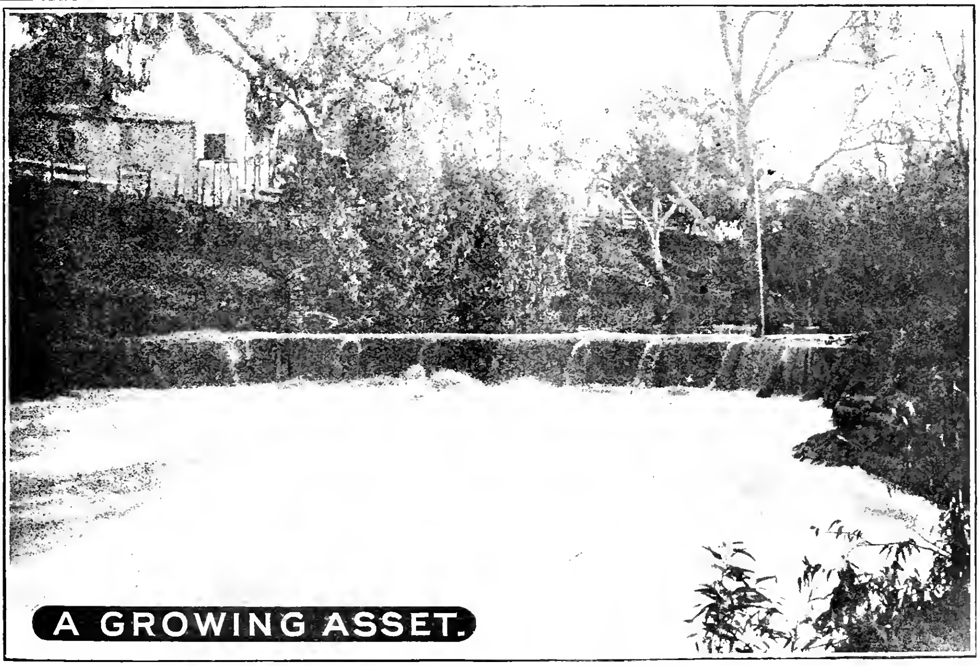

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A. T. SHARP, Editor.

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IRRIGATION.

G. H. Tolley, Manager, Wyuna Irrigation Farm.

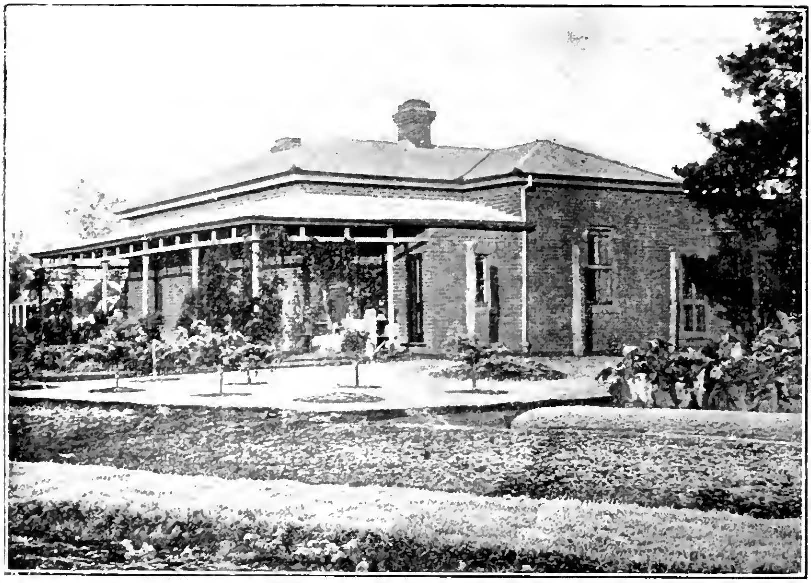
In most countries pursuing a policy of development by irrigation, centres for instruction are established with very little regard to expense of upkeep, the main object being to teach and to determine, by continuous

1. RIVER MURRAY AT MILDURA.

experiment, methods of irrigation and cultivation, varieties of products, efficiency of implements, etc., most suitable to different localities; and, by means of demonstrations and lectures, to provide such information for the agriculturist as by reason of his circumstances he is in most cases unable to determine for himself. In addition, extensive trials are conducted in scientific methods of feeding stock and in preparing and marketing products.

The Government of Victoria has equipped the Wyuna Irrigation Farm (situated about 9 miles north of Kyabram and 8 miles north-east of Tongala railway stations) for this purpose, and its development has now reached that stage at which its usefulness may be availed of and where practical instruction may be obtained at moderate rates. To the intending irrigationist, and especially to immigrants, such an opportunity should be invaluable and should assist largely in opening up a way for settlement of a considerable population on the land and eventually lead to the establishment of manufactories and many new industries.

In presenting my personal experiences and observations on this subject I have endeavoured to write so that everything may be made clear to the "man on the land." Close contact with inquirers and students and much correspondence has enabled me, to some extent, to anticipate many questions which might not otherwise have arisen and caused me to include



2. THE HOMESTEAD, WYUNA.

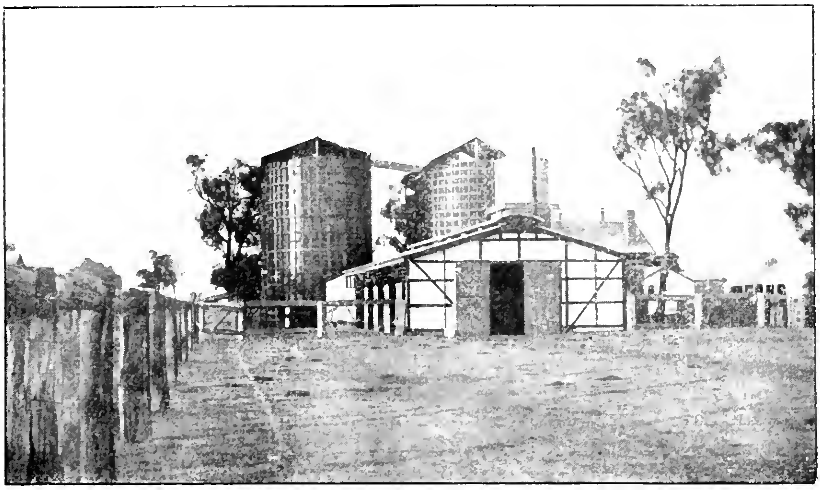
matter which an expert might hastily conclude was redundant. As to how far I may have succeeded I leave my readers to judge, at the same time assuring them that their correspondence will be valued and that every endeavour will be made to assist them, when necessary, by way of further explanation.

To those who may discover anomalies or errors I shall feel deeply obliged for correction and principally with the view of amplifying and perfecting the work when, at a later date, it shall appear in book form.

Technical work, which the ordinary reader more often than not is willing to "take as read," has been simplified as much as possible and a little careful study will, it is hoped, obviate unnecessary thought and argument. The work has been arranged to accord with the sequence of events from clearing the land to marketing some of the products.

It may be noted that the methods of irrigation hereafter described have been in actual operation in several Australian States, at least since

1887, when the irrigation settlements of Mildura and Renmark on the River Murray were started, and there has been very little alteration since, although the practice is looked upon by so many as an entirely new departure. Though irrigation methods, perhaps, do not leave much to be



3. SILOS, MILKING SHED AND YARD, WYUNA.

desired, there can be no question that we are woefully unprogressive in developing irrigated culture. A variety of causes have led up to this state of things, but there is no doubt much discouragement has arisen from badly arranged systems of irrigation, deficient supply of water,

4. FEEDING STOCK AT WYUNA.

applying water to unsuitable land, and want of knowledge and experience in making such application; other factors are the profitable returns from grain products and the desire of most rural Australians to increase their holdings and become largely pastoralists. Confining irrigation in the initial stages to small areas will go far towards popularizing the practice, and it is generally conceded that the policy of the country towards that end is a wise one and calculated to have a very considerable influence in securing substantial additions to our very sparse population.

Soil Conditions.

No matter what branch of Agriculture may be undertaken, the first and greatest consideration is the adaptability of the soil to the object contemplated, and in irrigated culture the aspect and configuration of the natural surface as well. I propose to deal chiefly with those soils of Victoria where my irrigation experience has been obtained and where similar conditions have presented themselves to me.

These localities are Mildura on the River Murray, and Wyuna on the Goulburn, the latter being included in the lands embraced in what is known as the famous Goulburn Valley. The geological formation of the country about Mildura, and indeed of the greater part of that vast and for a long time neglected portion of the State known as "The Mallee," is chiefly calcareous, light sandy soils overlying beds of marly limestone, rich in carbonate of lime, much of which under irrigation is readily soluble. The soil varies from a depth of 3 or 4 inches to at least 15 feet, and on the shallow areas is generally much closer in texture than the deep soils which are largely composed of moderately fine sand.

The greater areas under consideration are of a rich red colour, changing to grey in the lower levels, and particularly where the herbage consists of "Bluebush." The character of the land is easily determined from its natural vegetation, the higher lands being clothed with Pine (*Callitris robustus*), Belar (*Casuarina glauca*), Sandalwood (*Eremophila longifolia*), Hopbush (*Dodonæa viscosa*), etc.; that somewhat lower with Mallee (*Eucalyptus incrassata*, *E. oleosa*, *E. gracilis*, *E. uncinata*) and Sandalwood, below that again the Bluebush (*Acacia hakeoides*) and Green Bluebush (*A. osswaldi*), while the flats adjoining rivers, beds of old watercourses, and flats where water lies, is covered with a more or less dense growth of Redgum (*E. rostrata*), and Yellow Box (*E. largiflorens*) trees and Polygonum (*Muehlenbeckia Cunninghami*).

The limestone subsoil carries magnesia and other harmful salts in greater or less degree, and while it is no great difficulty to one having experience of these soils to know from inspection where these are likely to occur in quantities dangerous to agricultural operations, yet it is difficult to define it in writing. Generally speaking, there is little to be feared on the higher, and particularly, pine covered, land, but it is well to be cautious in respect of bluebush areas. Some of these, even after moderate irrigation, soon reveal the presence of this deleterious matter in the form of a white efflorescence on the surface, in some extreme cases giving the impression that it had been strewn with fine salt. It may develop slowly at first, and if not checked will certainly kill most plants with which it comes in contact. The expense of leaching the ground is considerable and is one that an owner will do well to avoid. The mechanical composition of these soils is very favourable to agriculture and they are readily and effectively worked with light implements.

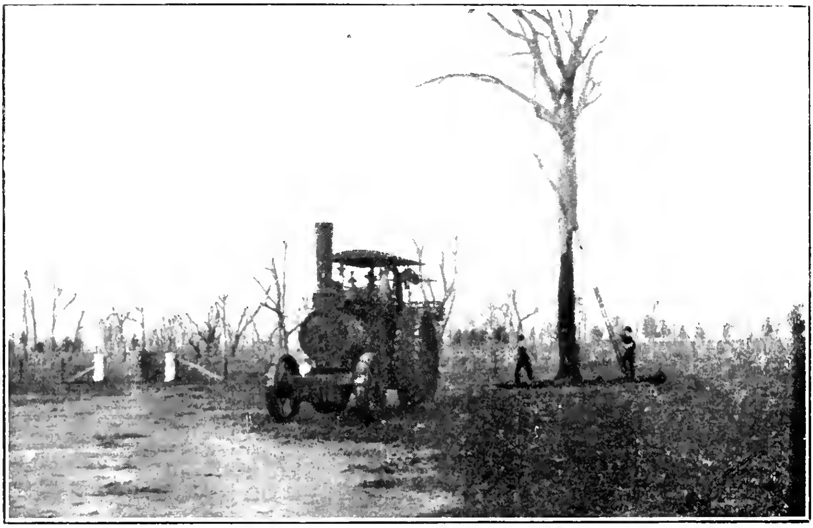
The Goulburn Valley soils are an altogether different proposition, being of much closer texture and overlying a stiff retentive clay containing in parts a small amount of scattered pieces of limestone, mostly insoluble with irrigation. The presence of hurtful salts is a negligible quantity, though occasionally a close observer may detect a faint efflorescence in isolated spots. Broadly speaking, the soil is classed as timber land and plain land, the former having at some period been more or less thickly covered with box trees. Sandy ridges with pine are of infrequent occurrence and are generally too high for irrigation unless by pumping. Although analysis does not reveal any marked difference, the plain land is of a more friable nature and easier worked, but it gives up its moisture too quickly to allow of continuous successful irrigation. Whether this defect will be remedied by subsoiling remains to be proved. Isolated experiments have been made on small areas of both classes of soil, but the results so far are not sufficiently definite to admit of any conclusive opinion. Systematic treatment in this direction is being undertaken but the results must be awaited with patience.

Analyses of Soils.

Locality.	Soil.				Subsoil.			
	Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Nitrogen.	Phosphoric Acid.	Potash.	Lime.
Footslopes of Grampians	66	20	29	66	66	23	54	40
" "	73	20	45	61	44	21	37	20
" "	55	33	41	78	33	29	33	68
" (Valley soil)	193	123	98	173	196	121	188	100
Ararat	81	43	450	144	...	...	...	...
"	154	21	48	134	115	18	54	84
"	93	49	183	152	73	49	139	132
"	148	80	346	200	56	36	269	160
Wyuna, Plain	71	52	251	134	64	52	609	190
" Timber ...	96	66	459	174	88	68	1,080	182
Edi	81	70	14	126	28	29	29	110
Colbinabbin	56	80	160	110	39	70	360	120
Moormbool Forest ...	179	57	431	120	110	38	422	130
Dandenong	110	16	38	58	20	13	37	36
Werribee Sewage Farm original soil	126	45	154	60	95	64	457	230
Werribee Sewage Farm 11 years' sewage ...	171	53	299	170	109	77	343	230
Fern Tree Gully ...	389	102	167	540	252	127	104	300
Kinglake	152	41	116	178	...	...	...	...
Croydon	120	39	139	161	...	...	...	...
Springvale	37	10	19	64	26	10	18	78
Rosedale	61	17	109	80	37	10	121	32
Trawalla	210	61	94	122	78	45	48	48
"	93	25	64	136	70	28	50	132
Condah	162	28	47	150	39	14	29	36
Moolap	130	38	277	488	100	19	795	352
"	210	20	141	292	140	19	498	992
Geelong	150	24	78	244	120	20	332	348
"	90	15	93	104	90	19	303	134
Irrewarra	176	65	349	144	101	98	425	180
Yeo	269	44	39	154	146	21	21	144
Cobden	204	24	157	208	143	15	55	214
Loch	266	53	127	220	112	35	42	120
Leongatha	241	14	195	320	106	40	197	100
Mallee, Kow Plains ...	77	26	498	11,420	32	17	661	12,250
" heavy Mallee scrub ...	81	36	612	380	62	34	772	1,370
" pine country ...	75	22	253	228	42	29	346	600
" porcupine ridge	43	12	191	164	49	18	478	1,300

CLEARING.

The preparation of land for irrigated culture cannot be too thorough. Necessarily, where there is standing timber the first operation is clearing.

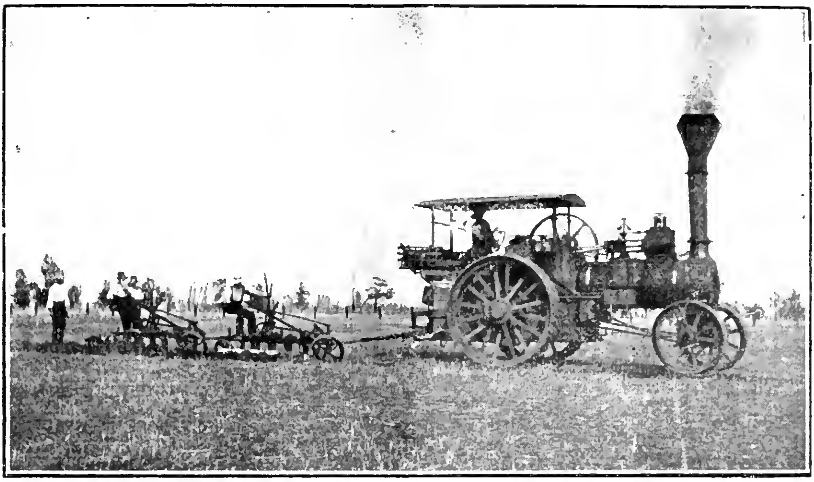


5. PULLING DOWN TREES WITH ENGINE.

In the Goulburn Valley the proportion of growing timber is small, the original pastoral holders having rung vast areas to insure the growth of natural herbage.

6. THE RESULT.

The most economical way of proceeding in the case of green timber is to kill it by ringing and remove it when dead. The standing dry timber can be made a very simple proposition by means of a traction engine, which can usually be hired. If attacked after the soil has been well saturated, and the surface is yet hard enough for the engine, a day's pulling with a team of three men who know their work will be about 10 acres of average country. Except in the case of very large trees, there will be no necessity for grubbing round the butts and cutting roots. Generally, the tree will yield, roots and all, and very little running of roots will be afterwards necessary. It remains then to burn off all rubbish and remove the serviceable wood for future conversion into fencing or other material, or if the owner so wills the whole may be burnt and done with, a course which is by no means recommended. Failing an engine, hand-grubbing is the most primitive method, but it may be shorn of much of its labouriousness by using a good double-purchase "jack." In addition, there are

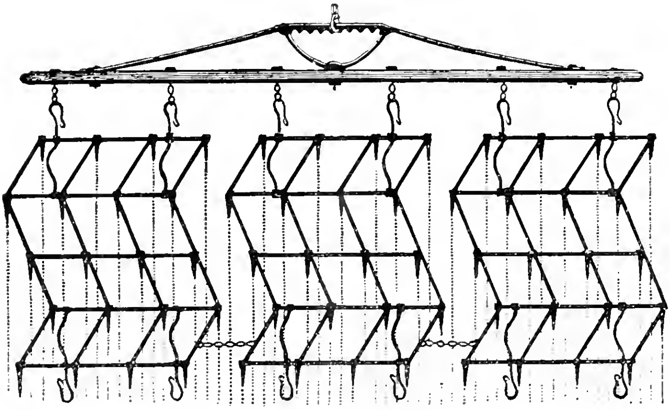


7. STEAM PLOUGHING.

many forms of effective stump-pullers on the market, or explosives may be used; as to their relative merits, the reader is left to the advice of his friends or to manufacturers. In the Mallee country much of the scrub can be rolled down with rollers specially made for the purpose and moved either by steam or animal power, but where the growth is too large for the roller, the traction engine well handled will make a most effective job. Bushes are easily dealt with, for which the mattock will be found a most effective tool.

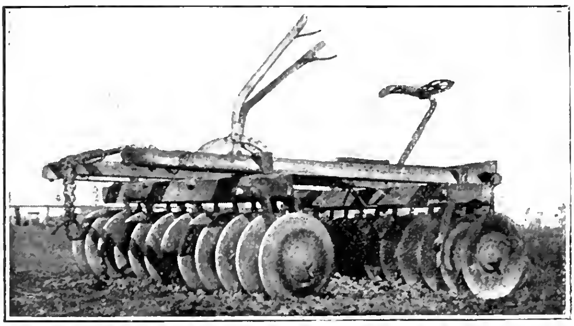
Ploughing and Cultivating.

Once the surface is clear the soil should be ploughed to a depth of about 18 inches or such lesser depth as the proximity of the subsoil to the surface will admit, care being taken that in no case shall the subsoil be brought to the surface. Where large areas are to be dealt with considerable economy is achieved by ploughing with steam or other motive power, but for the ordinary farmer the day of horse teams is not yet past. When

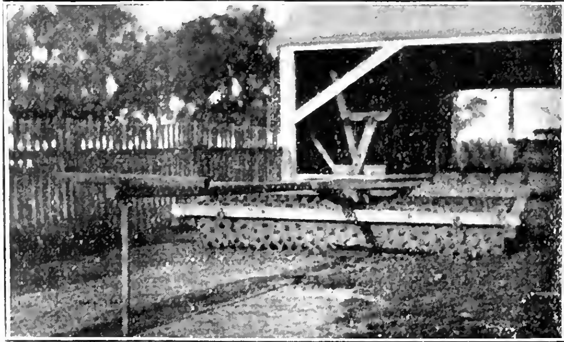


8. SET OF HARROWS.

thus broken up, all roots exposed in the operation must be gathered and burnt, or otherwise disposed of. Subsequent work depends so much on the result of the ploughing that no general rule may be laid down, but by means of harrows, rollers, disc harrows, scarifiers and other pulverizing tools the whole surface should be brought to as nearly the consistency of coarse sand as may be attainable, and thereafter, until sowing, stirred at intervals after rain has fallen. I have been met with much opposition in my advocacy of double disc harrows for work of this kind, but I am confident, when familiarity with the turning and regulating of the machine is attained, its popularity will be very much greater. At the same time, I am perfectly willing to accept any other machine that will do better work, other things being equal.



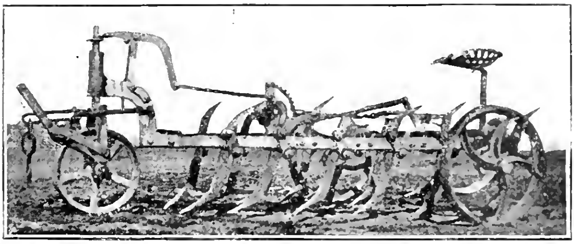
9. DISC HARROWS.



10. SPIKE ROLLER.

Levelling.

The next operation is one that the average farmer not only cannot do, but seems to have a superstitious dread of attempting, and yet it is easily within his power, that is, using a surveyor's level to ascertain the lay of his land for grading. He will find it very much easier to manipulate than a binder, and be more successful than he was in his first attempts at setting a plough. There are no castings to break, or bolts to wear out, besides other little annoyances that a farmer experiences with his own tools of trade. Long association leads me to have a very high opinion of the mechanical ability shown on a farm where a man is remote from stores and tradesmen, and has often to venture a lot of repairs with little else than fencing wire, "cockie's friend," as it is facetiously called, as a stand-by. Let it be understood, however, that I am speaking of the level only from a mechanical standpoint; the scientific side may be left to the professional man.

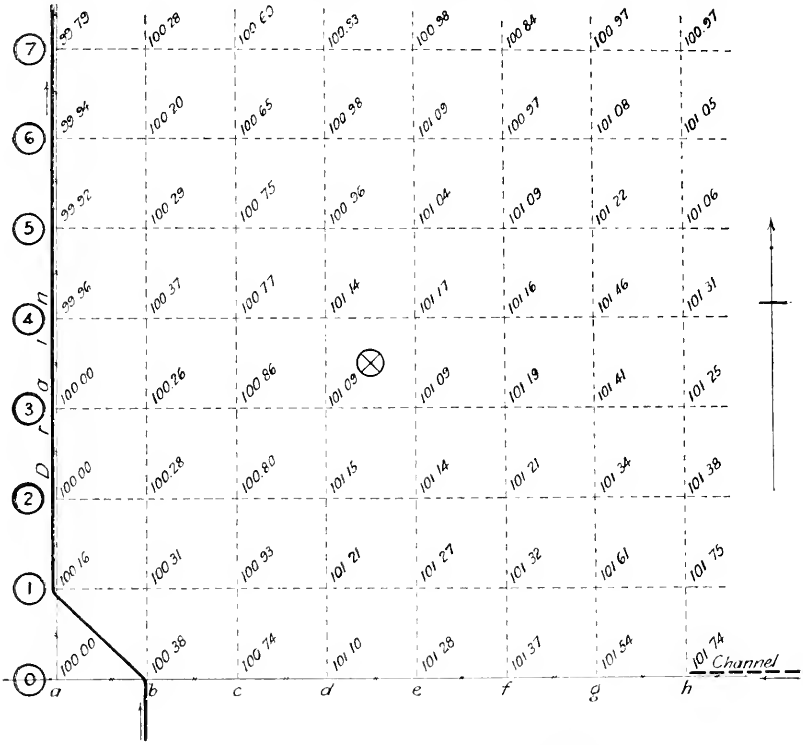


11. SCARIFIER.

The average cost of a good second-hand level and staff is about £10, and if that is distributed amongst a few neighbourly neighbours no one is hurt. Ability to set the level up, and read the staves, keep a proper level book and make a working plan may be acquired with a few weeks' instruction and practice. If anything is wrong with the machine a friendly shire engineer will soon remedy the trouble, and his services may generally be relied on to assist in selecting a reliable instrument. A 100-link measuring tape and set of arrows may be bought at any large store for about 20s. However, whether the farmer does the work for himself, or employs another, the following plan of operations may be confidently recommended.

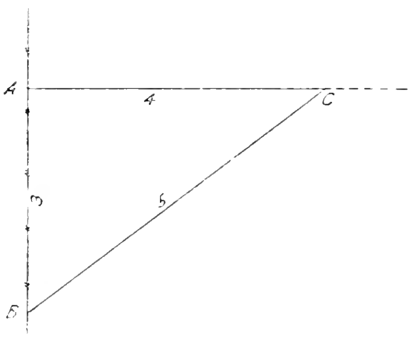
Setting Out.—Chain out the land to be graded in a series of squares, similar in appearance and plan to a chessboard, marking each chain point with a small peg. The attached plan is from an actual example. What is known as "section paper" may be purchased cheaply from a bookseller, and will save work in making drawings to scale. If none is available scale drawings may be made with an ordinary carpenter's rule, but preferably with what is known as a surveyor's 20-40 scale, which may be bought for 2s. 6d.

It will be noted that the plan refers to a square paddock having its south and west boundaries fenced, and therefore providing good base lines to work from. In other cases it may be desirable to set out some square line as a base, and it is not often that there is not some fence to set out from. The old 3, 4, 5 rule is a good method of setting off a square, and is readily understood. Measure along a base, as shown in sketch, a distance equal to 3 links, feet, yards, miles; it does not matter which. Then as nearly square as can be estimated, measure 4 along the line A C. Then, if B C measures 5, the line A C is square to the

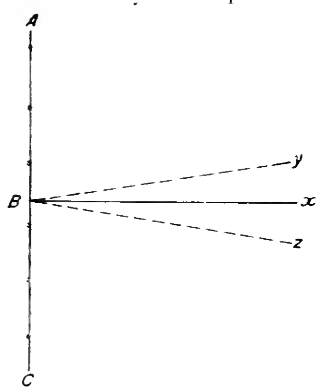


12. DIAGRAM OF CHESSBOARD SURVEY.

base or fence. If it does not, make it do so by shifting C. With sight sticks at A and C the line may be projected indefinitely. In place of



13. SETTING OUT A SQUARE.



14. USING AN "OPTICAL" SQUARE.

3, 4, and 5 a better result will be achieved by using 30, 40, and 50, 60, 80, and 100, or other multiples, the sight sticks then being further apart, insuring greater accuracy.

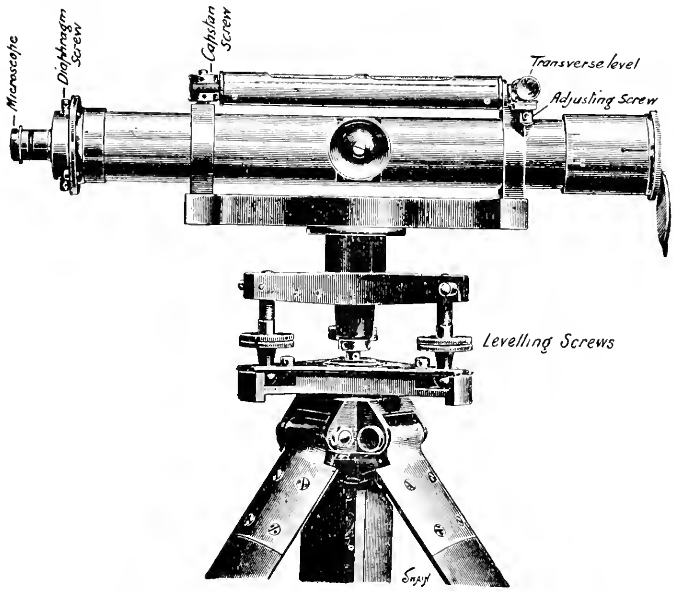
Better than all this, is a small scientific instrument about the size of a large watch called an "optical square," and costing about 12s. 6d. It will save many a land-owner a lot of trouble in setting out lines for his buildings, yards, fences, &c., and, with the chain, will enable him to do mostly all the surveying he is likely to require. The instrument comprises a set of mirrors so arranged that, on looking through the apertures provided for the purpose, square lines are at once apparent, and all that is necessary is to fix a peg where the instrument indicates, and proceed as before.

For example, let it be required to set out a square line, B x, from the point B in the fenced line A B C. Stand at the point B and, with the right hand holding the instrument to the eye in a horizontal position, gaze as nearly as may be estimated in the direction of x. Slightly move the instrument horizontally with a circular motion until it reflects the fence A B, and makes it appear to be on the line B x. Though not absolutely essential, it is well to send an assistant a few chains along the projected line, and move him back and forth until the instrument shows that he coincides with it. When that occurs, he should drive in a peg, and if the instrument is in order it will indicate the desired line. If the instrument is out of order, the point x will be made to appear at y. To correct this, fix a temporary peg there; turn the instrument upside down and proceed as before, and it will reflect the fence B C along the line B z. Fix another temporary peg at z. Half the distance between these two pegs will give the point x which will be at right angles to A B. The instrument should be tested from time to time in this way to ascertain if it is correct. Should it at any time be badly in error, take it to the shire engineer or send it to the instrument maker.

Set up the level at or about the point x shown on the plan, and having carefully levelled it proceed to read the staff at each peg, having previously ascertained, either by observation or otherwise, that the land to be graded is below the level of available water supply.

THE LEVEL.—A description of the level, as a preliminary to explaining its uses, will be of some assistance, though, as in most other cases, an ounce of practice is worth a ton of theory. In any case it will serve as a reminder when doubts arise due to the somewhat long intervals that may occur between successive usings.

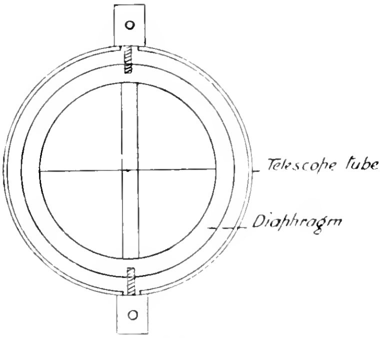
Most levels, in addition to the level placed longitudinally above the telescope, are furnished with a short transverse level near the object end of the instrument. Its purpose is to serve as an assistance in setting the instrument up, after which it is not referred to. Having screwed or clamped it upon its stand or tripod, it will be found a good plan when setting up to firmly plant two legs of the tripod first. Then, with the telescope pointing over the remaining leg, move that leg in or out, and right or left, until the bubbles of both levels are near the centre of their run, taking care to keep the point firmly pressed into the ground. Then proceed to centre them by means of the levelling screws. Some levels are provided with three and others with four levelling screws, and for simplicity of working and booking alone the former is to be preferred. In the four-screw instrument bring the telescope over two opposite screws, having previously slackened all four screws to prevent jambing. Revolve these screws in opposite directions until the bubble comes to its centre and the screws are felt to slightly grip. Bring the telescope over the opposite pair of screws and repeat. Continuing to move the telescope in the same horizontal direction until it comes over the first pair of screws but pointing in the reverse direction, again adjust the bubble. Repeat over the second pair of screws, and if the instrument is in adjustment, the bubble will now remain in the centre in whatever direction the telescope may be pointing. Should this not be so, the instrument may be adjusted as described later, but being a little out of centre will not vitiate results so long as the bubble is brought to the centre when making the first and final observations at any one station, and when taking readings on any fixed points. Readings on ground surfaces do not, as a rule, matter to half an inch. If running a line of levels as for a channel or drain, the error of the instrument will be corrected by setting it midway between each backsight and foresight.



15. DUMPY LEVEL.

The foregoing remarks apply equally to a three-screw instrument, only when levelling the telescope, bring it first over a single screw, then over the remaining two and repeat. It will also make it more convenient for correcting the bubble when levelling along lines, to set a four-screw instrument up with two of its screws approximately pointing in the direction of the survey; and with a three-screw instrument, one of the screws and the axis. No matter how carefully an instrument may be adjusted, slight corrections of the bubble by means of the levelling screws will constantly be required.

The diaphragm of the telescope is furnished with one horizontal and two vertical wires or cross-hairs as they are commonly called. In some instruments these are made of fine threads taken from a spider in the act of spinning, stretched across a metal ring and fastened with shellac. In others, the diaphragm consists of a glass disc with similar lines marked thereon and set in a metal ring, and are much to be preferred, especially for amateurs, on account of their permanency. Spider webs are easily damaged and are affected by atmospheric conditions and sometimes broken, and replacing them is a tedious job even to an expert. The "eye" end of the telescope is fitted with a small microscope which is slid in and out of its tube by the hand with gentle force and with rotary motion.



16. DIAPHRAGM OF TELESCOPE.

Point the telescope to some well defined object, such as a house or tree, or to the sky, and operate this microscope until the cross-hairs appear quite clear and devoid of any apparent shake. At the same time, focus the telescope also by means of the milled head screw at its side so that clear vision of the object observed is obtained. It would be well to do this before levelling the instrument to avoid disturbing it, and as a rule, once the cross-hairs are in focus the microscope will not require any further attention during the day's work. A very considerable range of temperature, or sudden change from sunlight to cloudy conditions, will be the most frequent causes of re-focussing. The telescope will require focussing for nearly every reading of the staff.

All readings are made with the horizontal hair; the staff should be read between the vertical hairs. If there is any suspicion that these hairs are not vertical, sight to a fine string carrying a heavy plumbob and suspended where it is not affected by wind. If in error, correct by loosening the diaphragm screws, when the diaphragm may be moved a little to right or left as required and with a rotary motion, the holes in the telescope tube through which the screws pass being slotted for the purpose. Doing this will derange the adjustment of the instrument so it will be wise to verify it prior to adjusting. When these hairs are truly vertical, the horizontal wire will be true also.

(To be continued.)

THE SPREAD OF WEEDS AND OF PLANT DISEASES.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in the Melbourne University.

There are many facts in regard to the spread of weeds and of plant diseases which are little known, and others, the precise bearing of which is not generally correctly understood. Hence, it may be of interest to give a general account of the chief factors responsible for the spread of vegetable pests and at the same time to mention a few illustrative cases which are of special interest or which have come lately into prominence.

The old idea in regard to pests and plagues, whether of animal or vegetable origin, was that they were to be regarded as visitations of God to punish the wickedness of man. This view is well illustrated in the Biblical accounts of the plagues of Egypt. Such punishment, of course, falls on both innocent and guilty alike, and sometimes indeed with greater weight upon the former. Among Mahomedan countries, the old idea is not yet dead and the attempt to check the spread of plagues and pestilences is largely regarded as an irreligious interference with the decrees of Providence.

A partial survival of the same view is evidenced by the undue importance attached in comparatively recent years to natural agencies as being responsible for the spread of weeds, pests and diseases, taking the term "natural agencies" to mean all factors not connected directly or indirectly with the presence and activity of man, that is to say, those factors that would act in his absence as well as in his presence. Among such agencies, wind, water and animals are the most active agents in dispersal, and to any one familiar with the minuteness of the germs of most animal diseases and of many plant diseases, as well as the special adaptations of the seeds of many weeds to suit them for aerial navigation, it would, at first sight, not seem necessary to look further for an explanation of the spread of pests and plagues. When, at the same time, it was assumed that such diseases as consumption and cancer in animals and rust and smut in plants were hereditary in the sense of being transmitted directly to the offspring, while still attached to the parent organism, the outlook seemed indeed to be a hopeless one.

As a matter of fact, although natural agencies do take part in the spread of weeds and diseases, they do so to a much less extent than might be expected. It is for the most part, by the ill-regulated and unscientific activities of man that most weeds and diseases are spread or that the conditions are provided for their excessive development. Under natural conditions, in the absence of man, there is much less migration of living organisms than might be expected and the term "living organism" of course includes all disease organisms and pests. Were this not the case, no continent could have developed an endemic fauna and flora largely peculiar to itself, and instead of the native flora of Australia being quite distinct from that of any other part of the world, it would have merely repeated that of corresponding regions in the Northern Hemisphere. That migration has taken place in the past in the absence of man is quite certain, but it probably has always been an extremely slow and gradual process requiring thousands of years for the introduction and naturalization of a few plants and animals in a new continent. When we compare with this the fact that, during the short period of occupancy of Victoria by civilized man, not far short of four hundred foreign weeds have succeeded in permanently establishing themselves in the country, it is easy to see how relatively unimportant are natural agencies for dispersal when unaided or unaffected by man. In other words, man himself is largely responsible directly or indirectly for the luxuriance and spread of the pests and plagues under which he suffers, and it is in the intelligent and scientific control of his activities that the best remedies for these evils will be found in the future.

In this connexion it may be of interest to mention a few specific instances showing that weeds do not invade an untouched native flora until man provides the conditions for their development, as well as carrying their seeds or causing them to be carried to the new soil. In the National Park at Wilson's Promontory, along the tram track used by the saw-millers many years ago at Sealer's Cove, thistles grow in abundance without being able to spread into the untouched native flora right and left of the track. The track is some miles in length and at its upper end in several cleared spots and where fires have been, thistles have entered and hold their own without spreading further. On Doughboy Island, where formerly a small residence stood, the ground is largely covered with alien weeds, whereas on other of the islands round the Park, which have not been occupied or are little visited, the native flora holds its own, although many alien weeds with air-borne seeds grow on the mainland within the distance the seeds may be carried by the wind. In addition, in many parts of Victoria, it has often been noticed that on cleared ground subsequently left to run wild, an originally luxuriant crop of the so-called Scotch Thistle may gradually thin out and ultimately almost disappear as the land reverts to its natural condition. Onion Grass again, actually follows in man's footsteps, since it flourishes in the hard soil at the borders of paths and in uncultivated overgrazed pastures in which the continual trampling of the stock has made the soil hard and given the Onion Grass the conditions it needs to enable it to suppress useful grasses and clovers. Travelling stock are common agents in spreading weeds to new districts and in providing the conditions which will enable them to gain and maintain a foothold, but even irrigation channels may aid in the spread of certain weeds. For instance, Stinkwort has in some cases been spread from one district to another by means of irrigation channels, the seeds floating on the surface of the water, and many other seeds could be spread in the same way. In this case, fixing a board across the channel so as to hold back the surface scum, would prevent this source of spread. The reticulation channels themselves, being moist and not under crop and usually composed of worked and fertile soil, are localities specially suited for the growth of weeds, and the running water is admirably adapted to provide for the dispersal of floating weed seeds.

The influence of animals, particularly of stock animals, upon the spread of weeds and also upon the spread of disease, is very pronounced, and this fact is recognised in the regulations for the prevention of the spread of certain contagious diseases. Such regulations are not unnatural interferences with the order of nature, but are rather attempts to bring our artificial conditions into harmony with nature again. In nature, sick or diseased animals are immediately killed by carnivorous animals or are thrust out by the herd and left to die in solitude. The only improvement man has made upon the natural conditions is by destroying or segregating animals which have been subjected to the chance of infection, as well as those which are actually diseased, whereas the natural conditions for extirpation only come into play when the disease has advanced sufficiently far to affect the strength and vigour of the animal.

The way in which stock, and particularly sheep, carry the seeds of Barley Grass and Spear Grass is sufficiently well known to need no comment, but even here it is possible in the simplest of ways to lessen the spread by such means. For instance, suppose that a run contains a tract covered with any of the troublesome species of *Aristida*, "The Three-awned Spear Grass." Left to indiscriminate grazing, this will soon be carried all over the run as the better grasses are eaten out, but if the infested tract is fenced off and the sheep crowded in while the grass is young or while it is shooting after being burnt off, and if they are taken out before it flowers, its spread may be prevented or the total amount of it even steadily decreased.

To take another instance, the hard seeds of the Onion Grass lie on the surface of the ground in abundance from October to December, and are commonly carried on the hoofs of stock from one place to another, stuck in adhering mud or soil. If a farmer has a good paddock free from Onion Grass, it would be worth his while, when placing stock in it at that time of the year, to see that they do not walk across ground where Onion Grass is abundant before entering the field, or if that cannot be avoided, to make them walk through water to clean their feet. If a patch of Onion Grass appears in a paddock, its further spread may often be prevented by fencing it off for a time and merely loosening and manuring the soil on and around the patch. Dozens of similar instances could be given whereby the exercise of foresight and by trifling immediate exertion great future trouble could be avoided.

The influence of animals on the spread of weeds is not of course confined to stock. Mistletoe, for instance, is carried by small birds. Many small weeds are carried by ants from place to place and other instances could be given. A curious instance of the action of fowls in favouring the survival of weeds may be mentioned. A particular plot of ground, overrun by a few fowls, contained mainly Rye Grass, Dutch Clover and Prairie Grass with small amounts of Couch Grass, Plantain, Dock, and Burr Clover. Although the ground was too hard to scratch or break in summer, and the turf too thick in winter, within one year both the clovers and the two first-mentioned grasses had practically disappeared leaving mainly Plantain with a little Dock and Couch Grass. Hence, although fowls may destroy insects in a pasture, their general action will be to cause it to deteriorate, particularly if allowed on it in spring when young grass and clover seedlings are endeavouring to establish themselves.

The origin and incidence of the diseases of animals and particularly those of man, have been more closely studied and more fully investigated than the diseases of plants have been as yet, but it is not so long ago that very vague and, in part, erroneous ideas were prevalent as to the spread and transmission of such common animal diseases as consumption and typhoid fever, for instance. To some extent, this lack of knowledge is compensated by the greater facility with which many plant diseases could be attacked or even extirpated, if a tenth of the attention devoted to the diseases of man and other animals were paid to them. It is not, for instance, possible to collect all patients showing signs of consumption and subject them to cremation, but this can be done in the case of diseased plants and usually at less cost than when, for instance, the destruction of stock animals is rendered necessary by the spread of swine fever or anthrax. In very many cases, simple and effective means of treating plant diseases are already known, which do not involve the destruction of the diseased plant or part, and which are comparatively inexpensive. There are, of course, certain obscure diseases of plants such as bitter pit in apples, certain cancerous growths in trees and many other little known diseases of cultivated plants, of which little is known and for which no effective cure or remedy has as yet been found. This is, however, hardly surprising when we consider that Plant Pathology is one of the youngest of the sciences and that as yet very little work has been done in this direction on an experimental, scientific basis. There are few departments of human knowledge which offer as great opportunities for scientific research and in which the economic value of the results obtained is likely to be so great.

It is, for instance, within the lifetime of an individual that the cause, spread and modes of treating many of the most injurious rust and smut fungi have been exactly determined, that the existence of bacterial diseases of plants has been definitely proved, and that the previously unexplained losses to which various crops are subject have been shown to be due to various injurious plant organisms. It has, for instance, been recently shown that the mycorrhiza fungi which develop on the roots of many forest trees and are generally supposed to aid them in obtaining food from the humus in the soil may, under special circumstances, become parasitic and cause the death of the tree, particularly when in the young seedling state. Large losses of one and two year old oak seedlings are reported to have been produced in Russia in this way and this may be one of the causes of the heavy losses which sometimes occur in forest plantations without apparent cause.

Even in the case of such a well-known disease as the common potato disease, *Phytophthora infestans*, wrong ideas as to its spread were long prevalent. The spores were supposed to be carried any distance by the wind, that is to say, by natural conditions which it was impossible to control. It is now known that, in ninety-nine cases out of a hundred, the disease is conveyed from one district to another by means of infected tubers which formerly were supposed not to be able to carry the disease. The spores are apparently responsible for the local spread of the disease over small areas from each centre of infection so that a careful farmer using clean seed may keep his fields free from disease for a considerable time in the middle of an infected area, particularly if his land is surrounded by a belt of timber and his fields by good hedges, and may escape infection if timely measures are taken to suppress the disease in the surrounding districts.

Half a century ago belts of timber were found to delay for a time the spread of the terrible coffee disease (*Hemilæa vastatrix*) which rapidly wiped out the coffee industry in Ceylon, and it is possible that, if a sufficiently broad quarantine belt had been maintained and proper regulations enforced, the plantations might, in part at least, have been saved. Without regulations to restore the balance of nature, and to counteract the artificial conditions which favour the spread of disease in any widely cultivated plant, a similar history is capable of repetition at any time and in any country.

Many other instances of similar character could be given, but sufficient has perhaps been said to emphasize two points, which are of great importance. Firstly, that the spread of weeds and of plant diseases takes place to a far greater extent as the direct or indirect result of the activities of man than it does by uncontrollable natural agencies. Secondly, this being so, very much more can be done to prevent the spread of weeds and disease by the increase and spread of knowledge, and by suitably directed regulations for bringing that knowledge into play, than would otherwise be the case. It is easy, for instance, to prevent the sale and planting of diseased potato tubers, or the sale of wheat or other seeds infested with the spores of parasitic fungi or mixed with the seeds of injurious weeds, but it is not possible to any extent to prevent the spread of spores or seeds by the wind, although it is of course possible to give them no opportunity of developing. It has been possible in man by suitable precautions and regulations to practically suppress certain diseases, and there can be no doubt that the same will ultimately be found possible in the case of certain at least of the more injurious diseases of plants.

WILD "GRASSES" FOR WEAVING.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in the Melbourne University.

The American Consul, Mr. J. F. Jewell, writes as follows:—

"I have the honour to state that I am in receipt of a letter from the United States forwarding the enclosed sample of grass, with the request to ascertain whether similar grass is procurable here and, if so, whether it would be possible to obtain regular supplies of at least 5,000 tons per year. My correspondent is a manufacturer of grass rugs and carpets and desires to establish the industry here which is successfully carried on in the United States, if the right kind of grass is procurable in sufficient quantities and at the price of, say, from £2 to £3 10s. per ton. The grass, he states, is grown in marshes or waste land, is cut with an old-fashioned reaper, and is bound in bundles by hand after lying long enough to get dried or cured. I would, therefore, appreciate your courtesy if you would kindly furnish me with the desired information."

The specimen accompanying the letter does not appear to agree exactly with any Victorian grasses or sedges, but since it consists simply of the stems and leaves used in manufacture, it cannot be identified with certainty. We have, however, certain grasses and sedges growing wild in Victoria which approach the present sample, and which might prove valuable for the purposes mentioned, if an abundant supply of them could be assured. Judging from the sample, the conditions required are:—

1. The stems or leaves must be slender, about the thickness of a steel knitting needle, of nearly the same diameter throughout, and from 18 inches to 3 feet in length.
2. They must be tough and fibrous and must remain flexible when dry.
3. They should not become discoloured in drying.
4. A steady supply in fair quantity should be obtainable. A temporary or an occasional supply would be of little value.
5. The surface should be smooth, but the edges may be rough, as in the present sample.

As the quantity required, 5,000 tons, is considerable, and at £3 per ton would represent £15,000 per annum, it may be worth while to find whether a supply could not be obtained from Victoria, as plants of this character grow wild in swampy places, which are often of no agricultural value. Only the cost of collecting the material would come into consideration, so that if a suitable native plant could be found to satisfy this demand, a fair profit might be possible. Samples of the material in question can be seen at the National Herbarium, or will be forwarded on loan if desired, and specimens of any grass sent in as a suitable one could be forwarded to the manufacturer in question for his approval, provided the requirements mentioned above seem likely to be satisfied.

PLANTS INDIGENOUS TO VICTORIA.

The attention of readers of the *Journal* is drawn to the notice on the back cover regarding Professor A. J. Ewart's latest work, *Plants Indigenous to Victoria*, Vol. II.

NUCLEI FOR MATING QUEEN BEES.

R. Beuhne, President, Victorian Apiarists' Association.

In the raising of queens for the purpose of superseding those which are either too old, or otherwise inferior, bee-keepers often encounter difficulties in any one of a number of methods employed to get the young queens safely laying.

The most direct, but also the crudest and most wasteful way, is to kill the old queen and either let the bees raise cells themselves or supply them with a queen-cell previously raised elsewhere. If the queen killed were old, but had been a good one in her time, the bees may raise a good young queen from her brood, but in the case of an inferior queen no improvement, except in age, need be expected. When a queen-cell of good stock raised under the proper conditions is given, the result will be as good as by any other method, so far as the vitality and prolificacy of the young queen are concerned.

In either case, however, there is a considerable loss in the reproduction of the worker-force of the hive, much less certainly, but still considerable, when a cell, ready to hatch within two days, is given. When allowing the bees to raise a new queen themselves after destroying or removing the former queen, it will be at least 21 days before the young queen commences egg-laying; when a cell is given it will be twelve days during which reproduction is at a standstill. Now, as good queens cannot be raised, excepting under the very conditions which cause brood-rearing to be at its best, it follows that breeding is interrupted just when it should be at the maximum. Even a poor or old queen will at such a time lay 500 eggs per day, representing for 21 days a worker force of 10,500 bees and 6,000 for twelve days, but as young bees continue to hatch for 21 days after the old queen is removed, the weakening of the colony does not become evident till a month afterwards, by which time the circumstances have probably passed from memory.

It is a generally understood fact that there can be only one queen in a hive at a time and, with the one exception referred to further on, that holds good, as, on the average, from the time the young queen hatches till she begins to lay, ten days elapse, and a break in egg-laying for that period must of necessity occur. To reduce this interruption of breeding to a minimum, or to do away with it altogether, different methods have been evolved and practised, principally by American bee-keepers in the first instance.

The plan which does away with stoppage of egg-laying altogether is to confine the queen to the combs of the lower chamber by means of a queen-excluding honeyboard. About half of the combs of brood are placed in the upper story, to which a separate entrance is provided. A queen-cell is given above and the young queen will take her mating flight from the upper entrance, and in due course will commence to lay while the old queen in the lower chamber still continues. The young laying queen may be removed and used elsewhere and another cell given.

This is an ideal method in theory, but success depends upon a combination of circumstances. These are: a colony covering the combs of two stories; a queen in the lower chamber at least two, but better three years old; a free use of the upper entrance by the worker bees, and a continuance of favourable conditions of weather and of income of honey and pollen. If one of the four conditions is absent the young virgin queen will either be destroyed or mauled by the workers, or on returning from her mating flight will enter by the lower instead of the upper entrance and kill the laying queen. In the hands of some of the most expert bee-keepers it was successful some seasons, but with the average bee-man it was a failure.

To reduce the total interruption of breeding to a minimum for the number of queens required, the ordinary practice is to divide one colony into a number of nuclei of two or three combs, each being given a queen-cell and stood apart from others. Many of the bees will, however, return to the former stand leaving but young bees behind. These are unable to properly take care of the brood and queen-cell and to defend the little hive against intruders.

NUCLEI HIVES FOR MATING QUEEN BEES.

There are several ways of overcoming this difficulty. The bees for each nucleus may be taken from any hive which can spare them, and they are shaken into a small empty hive, such as the first one shown on the right of the illustration. A wire screen is fastened over the top of the box and it is placed in a dark, cool, and well aired position, such as under the floor of a building on blocks. On the evening of the day following, that is, about 30 hours later, the box is taken to the spot where it is to be located. A comb of brood and one or two combs containing honey and pollen without bees are taken from some strong colony and given to the nucleus, a ripe queen-cell in a protector or a newly-hatched virgin queen in an introducing cage being inserted at the same time.

Another way of making nuclei is to break up, into lots of two or three combs each, a colony which has just thrown a swarm. As a number of bees will return to the old stand, only one comb of brood should be left in each nucleus. Select for the purpose those combs containing the greatest amount of sealed brood, and place the combs of young brood in the hive on the old stand where it will be cared for by returned bees.

A swarm may also be divided into nuclei. It is best to allow it to cluster somewhere; then hive it in an empty box and about sunset divide it amongst a number of nuclei hives, each containing a comb of the brood from which the swarm issued and one or two combs without brood. As bees which have swarmed and clustered will stay in any new stand, a greater number of nuclei can be made out of a swarm than a swarmed stock. The queen of the swarm should, however, be removed, otherwise the bees are likely to crowd to the particular box she is in.

By any one of these methods from four to ten nuclei may be made out of a single stock, and thus brood-rearing is interrupted only to the extent of one queen for four to ten new queens. In order to still further economize, American bee-keepers some years ago adopted a system of very small nuclei with miniature frames and only a tea-cupful of bees in each. These are known as Swarthmore nuclei. Owing, however, to the liability of such very small hives being robbed out when near an apiary, and the erratic behaviour of these small communities in frequently swarming out, the few Australian bee-keepers who experimented with this system have abandoned it. For the raising of the best type of queen, it is essential that from the first start of the queen-cell to the commencement of laying of the young queen, the most favourable conditions should exist. In the case of very small nuclei these conditions are absent during part of the chrysalis and the adult stage of the queen's life. Even in nuclei on standard combs in thin walled boxes holding two or three frames, the period between the hatching and laying of the queen is often unduly extended by climatic influences and the vigour of the young queen impaired.

The influence of extremes of heat and cold may be reduced to a minimum by having three or four nuclei in an ordinary hive body, as shown by the uncovered hive in the centre of the photograph. A ten-frame body will hold four, an eight-frame three nuclei of two combs each. The compartments are made by thin, tightly-fitting division boards, extending upwards to the level of the top of the hive. Each has a separate entrance facing in a different direction and a separate thin cover board independent of the ordinary hive roof.

As it is always desirable to have some spare queens at the end of winter, to make good any losses of queens, these nuclei grouped together in one hive may be carried through the winter, provided there are enough bees in each to nearly cover the combs. When queens have been removed, the divisions may be withdrawn and the bees united under one queen.

Nuclei may be grouped in yet another way by standing, close together, two boxes of two compartments each, as shown in the second hive from the right in the illustration. The advantage of this method is that, after one queen is removed from each box and the bees united, a four-frame super may be put on each, allowing an extention of the brood-nest upwards, as shown on the left. When all combs are occupied, an ordinary hive with entrance in the same position may be substituted for the four-frame boxes, the hives moved apart by degrees, and run as independent colonies.

For convenience the nuclei are numbered, the numbers being painted on tablets secured by a nail in the centre and used to indicate the state of each. The number is in normal position for queen laying; upside down, for queenless; diagonal upwards, for queen-cell; horizontal, for virgin; and for queen-fertilized but not laying yet, diagonal downwards.

TOMATO-GROWING IN THE NORTH.

L. Macdonald, Horticulturist, Dookie Agricultural College.

As yet we have only two districts in the North that may be considered important as tomato-producers, viz.:—Bendigo and Echuca. In these two districts the soils, situations, and cultural methods differ widely. Yet, on comparing results, they are found to be approximate. It is manifest, then, that the three things essential are: (1) A warm sun, (2) plenty of water, (3) good drainage. In the places mentioned we find a good practical representation of two methods of tomato-growing probably the most suited for Northern Victoria. The close-planting, single-stem, stake system prevails at Bendigo, where the growers are mostly European; while at Echuca the growers, chiefly Chinese, adopt the flat system on raised beds.

Culture.

At Bendigo the growers generally start their plants about the middle of July. When the plants are large enough to move they transplant them, about 3 inches apart, into larger frames. The latter are previously filled up close to the glass with well-prepared fresh manure, which is thoroughly tramped down as it is being filled in. When the whole mass is well and evenly compacted it is levelled off and is ready for the plants. The manure is usually about 18 inches to 2 feet in thickness and care is taken to get it of even density and quality so that there will not be a great variation in temperature due to irregular fermentation and consequently an uneven growth of plants in the frame.

The plants are grown in the frame until the frosts are over, planting out taking place early in October; in the more favoured places it is begun late in September. In growing the plants in the frames unremitting attention is necessary and careful judgment must be exercised in the control of air and water, otherwise damping off, lanky growth, or lack of growth will result. The plants should be kept growing slowly and should be in firm, stocky condition for planting out.

In lifting from the frames a ball of the material in which they are growing is cut out and left adhering to the plant; consequently the plants do not receive such a severe check as they would if planted out with bare roots. Watering takes place immediately after planting, to settle the soil well round the roots and force the air out; this prevents evaporation and consequent check to the plants.

The plants are put about 1 foot apart in the rows, the distance between the latter being about 2 feet. Between each pair of rows a shallow gutter is shovelled out for irrigation, the removed earth being ridged up around the plants. Under the staking system each plant is trained to a single stem, the side shoots being nipped off. The stakes are obtained from gum saplings that grow plentifully in the neighbourhood and are about 1 or 2 inches in thickness and 2 ft. 6 in. in length. They last for a number of years. The plants are tied to them with one to three ties of about 4 inches in length, which are obtained by unravelling old jute or "sujee" bags. Some of the growers give the stakes in each pair of rows a lean towards each other; this, it is contended, provides more freedom for picking between each pair of rows, and also has a tendency to retard growth and thus favour fruit production.

Drainage is recognised as one of the most important factors in the success of the tomato crop. A full appreciation is given to this matter by Bendigo growers. Although situated mostly on the slopes of hills, the gardens are a network of surface drains. So important is the effective carrying out of this work that some of the growers would not have them more than 15 feet apart. This matter, however, is governed to a great extent by the nature of the soil. Loose, porous, sandy soils do not require

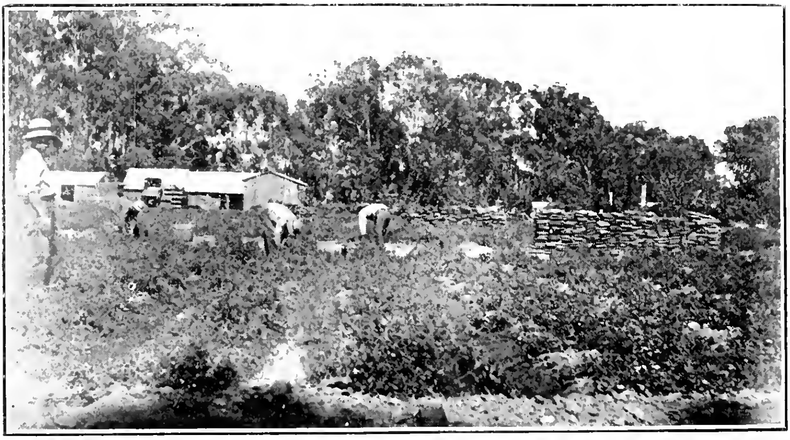
TERRACING, MR. PUGH'S PLANTATION, BENDIGO.

the drains so close together as those of a retentive nature. The drains are about 2 feet deep and run with the fall of the land; they cut the field up into narrow lands and make horse tillage practically impossible. Such drains are, however, not the most economic; they hamper operations, and take up as much land as would grow sufficient produce to pay in a few seasons for the initial cost of effective underground drainage.

STAKING SYSTEM, BENDIGO.

In irrigating, the water is brought to the head of the field and worked down the narrow lands, zig-zagging across them, and filling the gutters between the rows. No hard and fast interval between watering is fixed; it depends on the weather, soil and condition of the plants. Excessive watering is almost as detrimental to the success of the crop as the lack of water. The grower has to use his judgment as to when the plants require watering and in this matter it is largely responsible for the success or failure of the crop.

The methods of culture at Echuca differ considerably from those adopted at Bendigo. However, growers place as much stress on the importance of the two cardinal requirements of the plants; judicious watering and effective draining. The young plants are started in the latter part of June for early crops, or in July. Planting out takes place in the latter part of August or September; this is somewhat earlier than at Bendigo, but provision is made for sheltering the plants from frosts and cold winds at Echuca, which is not done at the former centre. The shelter is provided by planting the young plants a little below the surface; the earth that is taken out from the shallow hole is thrown up on the windward side, and a redgum board is then placed in an oblique position over the plant. The board is so placed that it will admit as much sunlight as possible throughout the day, prevent frosts



PLOT SYSTEM, ON RAISED BEDS, WITH GUTTERS FOR IRRIGATION, ECHUCA.

from affecting the plants at night and give as much shelter from prevailing winds as possible. The boards used are about 2 ft. 6 in. in length and 9 in. in width. They last for a number of years.

The flat system of culture adopted at Echuca lends itself to early planting and the adoption of some shelter against frosts. At Bendigo, under the stake system, sheltering is not considered practical owing to the great number of plants per acre. Under the flat system the plants are encouraged to develop a number of branches and spread out over the ground. Thinning out is adopted, however, but is intended to assist more in the ripening and setting of the fruit.

At Echuca the gardens are cut into small sections for convenience in irrigating. In these sections narrow beds are cut out; each bed holds one row of plants and the plants are put in about 2 to 3 feet apart in the rows. An early maturing companion crop, such as lettuce, is sometimes grown on the same beds.

A liberal system of manuring is generally adopted by all growers. Heavy dressings of stable manure are given in conjunction with artificial manures to the land in autumn, being well incorporated with the soil; if the land is fallow over the winter, it is kept in good order, being turned over frequently. In many cases, as soon as the tomato crop is done, the plants are ripped out and young cabbage or cauliflower plants are put in; these mature by early spring and are sold out in time to get the land ready for tomato planting again. In this manner two valuable crops are grown on the land each year.

The returns from some of the well-managed plantations last year were among the very highest of those obtained from any agricultural crop, and when one views the unkind, sterile-looking hills around Bendigo, and the uninviting bush at Echuca, and sees the conquest that has been won in the face of such conditions, by labour, fertilizers and water, he cannot be other than hopeful regarding the future of this industry, when there are thousands of acres of fertile land veined with brimming channels, in Rodney alone, ready to respond to intensive culture. Some growers claim to have obtained 1,000 cases per acre; however, one of the oldest and largest growers in Bendigo informed me that he usually expected an average ranging between 600 and 800 cases per acre. Even if a very low market price is put on these it will be seen that the profits are very large.

BOARDS USED FOR PROTECTING PLANTS FROM FROST, ECHUCA.

Last season was a good one in many districts. The early tomatoes suffered a good deal from frosts and floods, but the market was lively and maintained a good firm tone throughout.

Varieties.

It has been found by growers that many of the varieties catalogued by our leading seedsmen are practically worthless for commercial purposes. Most of them are fickle as to soils and situations and will only do well under certain conditions. These conditions are apparently not found in the North; the consequence is that their culture has been abandoned or restricted to a few isolated patches. Some are of such variable type and poor setting qualities that they cannot be depended on; while others are of such character and flavour that they only command a very limited sale. The "Selected Large Red" and others known as "French" and "Spanish" are the most favoured by Northern growers.

Owing to its vigorous constitution, uniform prolificacy, and early maturing qualites, the "Selected Large Red" easily holds pride of place. Growers generally select their own seed from the most prolific and typical plants, thus tending to perpetuate and improve the best features of the type. Although meeting with general favour with the public, being mild and uniform in quality, it sometimes exhibits a lightness or puffiness that is objected to by consumers. Some growers mix the more solid varieties with them to give weight. It is manifest, therefore, that there is yet abundant scope for the hybridist in the improvement of our tomatoes.

Pests.

Of the many diseases that attack tomatoes, only a few have proved themselves seriously troublesome in the North. The Victorian Locust (*Pachytalus australis*) does great damage in places some seasons when they come in large swarms. Burning smudges on which an occasional handful of sulphur is sprinkled is found a good remedy in such cases. The Tomato Moth (*Heliothis armigera*) is also doing great damage, particularly with the early tomatoes; while the disease known as "Sheath Calyx" has assumed threatening proportions. As yet it has not seriously affected yields, appearing more towards the latter end of the season. It manifests itself in the blooms towards the terminal points and also in immature wood. The terminal points of the shoots, the peduncle and pedicel of the late blooms become swollen; the calyx becomes enlarged and the flowers fail to develop. If this disease becomes so virulent as to attack the plants in the early stages of growth it will be a serious menace to the industry. I have found it has a wide distribution, being especially prevalent in the old tomato plantations. I have also found, in plants severely attacked, that there was a complete absence of fruit. The Crab Grass (*Panicum sanguinale*) is also found a troublesome pest; irrigation and lack of cultivation favour its development.

Future Prospects.

Despite the difficulties that confront the grower in the shape of pests, the tomato is destined yet to play an important part in the industrial development of the irrigable areas. It is to some quickly-maturing crop that will yield ready return that we must look to solve the difficulties that confront the tree planter in these areas. The finances of the average settler will not bear the long wait of four to five years till the trees begin to return some of the initial outlay.

Owing to the advertised success of the Bendigo growers, the stress laid on their sun heat, methods of irrigation, culture, etc., it is thought in many quarters that tomatoes could not be successfully grown in the North unless their methods of culture were adopted. The tomato is not a fickle plant; although half-hardy in our climate and unable to withstand severe cold, at the same time it has a robust constitution and a wonderful faculty of adaptation. Yields are, however, in other places, as great under entirely different methods of culture.

Many hesitate to launch their all in an industry that they only have a vague knowledge of and from which, in the ordinary course of events, they can only obtain results after a lapse of time that is almost sufficient to change the whole trend of events. Quite a number of crops may be grown without injury to the trees, and these will assist the orchardist in tiding over the first few years of fruitlessness. In this respect, the tomato probably offers the greatest inducement in our irrigated areas. It is an adaptable and vigorous plant and an early and profitable cropper. It may be contended by some that much further planting would cause a slump in the tomato industry. It is consoling to know that the same thing was said in respect of fruit-growing a few years ago, but that industry was never in a more flourishing condition than at present. Tomatoes may be used in such a number of ways as a household commodity that they will command a sale where many other fruits would fail. Commercially, they may be canned, jammed, sauced, dried or sold fresh. So as soon as a surplus of production occurs over local demands the way will be open for the manufacturer to compete in the world's markets.

DAIRY VALUE IN SHOW STOCK.

J. S. McFadzean, Dairy Supervisor.

A very common comment heard this year at the Melbourne Royal Show had reference to the apparent slump in the selling prices of some classes of dairy cattle. Good show stock in good condition found ready sale at satisfactory figures. That there was other stock hard to quit was no doubt true; and many good reasons might be found for this.

Throughout the whole of Victoria the dairying industry is flourishing. It has come to stay. During a few years past there has been more or less of a boom in some classes of dairy stock; and many very ordinary animals, from a show point of view, have changed hands at prices beyond their value for dairying.

Many people are slow to discriminate between good and inferior stock. Every roan is not a Shorthorn; every red-and-white is not an Ayrshire; and every fawn is not a Jersey. Each may have something in its appearance that warrants the supposition that it has descended from the breed that its colour is distinctive of; but that does not class it as "pure-bred." Every breed has peculiarities of form, as well as colour, that mark its individuals as its own; and, even though their breeding may conform to recognised lines, there are many animals whose shape does not approximate the standard set for their particular breed.

Again, every cow of each milking breed is not a good producer. There are many culls to be met with in every breed—animals that are almost worthless as dairy stock. Such cows should not be sold for dairy purposes; but should be fattened for the butcher. If this were done the milking qualities of our pure-bred herds would improve rapidly.

At the Royal Show a lot of rough-looking cattle were brought forward for sale. Among them were many well-bred animals; but, compared with other stock of the breed that were shown in good condition, these rough-coated, badly-fed specimens looked—to the uninitiated—the veriest of scrubbers. With every kind of stock, appearance and condition go a long way towards bringing satisfactory selling prices; and the breeder who overlooks this fact stands to lose thereby. Ill-conditioned animals will only bring their full value under some extraordinary demand.

Every year those engaged in dairying are becoming better versed in what are known as the milking points, as well as in the show points, of dairy cattle. An animal that two or three years ago might have found a buyer on account of its colour now requires something more than that to command attention. Few dairymen will bid for coarse, leggy, or slab-sided cattle, no matter what their colour may be; for these conformations are now universally considered as serious faults in any dairy animal. The question then arises as to what qualifications in a pure-bred cow should entitle her to be considered as good "dairy value," when sold by public auction at a pure-stock sale.

Some people—and breeders at that—would say that if a cow was apparently sound, and of a recognised milking breed, she should be qualified to be sold as dairy stock. A better recommendation than this should, however, be required; for, as already stated, every pure-bred female of a dairy breed is, unquestionably, not a good yielder. It may possibly be every breeder's ideal to have them so; but there are very few men, even amongst the high class breeders, who take the trouble to demonstrate effectively that heavy or consistent milk production is given more than a passing thought in their herd management.

Every cattle-owner knows that, outside the question of the escutcheon, there is no way of estimating the possible bulk or continuity of the milk yield of a cow from her appearance. Even if it were accorded its full weight at the hands of the judges, the escutcheon with its variations, is still almost an unknown problem among dairymen. In the show ring it is safe to say that the escutcheon of a cow or bull is seldom valued as highly as the set of the animal's horns; so we may leave this key to production out of present consideration.

The one infallible guide to a dairy-cow's quality that is understood alike by all—if obtainable—is that represented in her combined milk and butter-fat yield, as determined by records and tests taken during her full season's lactation period. The breeder possessing a knowledge of his cattle to this extent has something definite to place before an inquirer who is out to buy dairy stock; and such a guarantee of quality is the only one that is really worth considering by the dairy farmer. Yet how seldom is this obtainable? Nine out of every ten dairymen, before buying a cow, will make some endeavour to learn what her milk yield has been; yet ninety-nine out of every hundred of those selling cows cannot truthfully supply this information. The animal under offer may have been bred by them; or may perhaps have been in their possession for two or three seasons; yet they are ignorant of the actual quantity of milk or butter she has yielded. It can easily be understood that, where an inferior animal is being disposed of, the seller would not be willing to proclaim her deficiencies; and the absence of a record in such a case needs no further comment.

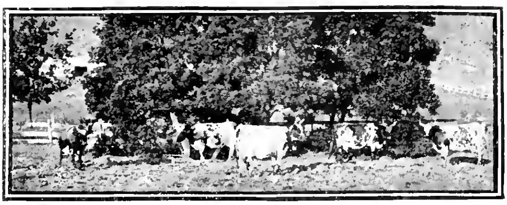
With the established breeder of pure stock, however, the case is altogether different. Where he has to make or maintain a reputation for good milking stock, nothing will assist him to this end so surely as the furnishing to the buyer, with every cow sold from his farm, of a guaranteed record of her yield in milk and butter-fat. Each year room must be found for his growing heifers. If he is breeding on right lines, his herd will be improving in quality annually; and, if he were to sell his young untried stock, he might be parting with some of his best; so whatever he sells will come from among the older cattle. And here he will find the utility of milking records; for an aged cow, if a good yielder, will have a special value for breeding purposes; and will find ready sale accordingly. Young stock also, bred from cows with recorded milk yields, would command the competition of buyers at much higher prices than now have to be oftentimes taken by the breeder, solely because he cannot, in other than general terms, guarantee the milk-yielding capacity of the parent stock.

Dairy stock, at the Melbourne show, are judged on appearance only. It would be equally reasonable to judge hunters or trotting horses in the same way; but, while the horses are put to a practical test, the cows are judged on their apparent possibilities. Does this make for progress in production? At Victoria's premier show, of all places, one would expect to see dairy cows judged according to their actual production. There, also, we might expect to find young stock being sold on the reputation of their parents as dairy cattle proved by milk and butter-fat records. A farmer, purchasing a pure-bred bull at that show, should be able to get with it something more than a verbal assurance that it has been bred from good milking stock. A prize-taking pedigree is of little value to a dairyman as compared with one demonstrating practical results. While we all appreciate the cow that "fills the eye," the one that "fills the bucket" regularly will give still more genuine satisfaction. A cow that does both is a very valuable asset.

In neglecting to keep records of the milk and butter yields of their stud cows our breeders are overlooking one of the most profitable points of their business. It pays to supply what a customer wants; more especially if it can be done with practically no outlay. Half-a-minute per cow at each milking for one day per week—or even one day per month—will be more than sufficient time in which to weigh and record her milk yield. A test of the butter-fat in her milk for one day in her second, fourth, and sixth months of lactation will give her average quality. With these items noted her value as a dairy cow is no longer mere guesswork. Every good cow so tested has her value accentuated; for every calf from her—male or female, irrespective of colour—has an increased value for breeding purposes.

Upwards of 300 dairy stock were brought forward for sale at the Royal Show; and milking pedigrees were conspicuous by their absence. In the sale catalogues the annual milk yield of the dam of either heifers or bulls was seldom referred to. Mention was occasionally made of the yield or test of a cow's milk, covering a period of a few days only, showing that the breeder felt the necessity for some reference to this qualification in his stock. Probably he will be better posted next year.

There are a few breeders in the State, however, who have given special attention to this point for years past; and, in consequence, their cattle have a reputation that insures them ready sale always. In fact, when it comes to selling pure-bred dairy stock, such breeders are in a class by themselves. They need no special effort to bring buyers for their surplus calves. In most cases these are bespoke before their birth is assured. The demand for such stock is in no danger of being over-supplied. There is plenty of room for others to profit by this work. Buyers want milking pedigrees, and are prepared to pay for them. It is therefore a sound business proposition with every breeder of milking stock to keep records of his cows' individual production.



BUILDING HINTS FOR SETTLERS.

XIII. CONCRETE FENCING POSTS.

T. J. Sledge, Instructor in Carpentry and Joinery, Eastern Suburbs Technical College.

A number of concrete posts were made, on the lines described, by Mr. Sledge and his pupils at the Eastern Suburbs Technical College for this Department. Some of them were used at the Royal Agricultural Society's recent Show to fence in the stand of the Engineer for Agriculture. Much credit is due to the College for the practical and useful work it is doing in training young men desirous of going on the land. Concrete fencing posts made on much the same lines as described have been in use at the Cowra Experiment Farm, New South Wales, for over twelve months. The Manager, Mr. G. L. Sutton, writes that the concrete fencing posts have been very satisfactory.—EDITOR.

Farmers could utilize concrete in the construction of many things on the farm, that are now made of wood and other materials which break or decay or are destroyed by bush fires. For instance, there is generally a certain amount of fencing to be done; either old fences need to be renewed or new paddocks require to be fenced, and before doing either the farmer should consider which is the best fencing post to use, and ask himself the question "Shall I use the old style of fence, or some more economical and up-to-date kind?"

Concrete fencing posts have many important features that should recommend them to the farmer. The wood posts rot and must be renewed from time to time, whilst they are always liable to be destroyed by bush fires and in some localities are expensive. The concrete post will last indefinitely, its strength increasing with age. It is practically fireproof, white ant proof, costs nothing for maintenance, and if there is a supply of sand and gravel near at hand the expense of making it but little.

Construction is not difficult; probably the greatest difficulty at first will be in judging the right proportions of sand, gravel and cement, but by adopting a systematic method of measuring the different materials this will be overcome.

It is very important to have good clean gravel, and clean and sharp sand. These must be free from all loam or vegetable matter, and the gravel not too coarse.

A good place to get the gravel is from a creek, taking it from the banks, rather than the bed as that from the latter is more likely to contain vegetable matter. Any large pieces of gravel should be broken or removed and nothing larger than would pass through a ¾-inch mesh should be used as large pieces of stone would cause weak places in the posts. Any good brand of Portland cement will do. Care must be taken to keep it in a dry place and well off the ground. If placed on the ground it will absorb moisture from the earth and its strength will be impaired; if in a wet place the cement will set and become useless. Attention to what may appear to be insignificant details is necessary if good posts are to be made.

The purpose for which the fence is to be used should be taken into consideration when deciding the size of the posts. If a light fence for sheep is required it would be a waste of material to make heavy posts. A good strong light post is obtained by making it 5 inches x 3 inches at bottom and 3 inches x 3 inches at top and reinforcing it with four pieces of No. 8 fencing wire. A stronger one would be 5 inches x 5 inches at bottom and 3 inches x 3 inches at top, using the same reinforcement.

whilst a very strong one should be 5 inches x 5 inches at bottom and 5 inches x 3 inches at top with the same reinforcing wires as the others. The best plan is to have single moulds, that is, a separate mould for each post, as they can be taken apart more easily and the posts removed from them much sooner than when several posts are made in one large mould, and with less risk of damaging the posts. Also, the moulds are more easily handled and can be stored away in a much smaller space than large ones when not in use.

A simple mould would consist of a bottom board, two side boards, two end pieces, and seven short pieces to be used as cramps, and six pieces of fencing wire or $\frac{1}{4}$ round iron about 8 inches long. Dressed oregon timber should be used; hardwood would do if oregon is not obtainable.

For a 6 ft. 6 in. post 5 inches x 5 inches at bottom and 5 inches x 3 inches at top, the bottom board should be 7 feet long, and 9 inches wide, and $1\frac{1}{2}$ inch thick and should be prepared as follows. Mark a line down the centre of board with a straight edge or with a fine piece of cord which has been whitened with chalk or blackened with charcoal. When strained taut between a point in the centre of one end and a point in the centre of the other end, it will, if lifted and suddenly released, make a straight and fine line.

Six inches from each end and $3\frac{3}{4}$ inches on each side of centre line bore a $\frac{3}{8}$-inch hole about $\frac{3}{4}$ inch deep, and half way betwen the ends and $3\frac{3}{4}$ on each side of centre line bore two more, making in all six holes.

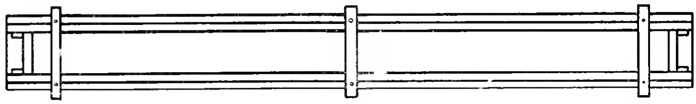
Now take three strips of wood about 12 inches long about 1 inch x 1 inch (pieces split out of the end of a kerosene case will do) and bore two $\frac{3}{8}$-inch holes in each, the distance between the holes to be equal to the distance between the holes in the bottom board.

Next prepare the sides. These should be 7 feet long, 5 inches wide at one end, and 3 inches wide at the other, and $1\frac{1}{4}$ inch thick; $\frac{1}{2}$-in. holes should be bored in them in positions to suit the number of wires to be used in the fence. For a seven-wire fence they could be placed as shown in sketch, that is, from end of mould to first wire 6 inches, then 12 inches, 9 inches, 7 inches, 6 inches, $5\frac{1}{2}$ inches. Cleats should now be nailed on the ends of side moulds, leaving 6 ft. 8 in. between the cleats as shown on sketch.

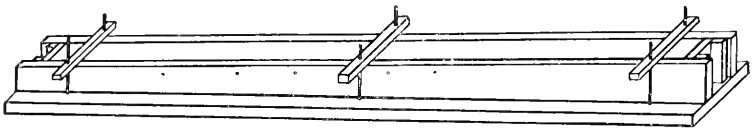
Round wooden pegs will be required and should be made about 9 inches long and $\frac{1}{2}$ inch thick at one end and tapered down to $\frac{3}{8}$ inch at the other.

If the first size post (5 x 3—3 x 3) and the last size (5 x 5—5 x 3) are adhered to and made the standard size, the same moulds and boards can be used for both posts, it only being necessary to bore three holes on one side of the bottom mould 2 inches nearer the centre, and corresponding holes in the cross piece. End pieces will be required—one piece 5 x 5, one 5 x 3, one 3 x 3, and 1 inch thick. The moulds should be well oiled or greased to prevent the concrete sticking to the wood—any oil or grease will do.

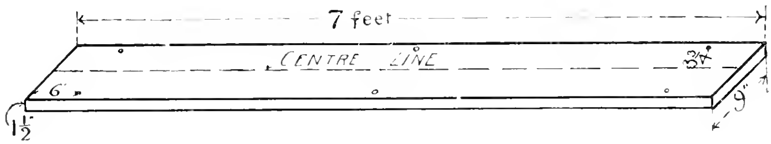
Care should be taken of the moulds after using them. They should be scraped and brushed with a stiff brush to remove any particles of stuff adhering to them and greased again. When not in use stack them carefully out of the sun and wet. If they are stood up against a wall or fence, or thrown carelessly about and left lying just where they happen to be thrown, they most likely will twist and split and become almost



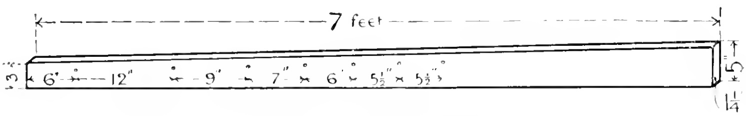
PLAN OF MOULD.



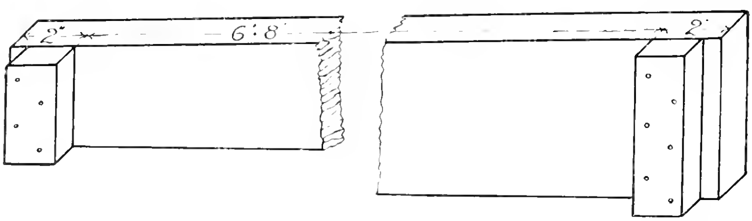
OBLIQUE VIEW OF MOULD.



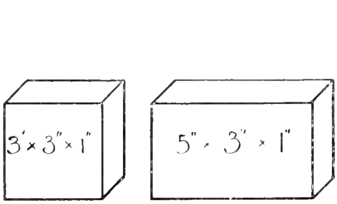
BOTTOM BOARD, SHOWING POSITION OF HOLES.



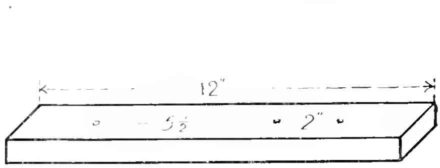
SIDE BOARD, SHOWING POSITION OF HOLES OR STAPLES.



ENLARGED DETAILS, SHOWING CLEATS NAILED ON SIDE MOULD.



END PIECES.



CROSS PIECE BORED FOR WIRE.

useless. When taking the moulds apart, all the different pieces should be carefully laid where they may be found, without a lot of hunting for them. A little care in this direction will be amply repaid by the ease with which the moulds can be set up.

The proportions of the materials used is an important point in making concrete posts. A good post is made with $4\frac{3}{4}$ parts gravel or broken stone, $2\frac{3}{4}$ parts sand, and 1 part cement and reinforced with four pieces of No. 8 fencing wire. The more cement there is used the stronger the post will be. The above proportions make a post strong enough for all ordinary purposes. Gate-posts and straining posts might be made with $1\frac{1}{2}$ cement to $4\frac{3}{4}$ gravel and $2\frac{3}{4}$ sand, and the gate-post should be reinforced with $\frac{3}{8}$-in. iron rods.

For mixing the concrete on, a box should be made, say about 4 ft. 6 in. square. This should be made of tongued and grooved floor boards; twelve pieces 4 ft. 6 in. long would be required for the bottom, using three of the pieces for nailing to the others like a ledge door. The sides should be about 6 inches wide and $1\frac{1}{4}$ inches thick. This sized box is large enough to hold material for about six small or four large posts which is quite enough for one man to handle at a time. It is important that the box should be as nearly watertight as possible, otherwise a lot of the cement is lost, by running away in the water that may leak out, resulting in weaker posts being made than was intended.

Only enough concrete to fill the moulds should be mixed at a time, as any left over will be wasted, so it would be advisable to find out how much will be required. In measuring the materials a household bucket or a kerosene tin could be used. To find out the quantity required fill the bucket or kerosene tin (whichever is to be used—do not use both), with gravel and count how much is required to fill the mould. The sand and cement must not be taken into account, only the gravel, as the cement and sand will only fill up the spaces between the stones.

Having ascertained the quantity of gravel required to fill the mould, calculate how much sand and cement will be required according to above proportions.

The posts should be moulded in a horizontal position, that is, the mould should be lying level on the ground.

In making the posts it is as well to adopt a plan and keep to it as there will be less risk of omitting anything than if they are made in a haphazard way. No. 8 fencing wire makes a good reinforcement and each post should have four wires placed about 1 inch from the outside. They should be bent at the ends to prevent them slipping in the post when it is under strain.

In making the posts, a good plan would be to first cut off sufficient wires 6 ft. 6 in. long, straighten them and bend each end over about 1 inch. [ ] Get the moulds ready, and care must be taken to have the top edges of the sides level. If they are placed in a sloping position and the concrete mixture is very soft, the cement will run to the lowest end or side and run away. Having got the moulds in a convenient position, not too far away from the mixing box (which also should be laid as nearly level as possible or the cement and water will drain away to the lowest side), measure the sand and put it in the mixing box. Next measure the cement and put it on the sand and mix both thoroughly by turning it over about three times in a dry state. The gravel should now be watered and afterwards measured and put in the mixing box with the mixed sand and cement, and the whole thoroughly mixed by turning it over about three times, dry. The mixture should now be watered from a watering can and turned over while being watered and until the whole is well mixed. Next place sufficient of the concrete in the mould to cover the bottom about 1 inch deep, and rake it up and down near the corners to work the concrete into the corners of the mould.

Now place in two of the reinforcing wires, keeping them about 1 inch from the sides. Put the round wooden pegs after greasing them through the holes in the side moulds, keeping the small ends all one way, and fill in the concrete to within $\frac{1}{2}$ inch of top mould. Now place in two more wires keeping them 1 inch in from the sides and fill in the mould level with the top; gently tamp the concrete till the mould is properly filled. If the end of the mould is lifted up a little and gently bumped on the ground two or three times the cement will become nicely level at the top.

Having mixed all the parts together *dry*, only sufficient to fill one mould should be wetted at a time and then the risk of the remainder setting before it can be got into the moulds will be avoided. If an ordinary household bucket is used to measure with, for $4\frac{3}{4}$ buckets of gravel, $2\frac{3}{4}$ of sand, and 1 of cement, about 4 gallons of water will be required, in addition to the water used previously for wetting the gravel.

The posts should not be moved in any way for three days; then the side moulds may be carefully removed and the post allowed to remain on the bottom board for about a fortnight, when it can be placed in as damp a place as possible and left for three months or longer before using. If the posts are watered daily for the first week or two they become much stronger than if allowed to dry straight away.

Staples made from No. 10 galvanized wire could be used, if preferred, instead of making holes in the posts. They may be inserted in the post after the mould is filled. Marks should be made on the side of the mould to show the positions and the staples should be pushed into place before the concrete begins to set.

Gate-posts should be made about 8 feet x 6 inches x 6 inches. The moulds could be similar to others, excepting that the sides would be parallel. The gudgeons for hanging the gates should be put in the post at the time of making or holes left in the post for them.

All tools used in making the posts should be washed directly after use, especially the bucket, as the cement will set on them and it will be next to impossible to remove it without spoiling the tools. The mixing box should be scraped out clean after use

A barrel of cement will make about 30 posts and with gravel and sand near at hand I think these posts could be made for about 8d. to 10d. each.

Concrete posts, if properly made, will give entire satisfaction and will last an indefinite time. They are used in a large number of places in preference to wood posts, for instance by such companies as the Great Eastern Railway Company and the London and North-Western Railway Company in England. By these companies they are considered to be cheaper than wood.

POTATO EXPERIMENTAL FIELDS, 1909-10.

G. Seymour, Potato Expert.

The experimental work for the past year embraces a continuation of the previous year's operations at Cheltenham. Fields were also established at the following centres:—

Centre.	Farm of—	Centre.	Farm of—
Broadford	.. Mr. A. Zwar.	Dean	.. Mr. I. Bousted.
Colac	.. Messrs. Rankin Bros.	Leongatha	.. Mr. Geo. Williams.
Daylesford	.. Mr. H. M. S. Cox.	Romsey	.. Messrs. Robb Bros.

The fields at Broadford, Colac, and Leongatha were primarily variety tests, whilst the plots at Daylesford, Dean, and Romsey were designed to test the relative value of artificial manure in the form of phosphoric acid, potash and nitrogen, when applied separately and in combination. Table A sets out the quantities of the various dressings applied. The plot was 1 acre in extent; each section was therefore one-seventh of an acre.

TABLE A.—MANURIAL DRESSINGS.

A.	B.	C.	D.	E.	F.	G.
2 cwt. Superphosphate.	1 cwt. Sulphate of Ammonia.	1 cwt. Sulphate of Potash.	No Manure.	2 cwt. Superphosphate, 1 cwt. Sulphate of Ammonia.	2 cwt. Superphosphate, 1 cwt. Sulphate of Potash.	2 cwt. Superphosphate, 1 cwt. Sulphate of Ammonia 1 cwt. Sulphate of Potash.

An effort was also made to discover what influence pasture has on soil fertility and what assistance it renders, if any, to artificial manures on volcanic soils.

The seed was supplied by the farmers, and was grown the previous year on the farms where the experiments were carried out. The soil in each instance was alike—chocolate volcanic—and typical of the best potato lands in the district. The plots were selected with due regard to the system of rotation followed in each case.

The Daylesford field, which had been under pasture of English grass and clover for eight years, was ploughed up in the early spring and tilled for the potato crop.

At Dean, the previous crop was wheat following four years' pasture under grass and clover.

The field at Romsey had been under cultivation for over 50 years continuously, without pasture, and practically without the addition of manure of any kind. The operations on this field may be divided into three periods, the first extending from 1859 to 1869 during which the crops were potatoes and cereals; the second from 1870 to 1899; the third from 1900 to date. At the commencement of the second period the Dun field pea was introduced; it then became a rotation of potatoes, cereals, and legumes. Since 1899 the pea crop has proved a comparative failure, so much so that on many farms their cultivation has been abandoned. Accompanying the discontinuance of peas in the rotation has been the failure of the Brown's River and similar varieties of potatoes to yield a profitable crop.

The experiments on the three fields under review are designed to throw some light on the causes leading up to the failure of two of the staple crops. Answers are sought to the following questions:—

1. What influence has pasture on the renovation of these soils?
2. What part can artificial manures play in restoring their fertility?
3. Is their action favourably influenced by pasture in the rotation?

With regard to the failure of the pea crops the answer by some is, "want of rain." Doubtless, with abundant seasonable rains, the crops would be much better than they are. In the case of potatoes, the light yields of Brown's River and other old varieties are ascribed to deterioration or running out, brought about by continuous production by the vegetative method. But careful experiment and observation go to prove that it lies more with the condition of the soil than the seed as the following experiments will show.

In 1902, a parcel of Brown's River seed, which had been grown continuously for over twenty years, on the same farm, was divided into three lots. No. 1 was planted in a field which had been cropped for 40 years without manure, No. 2 was planted on part of a well-manured field, and No. 3 on a plot which had been under grass for upwards of twenty years. All the sections were prepared in the same manner. The returns were as follow:—

Plot.	Yield.
No. 1	3 tons per acre.
No. 2	4 tons per acre.
No. 3	10 tons per acre.

A further test was carried out in 1907 by sending a parcel of seed to Tasmania, where it gave a yield of 13 tons 18 cwt. per acre, whilst that planted on the farm where it had been grown for over twenty years returned only 3 tons.

Pasture Rotation.

If satisfactory yields are to be obtained and a payable crop assured in adverse seasons, it can only be done by adopting a proper system of rotation embracing pasture. Professor Storer, in his work *Agriculture in some of its relations with Chemistry*, when dealing with this subject says:—

> It may be conceived that, as population and the consequent demand for grain increased, the pastures in fertile districts were gradually ploughed up and converted into arable lands, and that, as a consequence, comparatively few cattle could be supported. Hence, so little manure was obtained that the crops suffered; the land was after a while run out, and emigration was necessary. But, on being left to itself, the land reverted to the state of pasture. Cattle were again kept, and dung was again produced. To maintain the cattle, the significance of which as producers of dung and flesh was now apparent, regular fields of sown grass were established.

The rotation of crops is acknowledged to be the fundamental principle underlying the maintenance of soil fertility and the renovation of exhausted lands. The continuous growth of any one crop, especially cereals, has a very exhausting effect on the most fertile soils and has produced the same results in every country, including the rich volcanic soils of this State. In the pioneering days the practice was, in these areas, to plant potatoes under virgin soil, followed by wheat and oats alternatively, until there was no more virgin land to break up. Then followed potatoes in fallow. This course ultimately reduced the yields of grain and potatoes to such a degree that many of the best farms were regarded as worn out.

Then came a change in the rotation by the introduction of the field pea. Heavy yields of these were obtained and the benefit to the land was evident in the heavy crops that followed. The following rotation became established:—1. potatoes; 2. barley; 3. peas; 4. wheat or oats for hay, frequently followed by a crop of peas for green manure. This system obtained on the volcanic soils along the Dividing Range from Mt. Buninyong in the west to Mt. William, east of Lancefield. The satisfactory yields were no doubt due to the legumes, but this rotation ultimately broke down as a period was reached when the pea crop was abandoned on most of the farms. Since then, the returns from the potato crop have been very unsatisfactory. That these decreased yields are not due to the lack of plant food, is proved by the analyses of the soils of the three fields set out in Tables B and C. These show that even the lowest average may be considered a good agricultural soil.

The soil and subsoil of each plot were analyzed. Table B shows the chemical analysis and Table C the mechanical analysis.

TABLE B.—CHEMICAL ANALYSIS.

—	Daylesford.		Dean.		Romsey.	
	Parts per 100,000.		Parts per 100,000.		Parts per 100,000.	
	Soil.	Subsoil.	Soil.	Subsoil.	Soil.	Subsoil.
Nitrogen	372	291	318	176	198	123
Phosphoric Acid	454	480	297	233	259	209
Potash	253	197	175	127	145	112
Lime	500	470	450	184	320	260
Chlorine	5	2	7	2	2	2
	Available in 1 per cent. Citric Acid.					
Phosphoric Acid	78	66	28	9	38	19
Potash	39	25	31	17	16	12

TABLE C.—MECHANICAL ANALYSIS.

—	Daylesford.		Dean.		Romsey.	
	Parts per 100,000.		Parts per 100,000.		Parts per 100,000.	
	Soil.	Subsoil.	Soil.	Subsoil.	Soil.	Subsoil.
	%	%	%	%	%	%
Moisture	5.03	5.01	4.18	4.49	2.26	2.35
Loss on Ignition	11.70	14.77	14.63	11.34	7.46	5.98
Fine Gravel	.80	.58	.14	.49	.16	.25
Coarse Sand	3.19	2.37	2.17	1.63	1.71	1.56
Medium Sand	1.48	1.16	1.42	.97	1.33	1.52
Fine Sand	3.31	4.44	3.48	2.55	3.49	3.90
Very Fine Sand	13.39	11.79	17.52	12.42	16.24	11.08
Silt	10.06	11.07	7.62	7.18	12.20	15.88
Fine Silt	25.29	23.86	28.04	20.96	31.95	28.91
Clay	25.73	24.90	20.23	37.89	23.14	28.45

It must not be thought that the failure of crops and shortage in yields are entirely due to the system of farming practised in these districts. A survey of the register of the rainfall (Table D) during the growing period of the potato crop and embracing the most critical period of the pea crop shows that 1909-10 was abnormally dry.

Table D.—Rainfall, 1909–10.

	Daylesford.	Dean.	Romsey.
	Points.	Points.	Points.
1909—			
November	..	1.26	.44
December	..	.83	1.25
1910—			
January	..	1.14	1.07
February	..	.44	.16
March	..	4.10	2.94
April	..	.84	.67
	9.35	8.61	6.53

In connexion with the above it should be pointed out that the January and March rains were each followed by very hot weather, accompanied by drying winds; also that a heavy fall of rain often does more harm than good, especially when the precipitation is of only a few hours duration. Had the total February and March falls been divided into two equal amounts, spread over a week in each instance, more benefit would have resulted. However, there is every reason to believe that had a system of rotation embracing potatoes, cereals, legumes, and pasture been adopted for the last 30 years on all these plots it would have made all the difference in adverse seasons between a profit, though perhaps a small one, and an absolute loss.

By a glance at the chemical analysis, given in Table B, of the three soils under review, it will be noted that they are all of fairly high standard, Romsey showing the lowest, especially in nitrogen, lime, and chlorine. It must be borne in mind that the mechanical condition of a soil has an important bearing on its fertility and that the above condition is promoted by agencies altogether apart from the amount of tillage the land receives. It is a well-known fact that these soils, when brought to a fine tilth, are by a heavy fall of rain converted into a brick-like mass. So compact is this, when dry, that the air is excluded. Consequently, the action of bacteria in the soil, which play such an important part in the formation of nitrogen, is diminished or destroyed altogether. And probably the exclusion of oxygen from the soil may favour the development of organisms destructive of, or injurious to, plant life.

Common salt or, better still, lime, has the effect of flocculating such a soil and, in a measure, preventing it caking, but the most important factor is the amount of organic matter which it contains. The soil most abundantly supplied with this is the one that absorbs, and retains the greatest amount of moisture. This fact is shown in a most striking manner by the mechanical analyses of the soils of the fields under review (Table C). Those having the greatest loss on ignition have the highest percentage of moisture. It has been demonstrated by experiment that the soils which are abundantly supplied with phosphoric acid, potash, and all the mineral constituents are not benefited to any extent by the application of these forms of manure, whereas if they are liberally dressed with farmyard manure, results are obtained far beyond what a similar amount of plant food supplied by artificials would give. A glance at Table C will show that the insoluble silicates and sand of plots 1 and 2 are almost the same, whilst plot 3 contains upwards of 10 per cent. more. The difference is accounted for by the lower percentage of moisture and organic matter in the latter, and these, coupled with the proper aeration of the soil, are the controlling factors in its fertility.

The percentages of loss on ignition and moisture represent the amount contained in 100 lbs. of the soil in an air dry condition, and shows its power to retain the moisture it has received. The difference in moisture content between 4.16 in plot No. 2 and 2.30 in plot No. 3 does not appear very great, but it represents nearly double the amount and is still more striking when shown in lbs. per surface foot per acre. The same applies to the organic matter. This difference is still more striking when plots 2 and 3 are compared with No. 1.

The relative position of these fields as regards moisture, organic matter, and yield is shown in Table E :—

TABLE E.—MOISTURE CONTENTS.

—	Plot 1. 8 Years' Pasture.	Plot 2. 4 Years' Pasture.	Plot 3. No Pasture.
Moisture	5·02 per cent.	4·16 per cent.	2·30 per cent.
Weight of water per acre in surface foot ..	206,800 lbs.	166,400 lbs.	92,000 lbs.
Loss on ignition	13·23 per cent.	13·03 per cent.	6·62 per cent.
Average yield per acre	4 tons 18 cwt.	4 tons 6 cwt.	3 tons 3 cwt.

There is no doubt that, if plot 3 had received the same treatment as No. 1 and No. 2, it would have shown a higher percentage of organic matter, with a correspondingly higher percentage of moisture and a heavier yield.

EXPERIMENTS WITH ARTIFICIAL MANURES.

TABLE F.—MANURES AND YIELDS.

Section.	Manures.				Yields.		
	Manure used.	Weight.	Cost.		Daylesford.	Dean.	Romsey.
		cwt.	s.	d.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.
A.	Superphosphate	2	8	9	5 2 0 7	4 14 2 0	3 0 2 24
B	Sulphate of Ammonia	1	15	0	4 1 1 24	4 9 1 0	3 7 0 5
C	Sulphate of Potash	1	13	7½	5 2 0 10	4 3 0 14	2 17 3 26
D	No Manure	..	..		3 11 0 6	4 4 3 14	3 3 1 21
E	Superphosphate	2	23	9	5 12 2 26	4 7 2 0	3 11 1 24
	Sulphate of Ammonia	1					
F	Superphosphate	2	22	7½	5 13 1 21	4 1 1 14	3 13 0 16
	Sulphate of Potash	1					
G	Superphosphate	2					
	Sulphate of Ammonia	1	37	7½	5 1 0 7	4 4 0 0	3 11 1 24
	Sulphate of Potash	1					

Turning to the effect of the different manure dressings on the three plots it will be evident that the one containing the highest percentage of phosphoric matter responded most evenly to the manures. Section 1 of plot No. 1 shows an increase of 1 ton 11 cwt. per acre for a dressing of 2 cwt. superphosphate, and section 2 only of 10 cwt. per 1 cwt. sulphate of ammonia. It was noted during the growing period that this section had a more luxuriant growth of foliage, and these tender plants evidently gave way under the influence of a prolonged dry spell. In connexion with section 3, 1 cwt. sulphate of potash gave the most satisfactory returns obtained during five years. This may be attributable to the character of the soil, its high percentage of moisture and the presence of a larger amount of lime than is generally met with in these soils. Section 5 has the same dressing as No. 2 with 2 cwt. of superphosphate added, and gives a yield of 10 cwt. per acre more than that section. This would indicate the necessity of combining phosphoric acid with the ammonia salt, so that the growth of the tubers may proceed concurrently with the improved growth of the plant. It is a well known fact among potato-growers that liberal dressings of nitrogenous manure often produce a heavy crop of tops with a light yield of tubers—this is evidently what happened on section No. 2.

The results obtained on section 6 show the advantage of combining phosphoric acid with potash. In this instance, it resulted in an increase of over 11 cwt. of tubers per acre. Section 7, which received a dressing of the complete manure—phosphoric acid, potash, and sulphate of ammonia—gave a lower yield than sections 1, 3, 5, and 6. This section was remarkable during the early growing period for the rich growth of the plants and gave promise of a heavy yield. This was not realized. The section was on a slight depression which ran across the field and the crop was cut by frost in the middle of tubering which accounts for the light yield.

The results from plots 2 and 3 are in some respects similar, as sections B and E show an increase and C a decrease. The outstanding difference is the heavier yield on all sections in plot 2, showing the benefit of pasture in the rotation. It will be noted that section B, dressed with sulphate of ammonia in these two plots, gave 5 cwt. in plot No. 2 and nearly 4 cwt. in plot No. 3. Section E, with the addition of 2 cwt. of superphosphate, shows a very slight increase, plot No. 2, 2 cwt. 3 qrs.; and plot No. 3, 8 cwt. With reference to the potash dressing on section C, both plots show a decrease. In the case of plot No. 2 it amounts to 3 cwt. 3 qrs., and plot No. 3, 5 cwt. 1 qr., thus showing that these plots are in accord in sections B, C, and E. The most striking difference in the two fields occurs in section A. Plot No. 2 shows an increase of nearly half-a-ton to the acre, and plot 3 a decrease of nearly 3 cwt. This difference is, no doubt, due to some favourable condition of the soil not present in the other sections, and might have been produced by the presence of organic matter, the result of refuse left after threshing. Mr. Bousted states that such was not the case.

At the commencement it was pointed out that the rotation on two of these plots was similar, inasmuch as they had both been under pasture for varying periods; the other, No. 3, was given for a period of 50 years. The operations on this plot may be described as a continuous drain on the soil's fertility, everything out and nothing back. The only period when renovation of the soil was attempted was that devoted to peas. Complaints are sometimes heard from growers that yields of potatoes are not greatly benefited by pasture. They forget that continuous cultivation has depleted the land of its store of organic matter, making it physically unfit to produce a satisfactory crop. "One swallow does not make a summer." One term under pasture is only the first step in the direction of improvement, and cannot be expected to restore the soil to anything approaching its virgin condition. If much benefit is to be obtained from pasture in the rotation, it must be followed systematically.

The following conclusions may be drawn from the foregoing:—

1. That a proper system of rotation must embrace pasture, resulting in more stock on the land and the consumption of more of the produce on the farm.

2. That pasture improves the mechanical and physical condition of the soil, making it more friable, enabling it to absorb more of the rainfall, and making it more retentive of moisture.
3. That it improves the fertility of the soil chemically by increasing the amount of available plant food contained in it.
4. That artificial manures will improve the yields on chocolate volcanic soils, when supplied with sufficient moisture.
5. That the action of artificial manures depends upon the rainfall and is favourably influenced by a large supply of organic matter in the soil.

A Suggested Rotation.

It may not be out of place to give an outline of a definite system of rotation to comply with the practice suggested. It will be noted that the accompanying table is for a four years' pasture course which will require ten fields. Of these Nos. 2, 3, 4 and 5 are under grass, No. 1 is just broken up from sod and sown with oats, No. 6 has potatoes after oats, No. 7 barley after potatoes, No. 8 peas after barley, No. 9 potatoes after peas, and No. 10 barley or oats after potatoes, then under grass. It should be mentioned that wheat or oats will do equally as well as barley if the district is not suited to that crop.

Should the four years' course be too long for the pasture three years may be adopted. The fields may then be reduced to eight, which would give three-eighths under grass, and one-eighth each under oats, potatoes, barley, peas, and wheat. It will be noted that the first crop after grass is oats or other straw crop. This prepares the soil and fits it for the potato crop, which should not be planted on sod land, because if scab or eel-worm is present in the soil their ravages are always greatest in sod land.

Table G.—Plan of Rotation.

1.	2.	3.	4.	5.
Oats.	Pasture 4th year	Pasture 3rd year	Pasture 2nd year	Pasture 1st year
		Scheme No. 2 (3 Years' Pasture).		
	Oats	Pasture 3rd year	Pasture 2nd year	Pasture 1st year
6.	7.	8.	9.	10.
Potatoes	Barley	Peas	Potatoes	Barley
		Scheme No. 2.		
	Potatoes	Barley	Peas	Wheat or Oats

Cheltenham (Mr. J. Wedd's Plot.)

The work of planting this plot was delayed three weeks owing to wet weather. The first section, composed of four drills each of Carman, Clarke's Main Crop, and Up-to-Date, was planted on 26th July, the soil temperature at 3 p.m. being 46 and the atmosphere 53. The second section was planted 14th September; soil temperature at 3 p.m. was 57, atmosphere 63. The germination of the seed was satisfactory. A test of cut *versus* whole seed was carried out with two varieties, viz., Up-to-Date and Clarke's Main Crop. A section of the plot was sprayed with copper soda solution. The manure dressings were the same as last year, viz., eight lorry loads of dung per acre over the whole plot, with the following artificial manures:—

Section No. 1—Bonedust and superphosphate, equal parts, 6 cwt. per acre.
Section No. 2.—Bonedust and superphosphate, 6 cwt.; sulphate of potash, 1 cwt. per acre.

Section No. 3.—Bonedust and superphosphate, 6 cwt.; sulphate of ammonia, 1 cwt. per acre.
Section No. 4.—No artificial manure.
Section No. 5.—Bonedust and superphosphate, 6 cwt.; sulphate of potash, 1 cwt.; sulphate of ammonia, 1 cwt.

All the manurial tests were carried out with one variety of potatoes—Up-to-Date. The seed was grown on the same plot the season before. The most satisfactory results were obtained from the dressing of bonedust and superphosphate on section No. 1, which gave 7 tons 2 cwt. per acre. In order to test this a section in another part of the field on similar land with the same dressing gave 8 tons 12 cwt. per acre. The section with dung only returned 5 tons 5 cwt. In section 2, with the addition of 1 cwt. sulphate of potash, the yield was 17 cwt. per acre less than section 1 in section 3. An addition of 1 cwt. sulphate of ammonia further reduced the yield by 11 cwt. per acre. The lowest yield was from the complete manure on plot No. 5 6 tons per acre.

TABLE II.—SPROUTED *versus* UNSPROUTED SEED.

Variety.	Early Crop.	Late Crop.
	t. c. qr.	t. c. qr.
Up-to-Date	4 14 3	7 2 0
Clarke's Main Crop	4 19 0	6 18 0
Carman	8 2 0	6 0 0

Variety.	Unsprouted.	Sprouted.	Increased Yield.	Decrease.
	t. c. qr.	t. c. qr.	t. c. qr.	t. c. qr.
Up-to-Date	4 14 3	7 2 0	2 6 1	..
Clarke's Main Crop ..	4 19 0	6 18 0	2 1 0	..
Carman	8 2 0	6 0 0	..	2 2 0

The season for the early crop was the most favourable experienced for several years. There was no frost during the growing period sufficiently heavy to cut down the plants of the early crop, whereas in 1908-9 they were cut down twice with the result that the sprouted seed gave a very heavy increase, amounting in some varieties to 5 tons per acre. Owing to the mild season and favourable growing weather during 1909-10, the increase was only a little over 2 tons per acre. In one instance Carman sprouted gave a lower return than the unsprouted by over 2 tons per acre. This was due to some form of disease attacking this variety. It was first noticed on 24th November, 1909, and every effort was made to discover the cause. Specimens from the plot were taken to Mr. McAlpine, Vegetable Pathologist, and his assistant, Mr. Brittlebank, visited the plot and obtained plants and tubers, but no disease was found in either that would account for the falling off. It should be stated that up to the time the plants were attacked this variety promised a very heavy yield—anything up to 10 tons per acre.

The above results compare very favourably with those obtained in similar experiments in Great Britain, and go to prove that it will pay to box seed at all times.

Spraying.—The spraying did not have any appreciable effect on the yield. The only noticeable feature was that the sprayed plants kept green longer than the unsprayed.

Cut versus Whole Seed.—As stated above a test was carried out with two varieties, Up-to-Date and Clarke's Main Crop being selected:—

TABLE I.—CUT *versus* WHOLE SEED.

Variety.	Cut Seed.	Whole Seed.	Difference in favour of Cut Seed.
	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.
Up-to-Date	5 12 2 0	6 16 0 4	1 3 2 4
Percentage	17·9 per cent.	22·2 per cent.	4·3 per cent.
Clarke's Main Crop	5 0 2 24	6 18 0 24	1 17 2 0
Percentage, small	13 per cent.	30 per cent.	17 per cent.

In the above test a few sets missed in the cut only, but not sufficient to make any appreciable difference on the yield, whilst in the whole sets there were practically no misses. The most noticeable feature was the large proportion of small tubers unsuitable for market in the whole set section.

TABLE J.—PROPORTION OF SMALL.

	Cut Seed.	Whole Seed.
Up-to-Date	17·9 per cent.	22·2 per cent.
Clarke's Main Crop	13 per cent.	30 per cent.

The above returns correspond with previous experiments.

Varieties.—The following varieties were used in the plot:—Carman, Up-to-Date, Clarke's Main Crop, Sutton's Abundance, and Bismarck. None of the foregoing can be considered early when compared with Early Rose, or Beauty of Hebron. An effort has been made to discover a good yielding extra early potato and to that end five varieties, which in previous plots in other districts had given promise of meeting the above requirements, were tried. They are as follow:—

May Queen.—A true kidney variety, white skin and flesh. In Great Britain this has proved a prolific early cropper. The yield, considering the seed used, may be regarded as satisfactory, viz., $4\frac{1}{2}$ tons per acre. They matured very rapidly and were fit to market in cases by 18th November, or nine weeks and three days after planting.

Thorburn.—An American variety resembling Beauty of Hebron in many respects. Skin white, with a blush of pink; rather deeper in the eyes than the Beauty; flesh white and finer in texture than May Queen. This variety also matured in nine weeks and three days.

Uncle Sam.—Also an American variety. Pink skin, resembling Early Vermont; good flavour; flesh white, of very fine texture. Yield rather light in field plots, but very satisfactory results from garden culture.

Noroton Beauty.—An American variety resembling New Zealand Pink-eye. A little later than the other varieties. Only a medium cropper.

LEONGATHA PLOTS (MR. G. WILLIAMS').

This plot was primarily a variety test, although manures were applied. It must be stated that the manure dressings were all round heavier than was intended through an error in laying out the plot, which was situated on a grey soil flat. The results indicate that heavier dressings of manure are required on such a soil. The 1908-9 plot at Mr. Gooch's farm was on a chocolate soil on a hillside. A minimum and a maximum dressing of phosphoric acid was supplied by a dressing of 2 cwt. on section A and 4 cwt. on section B. In this case it was found that the most satisfactory returns were obtained from the lightest dressing, whilst in this season's plot the dressing of 270 lbs. of superphosphate on section A gave a return of 4 tons 8 cwt., and the heavier dressing, 540 lbs., on section B was 5 tons 2 cwt., equal to a gain of 8 cwt. of potatoes per acre, or 1.18 cwt. per acre over the unmanured section. These results show that the red and the grey soils require different treatment in manuring, or that the grey loamy soils are more retentive of moisture, and consequently artificial manures give a better return than on the red soils, which are so liable to dry out unless abundantly supplied by rain.

The manure dressings on this plot were as follows:—

Section A.—270 lbs. superphosphate cost 10s. 6d. per acre.
,, B.—540 lbs. superphosphate cost 21s. per acre.
,, C.—No manure.
,, D.—270 lbs. superphosphate, 135 lbs. sulphate of ammonia } cost 28s. 6d.
,, E.—270 lbs. superphosphate, 135 lbs. sulphate of potash } cost 27s. 1d.

From the following table, giving the yields on sections D and E, it is apparent that this soil has already sufficient nitrogen and potash and that the only form of plant food required is phosphoric acid:—

TABLE K.—RETURNS OF LEONGATHA PLOT.

—	A.		B.		C.		D.		E.	
Manure dressings	2 cwt. Super.		4 cwt. Super.		No manure.		2 cwt. Super; 1 cwt. Sulp. Am.		2 cwt. Super.; 1 cwt. Pot Sulp.	
Cost of do.	8s. 9d.		17s. 6d.		..		23s. 9d.		22s. 7½d.	
—	Tons.		Tons.		Tons.		Tons.		Tons.	
Carman No. 1	2·6	·6	2·1	·6	1·3	·4	2·2	·5	1·4	·4
Brownell's Beauty ..	5·4	1·6	4·0	1·2	3·9	1·2	4·5	1·3	4·7	·9
Fox's Seedling ..	4·3	1·8	3·0	2·1	2·3	1·8	3·6	1·9	3·3	1·7
Carman No. 3	5·5	·8	5·6	1·0	3·9	·8	5·1	·7	5·5	·6
Scotch Grey	4·1	2·5	2·3	2·8	2·6	1·7	3·1	2·6	2·4	1·9
New Zealand Pinkeye ..	3·6	·6	4·3	·7	1·9	·9	3·2	·8	3·4	·9
Bruce	4·8	2·4	5·7	1·8	3·9	1·5	3·4	1·8	3·6	2·1
Adirondak	5·8	1·5	7·6	1·5	5·6	·9	6·3	·9	5·1	1·1
Up-to-Date	6·6	2·5	8·9	1·3	5·1	1·6	4·7	2·0	6·3	2·3
State of Maine.. ..	5·6	1·6	5·4	1·1	3·4	·8	5·8	·8	4·0	·7
Green Mountain ..	7·1	1·3	7·9	1·6	6·2	1·6	7·1	2·1	5·8	2·1
Vanguard	1·0	1·1	1·8	1·2	0·5	1·2	2·5	1·3	1·5	1·5
Vermont	7·1	1·3	7·2	·8	3·6	·7	5·5	1·9	4·4	·8
Delaware	4·1	2·1	4·4	2·1	3·1	2·4	3·0	1·5	3·7	1·3
	4·8	1·5	5·2	1·4	3·3	1·2	4·2	1·4	3·9	1·3

Varieties.—The plot contained the usual early and main crop varieties. The earliest among the former is Vanguard, very similar to Early Rose. It is a very small plant, fine quality, but a poor cropper, doing best in garden culture. One peculiarity of this variety in this plot is its response to manure. Whilst most of the other varieties derived little if any benefit from the addition of nitrogen to the dressing of phosphoric acid, this variety was more than doubled. This was no doubt due to the fact that the production of tubers took place early in the spring when the soil contained abundant moisture and may in a measure explain the reason why the nitrogenous manure does not give more satisfactory results on main crop and late varieties. It always has a marked influence on the growth of the plant and foliage, which is not always reflected in the crop of tubers.

The following varieties gave the most satisfactory returns, the heaviest yields for each being as follows:—

	tons.	cwt.		tons.	cwt.
Adirondak	7	12	Green Mountain ...	7	18
Brownell's Beauty ...	5	8	State of Maine ...	5	16
Carman No. 3 ...	5	12	Up-to-Date	8	18

Adirondak is identical with the variety grown under the name of Excelsior. It is a medium early, produces very few small tubers, is a good keeper and very suitable for export.

Brownell's Beauty is also an early variety, good quality, and is deserving of more attention than it receives for early crop. In connexion with this variety it may be stated that one or two late maturing varieties are often supplied in error for Brownell's Beauty, with the result that growers are disappointed with the crop and give the potato a bad name.

The heaviest return from all sections was obtained from Green Mountain, a white potato very similar in appearance to Carman. This variety has proved itself a consistent cropper in every test and in a great variety of soils. In comparison with potatoes of the Up-to-Date type it has many points to recommend it. It is whiter in the flesh, finer in texture, does not produce so many small tubers, and is not so liable to second growth.

Broadford Plot (Mr. A. Zwar's).

This plot was planted on 29th October, 1909. The soil was volcanic of rather clayey nature.

The seed was not in good condition at the time of planting owing to having sprouted and receiving a check. This resulted in a large number of misses, averaging in some sections 50 per cent. The calculations of yields are based upon the number of plants per acre.

Table L.—Returns of Broadford Plot.

Sections	A.		B.		C.		D.		E.	
Manures	2 cwt. superphosphate		4 cwt. superphosphate		No Manure		2 cwt. superphosphate, 1 cwt. sulphate of ammonia		2 cwt. superphosphate, 1 cwt. sulphate of potash	
Cost	8s. 9d.		17s. 6d		..		23s. 9d.		22s. 7½d.	
Variety.	M.	U.	M.	U.	M.	U.	M.	U.	M.	U.
New Zealand Pinkeye ..	4·5	·3	3·9	·3	5·4	·4	6·5	·6	5·8	·4
Sutton's Abundance ..	7·5	·5	3·6	·4	4·6	·2	6·5	·7	2·7	·4
Black Prince	4·6	·8	3·7	·3	3·8	·4	4·2	·7	4·4	·7
Brown's River	4·7	·8	5·6	1·1	5·0	1·4	6·5	1·1	5·6	1·2
New Zealand Pinkeye, No. 2	4·6	·3	4·8	·3	4·2	·4	6·3	·3	6·4	·8
Up-to-Date	7·5	·5	5·4	·4	4·4	·4	7·2	·3	4·1	·3
	5·5	·5	4·5	·4	4·5	·5	6·2	·6	4·8	·6

As far as the manures are concerned on this plot it is apparent that the minimum dressing of phosphoric acid was ample. It resulted in an increase of 1 ton of marketable tubers per acre for a cost of 8s. 9d., whilst the maximum quantity, 4 cwt., costing 17s. 6d. per acre, did not increase the yield at all. The tubers on section A were a more even run with very little second growth, those on B were prongy, showing that the heavier dressing forced the growth of the crop in the early stages of the plants and caused second growth when the rain came in March.

The heaviest yield is on section D, showing the effect of a dressing of 1 cwt. sulphate of ammonia, 6 tons 2 cwt., being an increase of 14 cwt. per acre. There is no doubt that the action of sulphate of ammonia is due in a measure to the presence of a large amount of organic matter in the soil. With reference to section E the action of sulphate of potash was not so satisfactory, the increase over the unmanured section only amounting to 6 cwt., being 14 cwt. less than section A dressed with phosphoric acid.

New Zealand Pinkeye No. 2 in this plot was a continuation of the experiment for the improvement of the type of that variety.

Table M.—Improvement of Type of New Zealand Pinkeye.

Type Planted.	Full Crowns.	Deep Crowns.
Full Crown	80 per cent.	20 per cent.
Deep Crown	60 per cent.	40 per cent.

The above results show that all that can be claimed for selection is that the percentage of objectionable tubers can be kept down, but not eliminated altogether.

Colac Plot (Messrs. Rankin Bros.).

This plot was simply a variety test. The soil was rich virgin volcanic land. No manures were used. The following varieties were planted on 3rd and 4th November: Black Prince, Brown's River, New Zealand Pinkeye, Scotch Grey, Sutton's Abundance, and Up-to-Date. The season proved unfavourable for crops planted at that period. The most satisfactory yield was obtained from New Zealand Pinkeye—5 tons, 7 cwt. 1 qr. per acre.

Table N.—Returns of Colac Plot.

Name of Variety.	Marketable.			Unmarketable.			Percentage Small
	t.	c.	q.	t.	c.	q.	
Black Prince	3	4	2	0	17	3	21·7
Brown's River	3	1	2	1	10	3	41·6
New Zealand Pinkeye	5	7	1	0	19	0	15·0
Scotch Grey	1	5	3	2	0	0	61·5
Sutton's Abundance	3	13	2	1	10	0	28·1
Up-to-Date	4	2	2	2	10	0	37·8

Included in the above plot were six new varieties raised by Mr. P. J. Ryan, of Millbrook, whose efforts in the matter of raising new varieties have been in the direction of producing an export variety of heavy cropping capacity combined with quality. In this he has met with an encouraging measure of success with two of these varieties, viz., Norfolk and Wellington, produced by crossing New Zealand Pinkeye and Brown's River varieties.

Norfolk is practically a coloured New Zealand Pinkeye in type of tuber, colour, and texture of flesh. St. Albans proved a decidedly early variety, producing nice even tubers flattish oval in shape. Bedford is also a medium early very vigorous plant, producing a fine bold sample of tubers. The germination was satisfactory in all but one variety, viz., St. Albans. This, being an early variety, was a little wasted by sprouting. Notwithstanding the dry season the results may be considered very satisfactory when compared with such varieties as Brown's River, Up-to-Date, and New Zealand Pinkeye.

TABLE O.—RETURNS OF MR. P. J. RYAN'S NEW VARIETIES.

Variety.	Germination.	Total Yield.	Percentage of Small.
		t. c. qr. lb.	
St. Albans ..	54·3 per cent. ..	4 10 0 0	8·3 per cent.
Bedford	93·7 per cent. ..	6 12 0 0	9·2 per cent.
Wellington ..	81·3 per cent. ..	7 2 0 0	8·8 per cent.
Norfolk	93·9 per cent. ..	6 3 0 0	14·7 per cent.
Sussex	97·2 per cent. ..	6 1 0 0	16·6 per cent.
Marlborough ..	95·8 per cent. ..	5 18 2 0	13 per cent.

PROSPECTS OF THE COMING FRUIT CROP.

P. J. Carmody, Chief Inspector of Orchards.

To enable growers to obtain some idea of the fruit prospects of the coming season as early as possible I have asked the inspectors of the different fruit districts to supply me with a forecast of the crop as far as they were in a position to do so. Unfortunately, to be in time for publication in the *Journal* for November, we are obliged to make our estimate somewhat early and cannot predict with any degree of certainty the coming fruit yield.

A noticeable feature of the blooming period was the excessive irregularity of the opening of the fruit buds among many varieties, owing, no doubt, to the genial warm weather experienced throughout August and September succeeded by cold wintry weather at the time of opening. According to experienced growers, this irregularity indicates a poor setting of fruit and many are somewhat anxious as to the prospects at the present time. Unquestionably, growers do not pay sufficient attention to thinning out of fruit spurs at the time of pruning with the result that innumerable weak spurs are allowed to remain and take up the nourishment that should be concentrated in the more vigorous and fruitful ones, and thereby assuring a more regular fruiting habit in the trees.

Subjoined are the reports of the inspectors of the different fruit districts:—

BENDIGO DISTRICT.

Inspector Cock reports:—

Apples.—Heavy.
Pears.—Heavy.
Plums.—Good.
Peaches.—Fair.
Apricots.—Very light.
Cherries.—Early, fair; late, good.
Tomatoes.—Good promise. There has been but slight frost and the planting is very large.

DIAMOND CREEK DISTRICT.

Inspector Wallis reports:—

Apples.—Heavy blossom.
Pears.—Heavy setting so far.
Plums.—Heavy.
Peaches.—Early, medium; late, heavy.
Cherries.—Heavy.
Quinces.—Heavy.
Apricots.—Medium.

Doncaster District.

Inspector Hammond reports:—

Apples.—The leading varieties have not yet set their fruit. Jonathans will have only a medium crop. Young trees which appeared to have a good show of fruit buds are breaking away into leaf.

The Five Crown and Rome Beauty are just coming into bloom. On present appearances they should set a good crop providing the blossom is not injured by the thrip.

The Yates and Pomme de Neige are, like the Jonathan, not blooming as well as was expected. They are, however, much better than the Jonathan and should set a good crop.

The Duchess d'Oldenberg is conspicuous for its heavy bloom and promises a heavy crop.

All other varieties promise well and will in my opinion set a good crop.

Pears.—Keiffer's Hybrid bloomed very heavily as usual, and a fair crop has set. There is a marked difference when this variety is grown contiguous to other varieties blooming about the same time. When this is the case, heavy and regular crops are obtained. The Howell bloomed heavily, but I am afraid the crop will be light. Gansell's Bergamot and Winter Nelis also bloomed heavily, but they will have light crops.

The Black Achan, Napoleon, Broom Park, Doyenné Bossoch, Beurré Capiaumont, Beurré Clairgeau, and Swan's Orange all promise a good crop, and above the average.

The Josephine de Malines has a light crop, as is usual. In some orchards the trees are particularly shy, whilst in others there is a medium crop.

The blossoms of the Williams' Bon Chrêtien are rather small and delicate looking, but I think there will be a good crop.

There is plenty of blossom, but the fruit is just beginning to set. Taken altogether, the pear crop promises to be good and above the average.

Plums.—Early in the season the plum crop promised to be a record one but the recent spell of unseasonable weather has made matters in this connexion uncertain.

With the late blooming varieties it is yet too early to judge as to the probabilities of setting, but I think there will be a good average crop, and much better than last season.

The Black Diamond, Jefferson, and Angelina Burdett have set a good crop in most of the orchards visited. The Early Orleans, which is an alternate year bearer, has a good heavy crop in some orchards and a poor one in others.

Late Red, Reine Claude, Golden Gage, and Green Gage all have a fair crop. In some cases a very heavy crop has set, but the non-setting fruits in a large number of varieties have not yet begun to wither and fall, and, until this happens, it is uncertain what the crop will be. The prospects, however, are good.

Cherries.—The fact of the cherries hanging to their bloom for a considerably longer time than usual caused anxiety as to the setting of the fruit. The irregularity of blooming was also a matter of concern. I think, however, that a good crop is assured.

Early Purple Guigne is heavier than usual, as also is the Black (de Mezel) Bigarreau—both shy varieties. Burgdorf's Seedling is also good. Bedfords, good. Twyford, fair, bloomed very irregularly. The Lyons in all orchards visited had a very poor crop, and is the only variety noticed that is a failure this year. The Margaret, Florence, and Hortense are now in full bloom, and should have a good crop if the weather conditions are favourable.

Peaches.—There is every prospect of a heavy crop of peaches. Brigg's Red May and Hale's Early will have only a light crop, owing to the shedding of the blossom buds early in the spring. All other varieties, with few exceptions, have set a good crop. The trees generally look much better than last year, and, despite the wet weather, the aphis has been kept well in check.

Quinces are not largely grown, but there is every promise of a good crop.

Oranges and Lemons.—The citrus crop looks well, and where fumigation has been done the fruit looks bright and clean.

The absence of bees and other insects during the blossoming period, and the abnormal length of time the blossoms remained on the trees were very noticeable this season. With seasonable weather at the blooming period I am of the opinion that the fruit crop in my district this season would have been a record one. The hail did slight damage to the early settting plums and cherries, but I think they will grow out of it.

Evelyn District.

Inspector Farrell reports:—

Apples.—So far as can be determined at present the early blooming kinds are looking well; also late varieties, except Esopus Spitzenberg, which shows very little blossom.

Pears.—Early blooming varieties set rather heavily, except Keiffer's Hybrid. Others looking well.

Plums.—All kinds have set a heavy crop, but hail recently experienced may cause considerable loss.

Peaches.—Bloomed well, but will not bear as heavily as last year.

Apricots.—Not extensively grown, poor setting.

Cherries.—All varieties have set a very heavy crop.

Almonds.—Heavy.

Figs.—Heavy.

Lemons.—Heavy.

Oranges.—Medium.

Loquats.—Heavy.

Passion Fruit.—Looking extra well, and heavy returns may be expected.

Raspberries.—Blossoms appear healthy. Area under canes gradually diminishing owing to low prices obtainable.

Gooseberries.—Heavy, particularly the Roaring Lion.

Strawberries.—Looking well and promises heavy crop.

Loganberries, Blackberries, &c.—A nice show of blossom. A good yield is anticipated.

Gippsland District.

Inspector Pilloud reports:—

Apples.—Too early to predict crop.

Pears.—Beurré Bosc, Beurré Capiaumont, and Keiffer's Hybrid setting well.

Plums.—Good.

Peaches.—Good.

Apricots.—Very light.

Cherries.—Good.

Goulburn Valley and North-Eastern District.

Inspector McCalman reports:—

Apples.—Good.

Pears.—Good.

Apricots.—Very light.

Peaches.—Early, very light; late, heavy, about the same as last year.

Plums.—Medium.

Cherries.—Medium.

Maryborough District.

Inspector Chalmers reports:—

Apples.—Good.

Pears.—Good.

Cherries.—Medium.

Peaches.—Good.

Plums.—Light.

Apricots.—Medium.

Somerville.

It is too early to estimate the fruit crop of this district, but should growers experience favourable weather for the next week or two it is reasonable to expect at least an average crop in apples and pears.

Western District.

Inspector Davey reports:—

Geelong.—Apples promise a very fair crop, apricots are rather light, pears heavy crops, plums and cherries promise very heavy crops.

Inverleigh.—Apricots light, plums, apples, and pears, heavy.

Mount Cole.—Pears, cherries, and plums, heavy. Some apples, such as Jonathan, Cleopatra, Five Crown, and Ribston, promise heavy crops.

Panmure.—Pears heavy, cherries and plums good, but apples promise to be light.
Portland.—Pears very good. apples fair, plums good.
Rokewood Junction.—All stone fruits good, apples fair, pears heavy.
Timboon.—Apples a medium crop, pears heavy.
Tomahawk Creek.—All fruits promise well, but will be late.
Warncoort.—Pears, apricots, and apples, especially Jonathan, Newtown Pippin, Reinette de Canada, and Rokewood, good.
Werribee.—Apricots a light crop, peaches very good, pears and plums good, apples light.

ORCHARD AND GARDEN NOTES.

E. E. Pescott. Principal. School of Horticulture, Burnley.

The Orchard.

The exceptional and unseasonable rains of early October have given the fruit trees an abundant supply of moisture. The rains have also rendered the work of spring ploughing a comparatively easy one. It has been feared in some quarters that the excessive rains would interfere with the setting of the fruit; but these fears have not been realized. Pear trees generally have set a heavy crop, while apples are considerably lighter.

The soil should be occasionally cultivated in summer, so as to prevent any surface caking. Cross harrowings are beneficial, as the whole of the orchard area comes under cultivation; and the work of digging or hoeing the strips between the trees is obviated.

All weeds and foreign growths should be rigorously kept out of the orchard in summer, as they are great robbers of moisture. Also, they are a harbour for such pests as cutworm moths and Rutherglen fly. The latter, especially, is responsible for the loss of a large quantity of peaches and apricots.

Citrus trees may now be planted out.

Grafts, and young trees will all need attention now, by tying, protecting, staking, and mulching.

Vines and young fruit trees should be disbudded, so as to remove all superfluous shoots.

Codlin Moth and other Pests.

As a preventive against the Codlin Moth pest, spraying with arsenate of lead is now the recognised and only successful remedy. Analyses of various brands were published last month by the Chemist for Agriculture, and according to the list, the samples analysed show considerable variations. Attention was drawn last year to a standard which was set up in the American Bill dealing with this subject: and it was shown that arsenate of lead should not contain more than 50 per cent. of water or moisture: more than 0.75 per cent. of water soluble arsenic oxide; or less than $12\frac{1}{2}$ per cent. of a total arsenic oxide. This standard should be considered when purchasing this mixture for orchard use. By the use of arsenate of lead, the Codlin Moth pest is very easily kept in check, and from being one of the most formidable of orchard troubles, it has come to be one of the least feared of all pests. By constantly spraying with arsenate of lead, the use of bandages as a trap for the Codlin larvæ is now quite unnecessary. In fact, bandages, more often than not, become a harbour and a breeding ground. Further, the time spent in overlooking and attending to the bandages may be employed far more profitably by giving the trees an extra spraying.

There are a few growers who still make use of lamp traps at night time to destroy the codlin moth, irrespective of the fact, which has been pointed out again and again, that the codlin moth is *not* attracted by lamps or lights. These traps do incalculable harm to an orchardist, as they are responsible for the destruction of hundreds of lace-wing flies, insects that are most useful as destroyers of aphides and scales.

One of the secrets of success in codlin moth spraying is the destruction of as many as possible of the insects of the first brood. Thus, if particular care is given to the early sprayings, keeping the fruit covered with spray for a month or six weeks after setting, this result is easily accomplished. Some growers prefer to gather all fruit infected by the first brood, spraying only for the second and later broods. Even if all the fruits attacked are gathered, which very rarely happens, the grower suffers from the loss of fruit, which he can ill afford, unless his crop be a heavy one.

Another feature for consideration is the fact that the presence of any arsenical spray on the foliage is responsible for the destruction of the pear and cherry slug, root borer beetle, and all forms of leaf eating insects.

Spraying the cherry trees for the slug will now be necessary. Arsenate of lead may be used, provided the fruit is not far advanced. Hellebore, and also tobacco water are effective against this pest.

Vegetable Garden.

Frequent hoeings will now be necessary so as to provide an earth mulch, and also to keep down weeds, which will now be growing with great vigour. Vegetables being generally very succulent and quick growing plants, require a considerable water supply. At the same time, the hoe should be kept in constant use during the summer. The beds may also be mulched.

Asparagus beds should be kept constantly cut, and as few growths allowed to continue as possible.

Potato, onion, and cabbage crops should be frequently hoed and kept from weeds.

Tomato plants should be disbudded and pinched back to prevent too much wood growth, taking care to stake each plant.

French beans, celery, peas, cucumber, melon and similar seeds may now be largely sown; while plantings may be made from earlier sowings.

Flower Garden.

Hoeing, surface cultivation, watering and mulching are the principal necessities for the flower garden this month. The soaking rains of early October have been of great value to the flower garden; and if hoeing and mulching are resorted to wherever and whenever possible, especially the former, the garden will benefit very considerably. The moisture from these rains should last for weeks, especially if it is conserved by surface cultivation. One hoeing is worth half-a-dozen waterings. Keeping the soil surface loose, and providing an earth mulch for the plants, is far more beneficial, and far less weakening, than the excessive waterings, to which the garden plants are so frequently subjected in summer. It is safe to say that a greater number of plants are lost in summer through excessive watering than through the absence of water. Further, the light sprinklings which are so frequently given in hot weather rarely reach the roots of the plants, and only serve to cake and harden the soil, resulting in a still further loss of soil water by capillary attraction.

If not already planted out, all bedding and foliage plants should now be in their places in the garden—included among these are begonias, salvias, alternantheras, iresines, &c.; while annuals for autumn flowering should now be sown.

All bulbs, corms, and tubers that have ripened their foliage, may be removed from the beds after the foliage has died, and stored in a cool place until next season. Precaution should be taken against damp, which will cause the bulbs to decay.

Herbaceous plants, such as perennial phlox, delphiniums, campanula, as well as gladioli will all be benefited considerably by liberal waterings of liquid manure, or by mulching with well rotted manure. Whenever necessary, these should all be staked.

Dahlias and chrysanthemums for early flowers should now be planted.

LIME-WATER BORDEAUX FOR SPRAYING.

D. McAlpine, Vegetable Pathologist.

The use of lime-water instead of milk of lime in the preparation of Bordeaux mixture has many advantages, and the fact that equally good results may be obtained with a considerable reduction in the amount of sulphate of copper or bluestone is not the least important. Ever since Bordeaux mixture was regarded as the most generally useful fungicide, attempts have been made to use as little of the copper salt as was consistent with efficiency not only as a saving of expense, but as a safeguard against adding too much copper to the soil. As long as the chemistry of the mixture was not properly understood, these attempts were merely haphazard, and it is only quite recently that the chemical composition has been sufficiently determined to enable us to use the proper proportions of lime and bluestone.

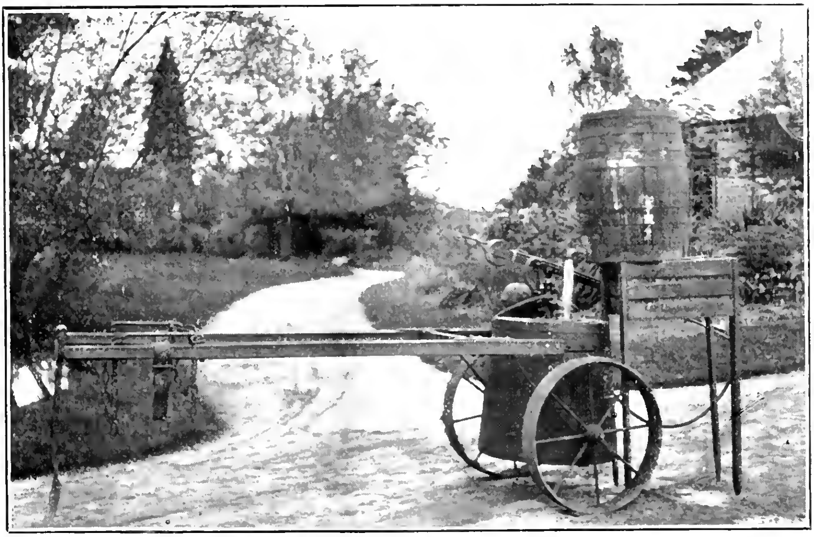
With the fine sprays now in use and the discontinuance of the old method of drenching the trees or vines, the danger is much lessened from this cause; still, with the more general and constant use of this fungicide year after year, an appreciable amount of copper is bound to reach the soil.

History of Bordeaux Mixture.

It had long been the practice in the Médoc district in the south of France to sprinkle the vines bordering the highway, either with verdigris or, on account of its being cheaper, with a thick paste consisting of milk of lime to which copper had been added, the object being to prevent boys and vagrants from pillaging the vineyards. They were afraid to eat the ripe grapes, splashed with a salt of copper which was so conspicuous, as they believed they might be poisoned.

When the mildew was very bad in the vineyards, it was noticeable that the vines treated in this way were comparatively free from it. This was clearly proved in 1882, but it was in 1884, when the attack was particularly severe, that the results were most striking. While the mildew caused the leaves to shrivel up and fall prematurely, the vines splashed with lime and bluestone remained green and the grapes ripened. Thus it was accidentally discovered that the mixture, at first used to protect the grapes from marauders, was a protection against the ravages of the mildew.

About the same time, in 1884, it was observed at Bourgogne, in France, that among the vines deprived of their leaves by the action of the mildew, there were certain spots where the vines had retained their leaves and showed relative freedom from the disease. Where this was the case it was remembered that the stakes to which they were trained had recently been impregnated with sulphate of copper, the usual means employed to preserve the stakes from rot. The difference between the portion of the vine attached to the stake and the rest of it was so striking that there was no doubt about the copper sulphate being a preventive of the disease. Of course, these facts were observed and recorded at the time by numerous persons, but Millardet, Professor of Botany in the Faculty of Sciences of Bordeaux, was one of the first to prove by experiment the effect of the mixture on the mildew and to advocate its use, so that it came to be known as the Bordeaux mixture. It was on the 1st of May, 1885, that he communicated the results of his experiments to the Society of Agriculture of Gironde, and from this date may be reckoned the extensive use of Bordeaux mixture as a fungicide.



RUNNING THE LIME-WATER INTO THE BARREL OF THE SPRAY PUMP.

The copper sulphate alone could only be applied to trees or vines in the dormant state and not when in leaf, as it scorches the foliage badly, so that lime is added in some form or another to neutralize the acidity of the bluestone. Many modifications of, and substitutes for, Bordeaux mixture have been since introduced, but the principal advances have been in the more economical use of it based upon a knowledge of its chemistry, in the improved methods of preparation and application, and in the extended list of diseases for which it is a preventive. At first the mixture was swabbed on the vines with a heath broom, whereas now there are spray pumps of various patterns with nozzles producing a fine mist-like spray, and motor spray pumps which are capable of thoroughly spraying large orchards in the shortest possible time.

Chemistry of Bordeaux Mixture.

It was thought at first that the reaction of the lime on the copper sulphate was a simple one, that it consisted in the sulphate of copper being decomposed, the sulphuric acid uniting with the lime and forming sulphate of lime, while the copper formed a hydroxide. To put the action supposed to take place in the form of a chemical equation: —

$$\underset{\text{(Copper Sulphate)}}{CuSO_4} + \underset{\text{(Calcium Hydroxide)}}{Ca(OH)_2} = \underset{\text{(Sulphate of Lime)}}{CaSO_4} + \underset{\text{(Copper Hydroxide)}}{Cu(OH)_2}$$

the lime taking the place of the copper and the copper that of the lime. Quicklime is chemically named calcium oxide (CaO), and when it unites with water, as in the process termed "slacking" of lime, it forms calcium hydroxide ($Ca(OH)_2$), which is the soft white powder known as "slacked lime."

Instead of the chemical action being so simple as the equation would indicate, it is found to be very complex, and an investigation of the compounds formed by the action of lime on copper sulphate has shown that as many as six different substances may be produced, according to the proportions taken. The chemistry of Bordeaux mixture has only quite recently been investigated by Spencer U. Pickering, F.R.S., and as he says, "It is remarkable that the chemistry of a fungicide in such general use should never have been elucidated." Such an investigation has shown, among other things, that the cost of the substance may be considerably reduced, without impairing its efficiency. Only the essential points can be given here, but those who are interested will find details in the *Eighth Report of the Woburn Experimental Fruit Farm* (1908).

The normal copper sulphate may be represented as a compound of copper oxide (CuO) and sulphur trioxide (SO_3) or CuO, SO_3. When lime is added to this in solution, it only takes away a portion of the sulphur trioxide and leaves what is known as a basic copper sulphate, that is to say, a copper sulphate containing relatively a larger amount of copper oxide. When lime is added in just sufficient quantity to precipitate all the copper from the liquid, the basic sulphate of copper which is formed contains only one-quarter of the sulphur trioxide present in the normal sulphate. But when lime is added in the proportions usually taken for Bordeaux mixture, then only one-tenth of the sulphur trioxide is left.

When the spraying mixture is applied to the fruit trees, it is acted on by the carbonic acid of the air, and since the ordinary Bordeaux contains basic calcium sulphate, which the other does not, and since this is attacked more easily than the basic copper sulphate, it follows that until all the former is converted into carbonate of lime, the latter is not acted on.

The result is that the ordinary Bordeaux mixture takes some time before it begins to act as a fungicide. That is the first advantage to be gained by using only the proper proportions of lime, for then no basic calcium sulphate is formed and no time is lost in the starting of the fungicidal action. But there is another advantage. It is found by experiment that the amount of normal sulphate of copper liberated by the action of the carbonic acid of the air is about twelve times as much, when the proper proportion of lime is used, as in the other.

It will now be evident why lime-water is employed instead of milk of lime, for then we know exactly how much lime is in solution and can adjust the quantity required in proportion to the amount of bluestone used.

The carbonic acid of the air in the presence of moisture has a double action on the copper compounds formed. It unites with some of the copper to form a carbonate of copper as well as liberating some of the copper in the form of the sulphate. Thus although in Bordeaux mixture, the copper is entirely insoluble to start with, it is gradually rendered soluble by means of the carbonic acid in the air, and some of it curiously enough is brought back to the condition of sulphate of copper with which we started.

The practical result of this investigation is that lime-water is recommended instead of milk of lime and the proportion of lime-water to copper sulphate has been approximately determined, so as to yield the maximum of efficiency with the minimum of the copper salt. In addition to this, Pickering has succeeded in preparing a paste known commercially as Woburn Bordeaux Paste, "which when diluted with water is practically identical, both chemically and physically, with the freshly made Woburn Bordeaux, except that it contains no excess of lime." The paste is patented, but the formula for the preparation of the fresh material may be given.

THE SPRAYER AT WORK.

The use of lime-water in the preparation of Bordeaux mixture is by no means new, as it has been constantly used in Italy since 1886 with very good results, when it was first recommended by Professor Cavazza.

The latest formula for 50 gallons is approximately as follows:—

Copper sulphate, 10 ozs.
Lime-water, $8\frac{1}{2}$ gallons.
Water to make up to 50 gallons.

The standard formula for Bordeaux mixture generally used here is 6.4.50 or 6 lbs. copper sulphate and 4 lbs. quicklime to 50 gallons of water, but with the substitution of lime-water in definite proportions for milk of lime, the copper sulphate is reduced in amount from 6 lbs. to 10 ozs. for 50 gallons.

Action of Bordeaux Mixture as a Fungicide.

How it acts is not certainly known, although there is a considerable amount of literature on the subject, and it will only be generally and briefly referred to here. It may either act directly by destroying the fungus or its spores, or indirectly by preventing the germination of the spores. The carbonate of copper which is formed has a protective action, since it adheres well to the leaves and prevents any fresh fungus spores germinating upon them, while the soluble copper sulphate gradually formed may either directly destroy the fungus spores already present, or by absorption into the cells of the host-plant, render them unfit for the nourishment of the fungus. There is thus an external and an internal protection against the fungus and its spores, by means of a layer of the copper compound on the surface, and the impregnation of the leaves by the soluble compound.

Experiments with Lime-water Bordeaux.

In 1908, lime-water Bordeaux was tested on apple trees alongside of the ordinary Bordeaux mixture, with the result that both were equally efficacious in preventing the Black Spot (*Fusicladium dendriticum*). The former adhered just as well as the other, and it had the additional advantages of being free from any gritty particles, of acting at once on the spores of the fungus and of containing a much smaller proportion of bluestone. The details are given in the Annual Report which will shortly be issued.

This season (1910) I have conducted spraying experiments at the School of Horticulture, Burnley, with the co-operation of the Principal, E. E. Pescott. The lime-water Bordeaux has been the form used, and as check trees have been kept for comparison, the results will be given when the fruit is gathered. The preparation is both quickly and easily made. The fresh quick-lime has first to be slacked. This may be readily done by just adding sufficient water to start the process and then adding more gradually, as it is absorbed. The process may be hastened by the addition of hot water, but it must be remembered that lime, contrary to the usual rule, is less soluble in hot than in cold water. When the slacked lime is mixed with water, it may either form a cream, or a milk of lime, according to the amount of water added. Lime is only very slightly soluble in water at the rate of about 1 lb. in 80 gallons of water, so that 1 lb. of lime will be ample for 50 gallons of lime-water. When sufficient water is added to the milk of lime, it is thoroughly stirred and then allowed to settle and the clear liquid which forms on the top in about a quarter of an hour is lime-water. The lime-water is allowed to run into the barrel of the spray pump as shown in the illustration on page 729, the necessary bluestone in solution is added and the barrel holding 50 gallons is then filled up with water, when the material is ready for spraying. Where spraying is done on a large scale, it will be found convenient to rig up barrels with cocks or spigots on an elevated platform. The lime-water could be made in one barrel and ordinary water contained in the other, so that both liquids could be run into the barrel of the spray pump as required, without loss of time.

REPUTED POISON PLANTS.

A. C. H. Rothera, M.A., M.R.C.S., Lecturer on Bio-chemistry in the Melbourne University.

A good deal of uncertainty still exists as to the harmlessness or otherwise of many of the native plants of Australia when eaten by stock. So much work still remains to be done, that often the inquiries of stock-owners as to whether a given plant or shrub is poisonous or not cannot be answered with any certainty. As pointed out by Professor Ewart, in the *Weeds and Poison Plants of Victoria*, there is no doubt that many of the plants which from time to time come under suspicion are really harmless enough, and usually, when a plant is definitely poisonous, it very clearly proclaims itself as such.

Of those plants which are on the border region of doubt, most of them will, in all probability, then be non-poisonous, and a consistent examination of them all would be meeting with a great measure of success if it could prove one specimen in every 20 or so to have poisonous characters. It is the possibility that there may be here and there amongst the large list of plants under suspicion, one or two which are definitely poisonous, that makes a general examination of them all so necessary.

It is important, in the first place, to say a word or two on what is a poisonous plant, because a plant may be useless, objectionable, or harmful, without being definitely poisonous. A *truly poisonous* plant is one which causes symptoms of poisoning, even though it is only eaten in conjunction with other foodstuffs. It will, as a rule, yield definite, active principles, which may be more or less isolated from the plant, and which, when injected directly into the blood, will cause immediate symptoms and, in large doses, death.

A *harmful* plant would be one which, when eaten in quantity, caused scouring or other derangement, without leading to any serious poisoning or death.

Plants are often *objectionable* to animals owing to bitter principles, or essential oils, though these plants, even if eaten in quantity, are not actually poisonous. The plant is protecting itself from being eaten by stock by means of an unpleasant principle, but not necessarily a poisonous one, at least in the quantity likely to be taken at any time by the animal.

A *useless* plant is simply one whose fodder value is so inferior as to make it unattractive and valueless.

When a plant is distinctly poisonous, it presents very little difficulty to the investigator, compared with the plant which is doubtfully so.

It is not fair to continuously feed animals on a given plant, and then call it poisonous if they finally die. If it is to be tested over a long length of time, it must be fed with other foodstuffs, otherwise the results obtained would be misleading, and a plant might be unjustly condemned as harmful or poisonous when there was no more reason for such a verdict than there would be, for instance, for a judgment condemning pork, because a man fed on it and nothing else for a week became seriously ill. Neither is it fair to separate the principles of a plant, and inject them in concentrated form direct into the blood. For plants contain principles which are poisonous under such conditions, as, for examples, *Saponins* and essential oils, which are not poisonous when the animal takes the plant by mouth in the usual manner.

On the other hand, if feeding experiments leave any doubt as to the character of a plant, it does very materially help one to arrive at a definite decision, if no symptoms of poisoning can be noted on injection of various extracts prepared with a view to their containing any poisonous principles likely to be present in the plant.

These few preliminary remarks are made because the initial steps in determining whether a plant is poisonous can best be done in the district where the plant grows. Unless a plant can definitely be shown to produce symptoms of poisoning on feeding, it is more than likely that it is harmless; if it is sent to a laboratory for testing, its detailed examination entails much work, with little or no profitable result.

Feeding experiments, too, are best carried out on the farm where the plant grows, because the collection of material in sufficient quantity for feeding experiments and its consignment to the laboratory is costly, both in time and money. Further, the laboratory only has the opportunity of working with the smaller animals—rabbit, goat, and sheep—whereas it may be in cattle that the poisonous symptoms develop. Once, however, there is evidence that a plant is poisonous, then it should be sent to a laboratory, where the facilities for a full study of the nature and mode of action of its poisonous principles are so much greater.

The following remarks apply to plants which have been investigated in the laboratory, and which appeared to be worth while testing, since they are widely regarded as poisonous. Fresh material in the requisite quantities was obtained from the Agricultural Department through the agency of the National Herbarium.

WILD PARSNIP, *Didiscus pilosus*, Benth. (*Trachymene australis*, Benth.) —This is a native plant regarding which it is stated in the *Weeds and Poison Plants of Victoria* that it "is commonly supposed to be poisonous, but no exact investigations have been made." This plant at once declared itself as highly objectionable to the rabbit, sheep, and goat. None of these would eat it, even after prolonged starvation. Several rabbits died during the experiments, but the number which survived makes it more than probable that the wild parsnip was not the actual cause of death. In these cases, a good deal of margin had to be given, as the animals were wild rabbits, brought into an unnatural state of confinement and subjected to a good deal of handling before arrival at the University.

The Wild Parsnip contains no alkaloid, and tinctures prepared to contain other active principles, such as glucosides, could be subcutaneously injected without any poisonous symptoms supervening. Four rabbits were also fed by stomach tube with the juice (and finer floating material) expressed from the finely minced plant, and the forced feeding was repeated two days later and, in one case, a third time, but no signs of any poisonous action could be noted.

Steam distillates of the plant also proved harmless when subcutaneously injected. A sheep was also used in this case, but even after two days with no other foodstuffs offered, only 1 lb. or, at most, 2 lbs. of the Wild Parsnip had been eaten. No symptoms were apparent. A goat was induced to take the Wild Parsnip cut finely and thoroughly mixed with crushed biscuit. This was continued for three days, but the animal was always fastidious, and never ate great amounts. It, however, showed not the slightest trace of any ill effects.

The universal dislike of all the animals experimented upon to this plant, which to the untrained human taste possesses nothing objectionable, made the investigation of it a matter of caution.

The result of a considerable amount of work performed during two successive seasons allows of the definite conclusion being drawn, that the Wild Parsnip is not poisonous. It contains no active poisonous principle that could be found by any of the standard methods of procedure. The questions whether cattle will feed upon it readily and in quantity, and whether under such circumstances it is harmful to them, could not be answered at the laboratory.

TREE TOBACCO, *Nicotiana glauca*, Graham. In the *Weeds and Poison Plants of Victoria* this plant is included among the poison plants, with the proviso that moderate quantities may be eaten without serious consequences.

The green parts were sent up to the laboratory in connexion with blindness occurring in horses. Nicotine is known to cause blindness in man, and it was therefore of interest to compare this species of Nicotiana with its better known relative. The stems and leaves were examined quantitatively for the amount of nicotine present. In both stem and leaf it was found that there was *no nicotine*, and a qualitative examination failed to show the presence of any alkaloid. It is possible that feeding tests with stock may show the supposed poisonous character of this plant to be based upon unsound evidence.

MERIAN'S BUGLE LILY. *Watsonia Meriana*, Mill., var. *iridifolia* (Trideæ). This plant, a native of South Africa, is now widely spread in Victoria, being carried both by its seeds and its bulbils and is especially abundant along the banks of creeks, and in moist or somewhat swampy places. It is frequently reported as poisoning stock, and since it belongs to an order which contains several poisonous plants, its exact investigation appeared to be highly desirable.

No evidence of any poisonous action was, however, obtained. Animals readily eat it, and no harmful after effects of any sort were noted in the case of sheep, goat, and rabbit. Injections of extracts designed to contain active principles were without effect. The possible presence of an alkaloid was negatived by qualitative chemical tests. The bulbs were investigated as well as the green parts.

BERMUDA PIG ROOT. *Sisyrinchium Bermudianum*, L. This is also a member of the *Irideæ*, but is an introduction from America. It is generally considered to be a weed injurious to stock, without being actually poisonous. It and an allied species are sometimes termed "scour-weeds."

This plant has not been exhaustively studied, but no indications were obtained that such a study would yield any definite result. From feeding experiments it appeared perfectly harmless, and without some further definite evidence as to its being poisonous, there is no reason to look upon it as such. Qualitative tests for the presence of an alkaloid were uniformly negative.

* * * * * *

It is evident from the foregoing tests that close investigation is likely to reduce considerably the number of supposed poison plants, both native and introduced in Victoria. As, however, the full investigation of these will take a considerable time to complete, it has been thought advisable to publish the notes from time to time as the tests on each small series of plants are completed, since it is often of considerable importance to be able to state definitely whether a particular plant is poisonous or not.

(*To be continued.*)

EGG-LAYING COMPETITION, 1911-12,

TO BE CONDUCTED AT THE

BURNLEY SCHOOL OF HORTICULTURE.

The attention of intending competitors is drawn to the following rules, which have been approved by the Hon. the Minister. Applications for pens must be lodged with the Organizing Officer (Mr. H. V. Hawkins, Department of Agriculture, Melbourne), not later than 21st November, 1910.

The competition will be open to all States, preference being given to small holders and legitimate farmers. A committee representing the competitors will be elected by the latter after the entries have closed. Competitors, after acceptance, will ballot for the pens.

COMPETITION RULES.

1. The competition to extend over the period from 1st April, 1911, to 31st March, 1912, inclusive. Competitors to deliver their birds to the Principal, School of Horticulture, Burnley, between 10th and 20th March, inclusive.
2. Each pen to consist of six pure bred pullets, not less than seven months or more than twelve months old on 1st April, 1911.
3. All birds to be bred by and to be the property of the competitor. (Note.—The competitor must have owned the parent birds of the pullets entered.)
4. The Poultry Expert is empowered to reject any bird or birds that he does not consider of correct age. Any rejected bird must be replaced by the competitor with another bird of suitable age.
5. The birds upon being accepted by the Poultry Expert as being of suitable age, no protest will be entertained upon that point.
6. Any bird found to be suffering from an infectious or contagious disease when delivered at the School of Horticulture, will be rejected, and must be replaced by the competitor.
7. The Poultry Expert shall reject any bird on arrival that is not a fair specimen of the breed entered, and such bird must be replaced.
8. One wing of each pullet must be cut by the owner before forwarding to the competition. The wing will be kept cut during the currency of the competition.
9. In the event of a bird dying, becoming diseased, incapacitated from laying, or developing vicious habits (such as egg or feather eating) the competitor must replace it with another of the same age and breed, upon being notified; failing which he must withdraw his birds.
10. All eggs to become the property of the Department of Agriculture.
11. Eggs under $1\frac{1}{2}$ ozs. in weight or soft shelled not to be counted.
12. Any pen, the eggs from which do not attain an average weight of 24 ozs. per dozen before the expiration of the first three months of the competition, to be ineligible for a prize.
13. The competition to be decided by the total number of eggs laid by each pen (subject to rules 11 and 12).
14. The market value of the eggs from each pen to be recorded.
15. The winter test to extend over the first four months.
16. Records to be kept of the total quantities of the various foods consumed, and the average cost per head.
17. No competitor shall withdraw any bird, except as hereinbefore provided, until the termination of the competition.
18. Any competitor violating or failing to conform to these regulations will be subject to disqualification.
19. The committee's decision in all cases of dispute to be final.

Application for Pen.

I hereby apply for a Pen in the First Laying Competition at the Burnley School of Horticulture, 1911-12.

Signed ....

Full Postal Address ....

Replies to the following questions must be furnished by applicants:—

1. What variety of fowls do you wish to enter? ....
2. How long have you been keeping this variety? ....
3. What is your present stock of this variety? .... adult birds and .... chickens.
4. Is poultry keeping your sole or partial means of livelihood, or a hobby? ....
5. If partial means of livelihood, what other occupation do you combine with it? ....
6. Have the pullets you expect to pen been bred from tested stock; if so, in what way has the stock been tested? ....

Note.—Only one pen will be allotted to each competitor. The entrance fee is £1 1s., but this amount must not be forwarded until after the pens are allotted.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. *All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.*

IDENTIFICATION OF PLANTS.—D. B., P. M., W. M., V. J. P., and H. B. S. forward specimens of plants for identification.

Answer.—(1) Hoary Cress (*Lepidium Draba*, L.). It is not poisonous, but it takes up the place of useful vegetation and should be suppressed. Clean cultivation and the prevention of seeding aid in keeping it down. If the pasture land is badly infested, it should be ploughed up and kept under bare fallow and well stirred for a year, then followed by root crops (potatoes, &c.), or a leafy fodder crop for a year or two, and then grain. The land may then be seeded down if required for pasture. Care should be taken to procure pure seed of either grass or grain. In small patches it should be dug up before seeding, piled and burnt. The roots must be removed from the soil, as any part left in the ground will grow again. In orchards or cultivated ground, frequent ploughing and stirring of the soil will keep it down and ultimately exhaust it, but if it has been long established, it may take two years to do this. No poisons are of any use in dealing with this plant on a large scale.

(2) Soft Crowfoot (*Ranunculus muricatus*, L.). A native of the Mediterranean regions. It is a small intensely acrid plant, useless for grazing, and of little value even in dry fodder, and preferring moist ground where it is difficult to eradicate. Drainage and cultivation or the encouragement of the larger pasture plants and grasses by manuring and loosening the soil, will keep the plant under. Its spread will cause steady deterioration in a pasture.

(3) Dodder (*Cuscuta epithymum*, L.). Proclaimed under the Thistle Act for the whole State. The infected parts of the crop and for some distance around should be at once cut, piled and burnt on the spot, and, if necessary, with the aid of brushwood or kerosene. Previously to flowering, it could be ploughed under or if in small patches dug in. If allowed to seed, no clover, pea, bean, lucerne, or other leguminous crop would be safe for at least five years. It sometimes attacks potatoes and other non-leguminous plants. Raking out only helps to spread the pest, as each part left in the crop will grow. It is spread principally by the agency of impure seed. Seed may last over five years in the soil.

(4) Burr Clover (*Medicago denticulata*, Willd.). It is of some value as a pasture plant, but its burred fruits are objectionable, and it becomes a weed in cultivated ground. The tubers on the roots are normal growths, and by their aid the plant is able to assimilate free nitrogen from the air, thus enriching the soil when ploughed in.

(5) Fumitory (*Fumaria officinalis*, L.). A cosmopolitan weed, not poisonous, but containing *Fumaric* acid and a bitter tonic principle which gives an unpleasant flavour to the milk and butter of cows eating it. It is a weak but freely seeding annual, growing and seeding in spring and early summer. In most crops the weed is easily kept down by hoeing, but in hay and corn crops if it cannot be kept down by harrowing while the crop is young it often proves troublesome. The land fouled with its seed can be cleaned with the aid of a root crop like potatoes or any crop which can be hoed between the rows. If the land is laid down in permanent pasture for two or three years the weed soon disappears. The seed form a common impurity in agricultural seed, and may last in the soil at least two or three years. The local name, "McDonald's Devil," furnished by our correspondent (H. B. S., Broadmeadows), is not generally recognised.

Eradication of Sorrel.—W. B. L. writes :—"My garden is full of sorrel. Is there anything I can add to the soil that will kill it? For over three years I have tried to eradicate it by careful digging, but still it comes."

Answer.—Sorrel is very difficult to eradicate when once well established, particularly among such plants as strawberries and small perennials. Heavy doses of lime, which in a garden can be applied at the rate of 10 or more tons per acre, will help to keep it down. This must be aided by forking out the underground rhizomes, followed by frequent hoeing as often as any green shoots appear. This is particularly important in spring and early summer. Care should be taken to see that the weed is not being re-introduced by seeds carried in manure. They may be abundant in unfermented horse manure, and particularly in cow manure.

Lichen on Fruit Trees.—L. K. N. forwards specimen of growth affecting his fruit trees.

Answer.—It is lichen, and can be removed by spraying with Bordeaux mixture.

Raising Orange Trees from Seed.—A. W. T. asks whether orange trees can be raised from seed.

Answer.—Orange trees may be grown readily from seed—the seed to be sown in a compost of sand and leaf mould or vegetable humus. Trees raised in this way are practically useless for commercial purposes. They rarely fruit satisfactorily, their fruit is inferior, and they are many years coming into bearing.

Pumpkins for Stock Feeding.—A. W. T. asks for best varieties of pumpkins for stock feeding.

Answer.—Ironbark, or Connecticut Field.

Buckwheat.—Red Gum desires information as to sowing Buckwheat.

Answer.—Buckwheat can be grown in succession from the latter end of September (provided the frosts are past in the particular district where it is to be sown) until March. Sow in drills at the rate of a quarter bushel per acre, or if broadcasted 1 bushel per acre. Poultry do well on the seed, and the straw after threshing is good pig food.

Removing Afterbirth.—T. J. B. asks how to remove the afterbirth from a mare or cow. Also asks what food should be given.

Answer.—Irrigate the womb daily by injection with 1 gallon of 2 per cent. solution of Lysol in warm water or solution of Permanganate of Potash; remove by gentle traction any traces of retained membranes and give a drench consisting of Epsom salts, 1 lb.; powdered gentian, 1 oz.; ginger, $\frac{1}{2}$ oz.; in $1\frac{1}{2}$ pints of warm water. Sloppy bran mashes and green food should be given.

Death of Rams.—E. S. B. writes :—"I purchased two prize rams at the recent Royal show. When removing them from the truck at the local railway station I noticed that one was a bit 'off.' In the paddock, a grassy garden patch of half an acre, it got worse. I called in men of experience, and the general opinion was that stoppage of water was the cause. Nitre was given internally, but in five days death ensued. On *post mortem* examination I found the bladder burst. Two days afterwards the other ram took bad, and although treated similarly it died five days later. Its bladder was full and badly inflamed with clots of blood in the urine passage. Kindly inform me whether successful treatment could have been applied. I also bought two ewes at the same time, and I am fearful lest the same fate may overtake them."

Answer.—Small calculi being arrested in the passage from the bladder was probably the cause of the death of your rams. The point of stoppage is usually at the end of the penis, where they may be felt. Efforts should be made to remove them by lubricating the passage with oil and the penis gently manipulated. If all efforts fail the animal's life may be saved by removing the point of the penis, but he would be of no further use for breeding purposes. You need not be anxious about the ewes as they are not subject to the trouble in the same degree as the rams.

Destruction of Rabbits.—F. A. E. states that he is renting a creek frontage adjoining his property. The frontage is gradually being covered with Blackberry Bramble, which affords excellent harbour for the rabbits. He asks whether he can be compelled to destroy both blackberry and rabbits.

Answer.—The Inspector has the power to enforce the destruction of rabbits and harbour for same as may be necessary. The Blackberry Bramble (*Rubus fruticosus*, L.) is proclaimed under the Thistle Act for the whole State.

STATISTICS.

Third Quarter, 1910.

Rainfall in Victoria.

Table showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with corresponding monthly and quarterly averages for each Basin, deduced from all available records to date.

Basin or District.	July.		August.		September.		Total amount for Third Quarter.	Average for Third Quarter.
	Amount.	Average.	Amount.	Aver	Amount.	Average.		
	points.	points.	poi	ints.	points	points.	points.	points.
Glenelg and Wannon Rivers	457	333	-76	315	438	280	1,171	928
Fitzroy, Eumerella, and Merri Rivers	467	371	270	335	493	297	1,230	1,003
Hopkins River and Mount Emu Creek	299	249	221	266	464	251	984	766
Mount Elephant and Lake Corangamite	246	241	219	253	408	249	873	743
Cape Otway Forest ...	474	408	384	412	594	367	1,452	1,187
Moorabool and Barwon Rivers	266	230	224	254	421	243	911	727
Werribee and Saltwater Rivers	286	191	184	220	383	227	853	638
Yarra River and Dandenong Creek	299	316	205	315	541	320	1,045	951
Koo-wee-rup Swamp ...	248	312	230	337	523	340	1,001	989
South Gippsland	221	389	260	399	552	397	1,033	1,185
Latrobe and Thomson Rivers	236	318	256	354	507	371	999	1,043
Macallister and Avon Rivers	159	145	113	230	437	187	709	562
Mitchell River	240	213	119	215	477	248	836	676
Tambo and Nicholson Rivers	240	187	86	192	464	211	790	590
Snowy River	262	278	73	259	351	309	686	846
Murray River	289	204	155	198	287	180	731	582
Mitta Mitta and Kiewa Rivers	418	440	370	332	525	302	1,313	1,074
Ovens River	472	462	335	350	542	319	1,349	1,131
Goulburn River	376	290	287	263	407	237	1,070	790
Campaspe River	386	265	309	250	387	251	1,082	766
Loddon River	297	185	218	200	310	169	825	554
Avon and Richardson Rivers	307	151	155	182	336	150	798	483
Avoca River	309	184	188	188	283	152	780	524
Eastern Wimmera	380	236	240	257	403	200	1,023	693
Western Wimmera	345	243	167	225	381	193	893	661
Mallee District	232	136	136	147	261	130	629	413
The whole State	340	248	235	245	391	229	966	722

100 points = 1 inch.

H. A. HUNT, *Commonwealth Meteorologist.*

Perishable and Frozen Produce.

Description of Produce.		Exports from State (Oversea). Quarter ended 30.9.1910.	Exports from State (Oversea). Quarter ended 30.9.1909.	Deliveries from Government Cool Stores. Quarter ended 30.9.1910.	Deliveries from Government Cool Stores. Quarter ended 30.9.1909.
Butter	lbs.	4,919,760	2,268,340	3,752,392	1,242,472
Milk and Cream ...	cases	481	36	80	35
Cheese	lbs.	5,040	30,600	23,320	10,960
Ham and Bacon ...	"	10,080	480	...	...
Poultry	head	1,630	6,915	2,385	2,647
Eggs...	dozen	60	...	6,529	2,740
Mutton and Lamb	carcases	69,038	12,279	3,440	930
Beef	quarters	4,5[illegible]2	2,386	...	...
Veal	carcases	932	799	194	...
Pork...	"	11	123	105½	631
Rabbits and Hares ...	pairs	991,056	566,400	140,091	62,994
Sundries	lbs.	...	...	60,664	1,628

R. CROWE, *Superintendent of Exports.*

Fruit, Plants, Bulbs, Grain, &c.

Description of Produce.	Imports. Inter-State.	Imports. Oversea.	Exports. Inter-State.	Exports. Oversea.	Description of Produce.	Imports. Inter-State.	Imports. Oversea.	Exports. Inter-State.	Exports. Oversea.
Apples ...	19,318	—	2 478	6,093	Maize ...	3,046	41	—	—
Apples, Custard	142	—	—	—	Melons ...	—	—	3	—
					Millet ...	65	—	—	—
Bananas, bs.	41,538	—	—	—	Mohair ..	—	2	—	—
Bananas, cs.	7,451	70	1,850	35	Nutmegs ...	—	370	—	—
Barley ...	14,748	1	—	—	Nuts ...	142	2,512	7	—
Beans ...	53	450	—	—	Oats ...	3,320	652	—	—
Bulbs ...	—	31	12	—	Olives ...	2	—	—	—
Chillies ...	38	124	—	—	Oranges ...	140,816	—	1,126	1,122
Cloves ..	—	30	—	—	Passion ...	6,468	—	766	8
Cocoa beans	—	1,132	—	—	Paw-Paws...	99	—	—	—
Cocoanuts..	20	683	130	—	Pears ...	—	—	6,524	—
Coffee beans	—	1,787	—	—	Peas, Dried	1,657	104	—	—
Copra ...	—	1,365	—	—	Pepper ...	—	898	—	—
Crape Hair	—	2	—	—	Pineapples	20,527	—	1,102	304
Cucumbers	1,018	—	277	—	Plants, Trees, &c.	398	100	1,452	368
Currants ...	844	250	—	—					
Dates ...	—	1,499	—	—	Plums ...	—	5	—	—
Figs ...	—	9	5	—	Potatoes ..	24	—	—	—
Fruit—				—	Prunes ..	—	462	—	—
Canned...	—	—	—	2,505	Raisins ...	—	3,210	—	—
Dried ...	—	40	—	3,952	Rice ...	7,584	10,565	—	—
Mixed ...	58	10	9	—	Seeds ...	690	4,814	—	—
Green ginger	16	96	—	—	Spice ...	—	219	—	—
Hay ...	—	144	—	—	Strawberries	39	—	—	—
Hops ..	—	271	—	—	Straw Packing	—	9,803	—	—
Jams, Sauces, &c.	—	—	—	1,099					
					Tapioca ..	—	1,420	—	—
Lemons ...	11,087	—	255	3,880	Tobacco ...	—	225	—	—
Lentils ...	—	28	—	—	Tomatoes ...	1,575	—	84	—
Limes ...	1	—	—	—	Vegetables	2,727	208	—	—
Linseed ...	—	480	—	—	Wheat ...	1,863	269	—	—
Loquats ...	15	—	—	—	Yams ...	406	159	—	—
Mace ...	35	64	—	—					
Totals ...	96,382	8,566	5,016	17,564	Grand Totals	287,830	44,604	16,080	19,366

Total number of packages inspected for the quarter ending 30th September, 1910 = 367,880.

J. G. TURNER, *Senior Inspector, Fruit Imports and Exports.*

Agricultural Education in Victoria.

DOOKIE AGRICULTURAL COLLEGE.

H. PYE, Principal.

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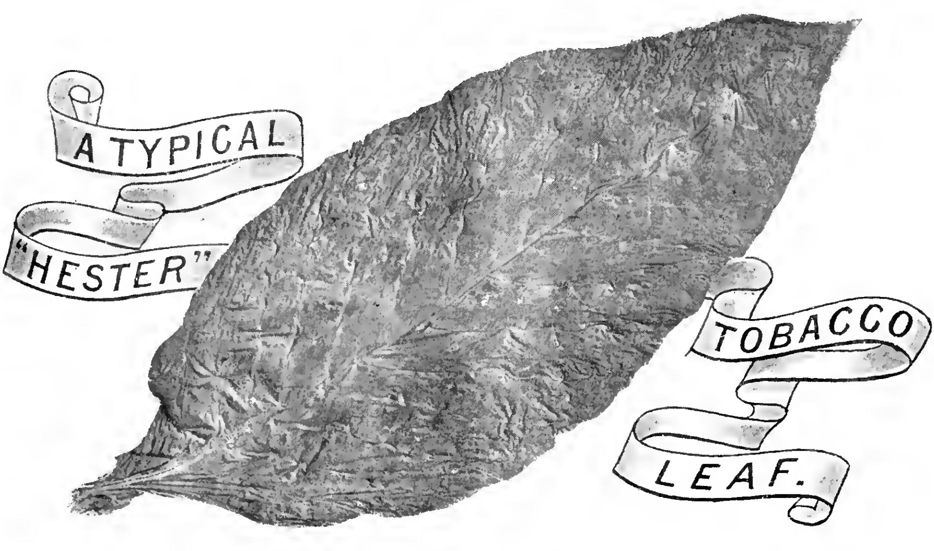

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A. T. SHARP, Editor.

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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. VIII. Part 12. 10th December, 1910.

TOBACCO CULTURE.

T. A. J. Smith, Tobacco Expert.

During the past nine years, tobacco-growing in Victoria has shown a steadily increasing production, as the following figures will prove. The fluctuation in year 1906-7 was due to an unusually bad season for summer crops in those districts where the bulk of the tobacco is grown:—

Year.	Yield. lbs.	Year.	Yield. lbs.
1901-2	35,640	1905-6	157,360
1902-3	83,472	1906-7	67,536
1903-4	94,976	1907-8	309,629
1904-5	124,544	1908-9	296,464

These results are encouraging and yet, when we find that values have increased from 50 per cent. to 150 per cent. for the cured leaf, it is remarkable that the industry has not progressed at an even greater rate. In 1901-2, first grade leaf was selling for 4d. per 1 lb. for pipe tobacco, little or no cigar leaf being then grown. During the past two years first grade pipe tobacco has commanded prices ranging from 7d. per lb. to 9d. per lb., and cigar leaf has been selling at prices ranging from 7d. to 1s. per lb. and, in special cases, to 1s. 3d. and 1s. 6d. per lb.

These facts go to prove that good leaf can be produced profitably in Victoria, and that tobacco-growing as a form of intense culture, especially on small holdings, should in time become one of the most important of our rural industries. Small areas have given large returns, an important matter to people with only a small capital to invest in land; further, little or no special machinery is required for the production of the crop. At Edi, three men took £750 worth of tobacco (pipe) from 15 acres in one season—a return of £50 per acre. A small plot of 5 acres, at Whitfield, returned £226. Another plot of 30 acres at Moyhu returned an average of £780 per annum for four years without any manuring. In Gippsland a plot returned cigar leaf worth over £60 per acre.

When it is considered that there is no really heavy work connected with the growth of tobacco, that boys can do the greater part of the work equally as well as men, and that the growing season during which the out-door work is necessary takes only four to five months, it will readily be acknowledged that Victoria should at least produce the greater part of the 4,000,000 lbs. of tobacco consumed by her people, to say nothing of supplying at least a proportion of the world's markets.

Again, when we find that the demand is exceeding the world's supply, the prospect of good prices for growers looks bright. Our local market is asking for more tobacco than can be supplied, and it is rumoured that one Australian company intends growing some 500 acres of tobacco to assist in supplying its own requirements—sufficient evidence in itself that Australian leaf is considered good enough, and that more is wanted. In America, 200 years ago, the tobacco produced was of very inferior quality to that now grown and cured, and there is every reason to expect that, with the experience of other countries, combined with more scientific methods of culture and treatment, qualities will also improve in Victoria to a marked degree. We have an immense variety of soils and climates not yet exploited so far as tobacco production is concerned. Analysis shows that the mechanical condition of Victorian soils is comparable with that of American tobacco soils, and also that they contain the chemical elements of plant food necessary to the growth of good tobacco. Our growers have therefore reason to expect the production of good leaf, provided the right treatments are employed. The climate, too, in many parts of the State is suitable. The following table showing the comparative analysis of some typical American and Victorian tobacco soils will be of interest. These analyses were published by Dr. F. J. Howell, then Chemist for Agriculture, in the *Journal* for November, 1904:—

Comparative Analyses of American and Victorian Soils.

—	Kentucky Soil.	North Carolina Soil.
	White Burley Tobacco.	High Grade Yellow Tobacco.
	%	%
Organic and volatile matter	8·462	1·2050
Alumina	4·745	2·4965
Oxide of iron	6·240	0·6275
Lime	·836	0·2330
Magnesia	·798	0·0847
Manganese	·146	0·0417
Phosphoric acid	·231	0·0379
Sulphuric acid	·084	0·0140
Potash	·558	0·5045
Soda	·160	0·2892
Silica	78·100	93·5035

Tobacco Soils, Edi, Victoria.

—	Byrne.	Neylon.	Smith.	Howard.	Hall.	Swan Bros.	Average.
	%	%	%	%	%	%	%
Insoluble matter ..	76·53	54·28	76·41	79·16	83·32	84·12	75·63
Soluble silica	·16	·42	·28	·20	·20	·11	·22
Potash..	·49	·58	·56	·36	·34	·39	·45
Soda	·22	·28	·19	·11	·20	·15	·19
Lime	·38	·53	·48	·52	·22	·23	·09
Magnesia	·40	·51	·44	·45	·28	·32	·40
Manganese oxide ..	·08	·21	·04	·09	·13	·10	·11
Ferric oxide	4·82	15·04	4·86	4·20	3·96	4·00	6·05
Alumina	2·53	7·58	3·78	3·40	2·25	3·25	3·80
Phosphorus pentoxide ..	·34	·48	·32	·35	·18	·17	·30
Sulphur trioxide ..	·09	·07	·08	·10	·09	·10	·09
Carbon dioxide	·65	·09	·06	·01	·05	·08	·05
Water in organic matter	14·09	19·98	12·69	11·16	8·69	7·13	12·29
Nitrogen per cent. in soil	·35	·19	·19	·18	·11	·10	·19
Humus	5·42	5·90	4·27	3·68	2·80	2·25	4·05

A comparison of the average figures of the important plant foods in the six fields with the two American will disclose percentages in the Edi soils practically equalling those of the Kentucky, and considerably surpassing the North Carolina. It is possible that an addition of lime to some of the Edi soils might prove of advantage, but in all other respects the figures would appear to indicate that the use of fertilizers will probably prove of little effect.

The Mechanical Analysis of Edi Tobacco Soils.

As already stated, it is in difference of mechanical rather than chemical composition that we find the most potent influence operating on the physiology of the tobacco plant. The figures giving the results of the mechanical analysis of the six samples, taken from different localities in the Edi district, will give an idea of the general characteristics of the soils of the district in this respect. These percentages, however, have to be considered in conjunction with the meteorological conditions prevailing in the various localities.

The figures above represent what is known as the texture of a soil. A knowledge of the texture of a soil gives a fair, although by no means an absolutely correct, idea of the relative amount of water it will contain. The greater percentage of clay in a soil, the greater amount of water as a rule the soil will hold, and it is owing to these differences in water content particularly, that difference in mechanical composition so profoundly affects the tobacco plant. But the knowledge of the texture alone of a soil is not sufficient to say decisively what the relative amount of water it will contain will be, for this water content is also determined by the structure of the soil, or the arrangement of the soil grains. There are two factors then requiring consideration. The determination of the texture is a laboratory operation presenting no great difficulties. To determine the arrangement of the soil grains is, on the contrary, not an easy task, and the actual relation of the soil to water is best determined by actual moisture tests carried out on the soil itself in the field. Such records of the moisture content of soils in some of the principal tobacco districts of America have been kept continuously for years, and an extension of the system is advocated. As a result of these determinations, the following conclusions have been arrived at. They are given in Whitney's words :—

"Northern Cigar Tobacco Soils.

"Tobacco soils of the best grade in the Connecticut Valley maintain on an average about 7 per cent. of water throughout the season. There are many soils cultivated in tobacco which average 10 or 12 per cent., but these do not produce a tobacco leaf of the finest texture and most desirable quality on the present market.

RESULTS OF THE MECHANICAL ANALYSIS OF SOME OF THE TOBACCO SOILS AND SUBSOILS OF THE EDI DISTRICT.

Diameter of Soil. (Millimetres.)*	Grains.	Conventional Names.	Farms Where Samples were taken. Soils. R. C. Hall, Whitfield.	P. Howard, Cheshunt.	— Byrne, Moyhu.	Edi Tobacco Farm.	Swan Bros., Upper King.	Temple Smith, Cheshunt.	Average of 6 soils.	Subsoils. 6 to 30 inches. R. C. Hall, Whitfield.	6 to 24 inches. P. Howard, Cheshunt.	6 to 30 inches. — Byrne, Moyhu.	6 to 24 inches. Edi Tobacco Farm.	6 to 24 inches. Swan Bros., Upper King.	8 to 36 inches. Temple Smith, Cheshunt.	Average of 6 subsoils.
			1	2	3	4	5	6		1	2	3	4	5	6	
			%	%	%	%	%	%	%	%	%	%	%	%	%	%
2	1	Fine gravel	0·43	0·50	0·54	2·18	1·24	0·17	·84	0·43	0·33	0·80	1·78	1·34	1·39	1·01
1	·5	Coarse sand	1·64	1·56	1·57	4·72	2·49	0·98	2·16	1·46	1·67	0·92	3·19	2·29	2·84	2·06
·5	·25	Medium sand ..	1·86	1·71	0·62	1·57	2·71	1·29	1·63	1·41	2·29	0·76	1·19	2·81	2·78	1·87
·25	·1	Fine sand	7·12	14·28	4·36	18·56	15·70	6·79	9·47	5·88	13·92	5·27	5·56	16·45	11·24	9·72
·1	·05	Very fine sand ..	34·52	39·88	32·70	38·30	41·88	33·30	36·76	32·69	44·26	40·65	29·04	36·43	43·62	37·78
·05	·01	Silt..	33·38	22·50	21·72	17·47	1·39	31·49	21·32	30·42	18·84	23·64	14·97	19·72	12·88	20·08
·01	·005	Fine silt	6·08	1·74	16·79	10·80	19·54	2·10	9·51	5·63	2·88	6·85	20·70	1·38	4·85	7·05
·005	·0001	Clay	4·64	4·68	5·90	6·36	7·17	8·87	6·27	14·84	9·97	14·92	16·75	12·74	13·19	13·74
		Loss @ 110 C. ..	3·36	3·48	4·17	2·37	2·01	5·31	3·45	2·32	1·42	2·33	2·72	2·03	2·62	2·24
		Loss on ignition ..	6·76	9·45	11·27	7·35	5·97	9·28	8·35	4·55	4·75	3·64	4·77	4·34	4·76	4·47

* 1 Millimetre (mm) = approximately $\frac{1}{25}$ inch.

The meadow lands of the Connecticut Valley, which were formerly cultivated in tobacco when a dark heavy leaf was in demand, contain on an average from 20 to 28 per cent. of water. As already stated, these soils are entirely unfit for the production of the grade of tobacco necessary to meet the present market demands.

"The tobacco soils of Pennsylvania are heavier than those of Connecticut Valley, and maintain on an average about 18 per cent. of water.

"The soils of the tobacco district of Ohio are as heavy in texture as the limestone tobacco lands of Pennsylvania. It is probable that the mean water content of these soils in an average season would amount to about 23 to 24 per cent. of water. The tobacco grown under these conditions is used almost exclusively as a filler leaf.

"SOILS OF MANUFACTURING AND EXPORT TOBACCO DISTRICTS.

"The typical soils for the highest yellow tobacco of Virginia, North Carolina, and East Tennessee maintain on an average about 7 per cent. of water. Where the soils contain less than this, the leaf is inclined to be thinner in texture and to have a better colour, but the yield per acre is small, and the most economical conditions on the whole are maintained by those soils having from 7 to 8 per cent. of clay, and maintaining on an average 7 or 8 per cent. of water. As the soil becomes heavier in texture, and the amount of water increases, other grades and types of tobacco are produced.

"The export tobacco lands of Kentucky and Tennessee contain about 22 or 23 per cent. of clay, and, as a characteristic feature, they contain from 40 to 60 per cent. of silt. These soils contain on an average about 15 per cent. of water.

"The characteristic soil of the limestone area of Kentucky, adapted to the White Burley tobacco, may be said to maintain on an average about 20 per cent. of water.

"Records have not been kept of the manufacturing tobacco soils of Virginia, but from investigations which have been made on adjacent lands, it is probable that the mean water content of these soils, having as much as 40 per cent. of clay, will not be far from 20 to 22 per cent. of moisture."

THE MECHANICAL ANALYSIS OF A FEW TYPICAL AMERICAN SUBSOILS.

For comparison with the figures of the Edi soils, the returns are given below of the average results of the mechanical analysis of a large number of typical American subsoils. The very great difference in the relative clay percentage of the various soils adapted to each type of tobacco, will indicate the very important part the physical properties of the soil play in the production of the various characteristics of the product.

Number of Sample.	Locality.	Description.	Moisture in Air—Air-dried Sample.	Organic Matter.	Gravel. (2–1 mm.)	Coarse Sand. (1—0·5 mm.)	Medium Sand. (0·5—0·25 mm.)	Fine Sand. (0·25—0·1 mm.)	Very Fine Sand. (0·1—0·05 mm.)	Silt. (0·05—0·01 mm.)	Fine Silt. (0·01—0·005 mm.)	Clay. (0·005—0·0001 mm.)
			%	%	%	%	%	%	%	%	%	%
44	Virginia & N'th Carolina	Bright Yellow	1·10	2·24	2·57	6·39	13·67	22·02	23·45	14·08	5·43	8·23
55	Kentucky and Tennessee	Export ..	2·23	3·00	·39	·56	·73	1·93	9·50	52·50	6·28	22·59
30	Kentucky and Ohio	White Burley	3·48	4·42	·64	1·63	1·44	1·22	7·04	39·77	9·36	31·62
21	Virginia ..	Manufacturing	5·55	7·87	1·22	2·05	3·47	6·94	9·45	11·29	7·67	44·38

so small, that 1 lb. of the leaf will wrap 500 cigars. At the same time, a cigar made wholly from this class of leaf would not be a good smoke.

Cold rainy weather, especially during the ripening period, is liable to cause acidity in the leaf. This will have a detrimental effect during the curing, and fermentation process, preventing the development of the necessary oxidizing enzymes. Moderate rain with warm weather is the best general condition. Dry weather during the ripening stages assists the formation of bacterial life, and preserves the products required for aroma in tobacco. Dews in autumn also have a good effect on the leaf.

It has not been considered wise to grow tobacco within 30 miles of the coast, yet good leaf is grown in Sumatra and Manila close to the seaboard. In Victoria, too, some good leaf has been grown within a few miles of the sea. Provided the land is not too exposed to wind and the soil does not contain an undue proportion of salt, proximity to the coast should not prevent success in most cases.

So far as frost is concerned we have to remember that the crop is a summer one. Where there is immunity from frost for four to five months in the year tobacco can be grown. The plant is less susceptible to frost than maize, potatoes, and pumpkins, and I have several times seen these crops ruined by frost, while a tobacco crop adjoining has escaped injury.

With regard to moisture, it will be seen from the foregoing remarks that soils too retentive of moisture are not suitable, and that good drainage, either natural or artificial, is essential. The crop does not require a heavy rainfall. Once the young plants are established they are very hardy, will stand a long drought, and respond very fast when the rain does fall. Last season, in the King Valley, the rainfall from the end of October to the end of February, which is the growing season, was only 3 inches, yet the crop was a fair one, showing that a heavy rainfall is not necessary. Where irrigation water can be commanded during a dry time, good results will follow, and two applications with proper cultivation will be found sufficient. The water should not be allowed to lie on the ground—it is wiser to err on the side of too little than too much. Water should never be applied after the topping stage, as it is liable to kill the life in the leaf cells, thus destroying, to some extent, the cure and fermentation process, that are necessary in preparing the leaf for market.

VARIETIES.

In selecting varieties for each particular soil and climate, several matters should be taken into consideration. Lemon bright aromatic wrapper leaf and cigarette leaf can often be produced on the same soil, yet in a country where wages are high, it will pay better to grow for the plug wrapper leaf. The cigarette leaf will require double the labour, owing to the extra number of plants per acre to be handled, the finer texture required in this class of leaf necessitating closer planting in the field.

The varieties suited to the light sandy or slaty soil used for this purpose are Little Oronoco, Yellow Pryor, Bonanza, Hyco, and Granville Yellow. These yield from 700 lbs. to 900 lbs. per acre.

For rich river flats, on which the heavier pipe leaf is grown, it is wise to avoid very heavy dark soils. As the leaf takes its colour largely from the colours of soil upon which it is grown, sandy loams should be used for preference. The following varieties are suitable:—Medley Pryor, Blue Pryor, Lax. These are all heavy yielders, giving from 900 lbs. to 1,500 lbs. per acre of cured leaf for plug tobacco.

For red chocolate soils, Hester and Conqueror, for pipe, yield from 800 lbs. to 1,200 lbs. per acre, cured leaf.

For cigar tobaccoes, the varieties suited to sandy soils, from 70 per cent. to 90 per cent. sand, are Connecticut Seed Leaf, Havana, and Comstock. The greater the percentage of sand the finer the texture of the leaf. At the same time, when the percentage of sand is very high, either regular rainfall is required, or artificial watering. The yield from the first-named is sometimes very heavy, as much as 2,000 lbs. of cured leaf per acre being secured in America. The plant is a vigorous grower in Victoria though somewhat difficult to work, owing to its low habit of growth and the closeness of the leaves on the stem. Comstock and Havana varieties are easier to work, but yield less, 1,400 lbs. being a good crop. All these are grown for both filler and wrapper purposes.

On richer soils, either red chocolate or gravel or strong sandy loams, only filler leaf, or binder, can be grown for cigar making. The best varieties for the purpose are Vuelta de Abajo (known as the sweetest Cuban filler grown in the world), Comstock and Pennsylvania, and yields of from 700 lbs. to 1,500 lbs. are possible.

Only those varieties which have already been proved successful in Victoria, are recommended in this article. These have been selected from about 40 varieties imported from the United States for experimental purposes. There may be many others of the 220 varieties and sub-varieties known, yet to be proved suitable. One important fact to be remembered in growing under new conditions is that a variety, taken from a district where it has proved suitable and sown in a new locality, is liable to lose its useful characteristics after a few years, or it may possibly develop new and better ones. Therefore, the tobacco leaf will require close watching; if it is found to deteriorate it should not be grown from seed taken year after year, but from a crop that has been acclimatized one year, when sufficient seed can be saved to plant the area required for five or six subsequent years. This is not a big undertaking as one good plant will provide enough seed for 10 or 15 acres, and its vitality is remarkable for such a small seed.

The bulk of this work, up to the present, has been done by the Government tobacco farm at Whitfield. Seed has been distributed gratis to more than a thousand applicants during the past five years, but there can be no doubt that growers in different localities could materially assist the industry if they would also undertake this work to some extent under a greater variety of conditions. In order to keep up the standard of quality fresh seed should be imported every fourth or fifth year from those parts of the world where each variety has reached the highest state of perfection.

Seed and Seed Beds.

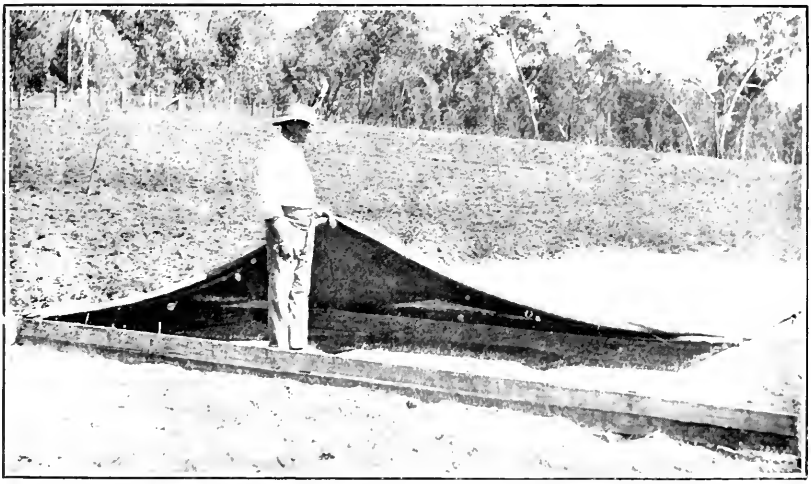
Tobacco seed is so small that between 300,000 and 400,000 are contained in one ounce. Quite 70 per cent. of these are infertile, consequently an ounce of seed will provide sufficient plants for from 7 to 10 acres of heavy tobacco and 2 to 4 acres of cigar tobacco, the latter being planted closer in the field to obtain better texture. The cost of the seed is probably less than that of any other farm crop, being 2s. 6d. to 5s. per oz., or 4s. to 12s. per lb. Seeing that the seed is so cheap, quality should be considered more than quantity. It should be purchased only from reliable sources.

A question that is often asked is, "Can the seed issued in one year be sown the following with success?" Tobacco seed, although so small, has remarkable vitality and will keep for ten years if properly cared for. It should be placed in glass jars when thoroughly dry, and the top screwed tightly down or sealed. The ordinary Mason jam jar is excellent for the purpose.

Rearing the young plants is a somewhat delicate process. I have several times been accused of sending out infertile seed. In no case has this been done, only tested seed being given out. The fact is, the seed being so small, has little store of food to draw upon in itself; the tiny root and leaf are scarcely discernible during the first week's growth, and if during that period the soil is allowed to become dry to a depth of half-an-inch the plant dies and nothing is seen of it. Sometimes small black ants will remove the seed in the same way that they collect the seed of trefoil. In other cases the seed is buried too deeply when sown, and never germinates.

As growing the young plants is, perhaps, the most critical process in connexion with the growth of the crop, it is intended to go fully into a description of the best systems under which to make seed beds and care for the young plants.

An area of 50 square yards will require an ounce of seed, which should provide plants for say 8 acres of pipe tobacco or 4 of cigar. It is always wise to sow twice the quantity required, as it is a great advantage to have



1. UP-TO-DATE TOBACCO BED, SHOWING HESSIAN COVERING.

plenty of plants to draw upon in the event of a fall of rain making the ground specially suitable for planting out at any time. The cost of seed is small as compared with the benefits derived from observing this rule. It is also wise to sow the beds in relays—about three weeks between each seeding. The late plants will be found to come on much faster than those sown early, but it is wise to have them in case of accident to the early beds.

When choosing a site for seed beds, be careful to get a patch of well-drained land, not too close to standing water. Running water does not matter; it is, in fact, an advantage when watering is necessary. Stagnant water is more liable to cause the disease known as Blue Mould—the worst trouble the grower has to deal with in Australia.

A dark sandy loam, or free red chocolate soil, with a northern aspect, is very suitable. Plenty of sun is advisable as the plant likes warmth, and the sun kills the germs of disease. Cold clay soils are not suitable as they are liable to hold water too long and also crack badly when drying. They are also bad to draw the young plants from when ready to transplant, the roots break in the pulling process and the hearts of the young plant are liable to bruising in the effort to release them.

It is a good plan to burn the site of the beds with the object of destroying insects or their larvæ in the soil. The dormant seeds of weeds are also destroyed by the burn, and this will save labour later on in weeding. The potash left in the ashes is an important factor in raising healthy and quickly grown plants.

First scrape all the grass off the plot chosen for plant beds and lay poles 3 to 4 inches in diameter across the land to keep the actual fire just off the ground. This will prevent the danger of too great a fire destroying the organic matter in the soil unduly. Pile rubbish in the shape of bushes, straw, wood, &c., to a height of 4 or 5 feet across the poles, and start the fire on the leeward side in order to get a slow burn. Burned in this way the soil will get a thorough steaming which will practically cook all seeds and insects, to a depth of 3 or 4 inches. The rough ashes should be raked off and the soil worked finely to a depth of 3 inches.

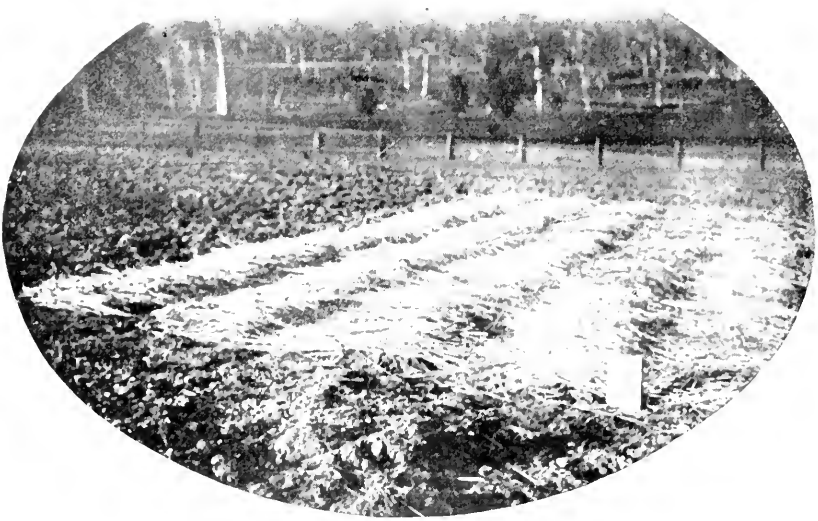
2. ANOTHER SATISFACTORY SEED BED.

Deeper working is not advisable, unless the land has been fallowed previously and commercial fertilizers (bonedust, superphosphate, and blood manure) well worked into the soil. Ordinary farmyard manure is not generally used, owing to the number of weeds liable to follow. Two pounds of bonedust and blood manure to a bed, 10 yards long by 1 yard wide, is a fair allowance on burned ground. If not burned, 1 lb. of sulphate of potash may be added.

The most convenient shape for beds is 1 yard wide to any desirable length. Wider beds are difficult to weed and water when necessary. The pathway between the beds need not be wider than 1 foot so that little space is lost. The shape of the bed will depend greatly on the soil and rainfall. Where the rainfall is heavy and drainage important, raised beds about 6 inches to 9 inches above the surrounding land should be made. Where the natural drainage is good and the rainfall light, level beds give best results, and it is often wise to have both so as to provide for a wet or dry season.

The most satisfactory system now in vogue is the frame bed (see illustration No. 1). It is made of hardwood boards 12 inches deep all round the beds over the top of which cheese cloth or hessian sewn together is stretched after the seed is planted. This system is cheap. The covering is easily and quickly constructed, and saves much time and trouble as compared with other systems in watering and dealing with insect pests. A more uniform temperature is preserved and the loss of water by evaporation is minimised. The cover should be removed a few days before transplanting in order to harden the plants. Choose a dull day on which to first expose the plants.

Many growers simply dig over the soil and sow the seed on the surface, covering with clean straw or grass to a depth of about half-an-inch (No. 3) From these beds good hardy plants are raised, but they are subject to winds and all changes of the weather, which tends to weaken them under certain conditions, and insect pests have free access to them. They are also slower in growing, which means more weeding.



3. PRIMITIVE SEED BED.

The amount of seed to be sown is about a tablespoonful to 50 square yards. The seed is so small that it is necessary to mix it with say twenty times its own bulk of sifted wood ashes, or dry sand, gypsum, or bonemeal, and sow backwards and forwards over the finely prepared surface until the quantity is exhausted. The colour of the sand, meal, or ash will give a fair idea as to evenness. Do not rake in as the seed will not germinate if buried; but on very sandy soils in a dry climate lightly brush the surface and water well. Then, when dry enough, press down close with a board or the back of a spade and put on the cover previously mentioned. In stiffer soils watering will often be sufficient, but pressure on the surface, will generally assist the seed by closing the soil round it, and bringing the moisture right to the surface which is essential during the early stages of growth—a critical time with the plant. The soil should be kept moist, but not too wet, and all weeds must be removed as soon as they can be handled. If the plants are too thick in the beds they will be delicate, so they should be thinned out with a penknife. The rule is to allow each one, as nearly as possible, 1 square inch of space; strong plants may then be expected.

The seed will germinate in from two to six weeks, according to weather conditions, and will take about eight weeks for the plants after germination to arrive at the transplanting stage. Should the seed not germinate well the bed can be resown on the surface and well watered. Replace the covering until the plants are well established and the danger of frost is passed.

Should it be found expedient to hasten the growth of the plants either of the following mixtures will be found to have the desired effect:—Nitrate of soda, 6 oz. in 50 gallons of water, applied to 100 square feet, about once in twelve days; sulphate of potash 8 oz. to 50 gallons of water to 100 square feet, once in twelve days. Care must be taken not to overdo this mixture—either in strength or applications. It should be applied after the plants have sent out the fourth leaf.

Sprouting tobacco seed is not to be commended, as little is gained in time, and plants grown from sprouted seed are often delicate and of bad shape. It can be done, if wished, between flannel with some well rotted wood mould. Keep moist and warm, and in six days the seed will show white specks. Sow at once and water, covering immediately afterwards.

(*To be continued.*)

THE WINE INDUSTRY IN SOUTHERN FRANCE.

DEPARTMENT OF HÉRAULT.

(*Continued from page 671.*)

F. de Castella, Government Viticulturist.

Preliminary Preparation of Vineyard Land.

Trenching and subsoiling are questions which have given rise to much discussion in Victoria, and concerning which different opinions are even now held by experienced vinegrowers. The vital importance of the subject, especially now that the reconstitution of phylloxera-infested vineyards is in active progress, makes it necessary to devote rather more attention to it than it should otherwise receive here.

IS DEEP PREPARATION NECESSARY?

A few years ago it was common to be assured by intending planters, that subsoiling was not necessary under Victorian conditions, that our soils did not require it. No logical reason was given for such a radical difference from what obtains in Southern Europe,* where high summer temperatures and long dry periods, such as we are accustomed to, prevail. Though a healthy change from these views was brought about a few years back, owing to the dissemination of more up-to-date ideas by the officers of the Department of Agriculture, there is in some quarters a regrettable tendency towards a reversion to the errors of the past—in the days of hasty

* The importance of climate is very considerable. In a cold district, such as Champagne (north of France), the land is seldom worked more than a foot deep. In the warm south, 2 feet, and even more, is not considered too deep to be profitable.

plantation of large areas of badly prepared land, the yields from which have inevitably been disappointing and in striking contrast to those of Hérault, the home, as we have already seen, of intense vine culture.

It is true that replantation of the phylloxerated vineyards in the north-east is very generally being made on properly prepared land, a most satisfactory change of opinion being noticeable in this district at any rate. It is also true that nearly all that there is to be said on the subject has already appeared in publications issued by the Department of Agriculture, more particularly in *Trenching and Subsoiling for American Vines**, a work containing very full information on the subject, the study of which is most earnestly recommended to those who are in search of information. During the ten years which have elapsed since it was issued opinions have not in any way changed in Europe; nevertheless, at the present juncture, a few reminders and some further arguments, based on recent research, may not come amiss.

The very fact that the subject is one which receives rather scanty attention in recent French viticultural literature is apt to mislead and to cause its importance to be under-estimated. Its necessity is so universally admitted in Southern Europe that further argument in its favour is needless. No one in Southern France or Spain would think of planting a vineyard without first thoroughly preparing the soil.

Several arguments are, at times, put forward by those anxious to find an excuse for avoiding the initial expense necessary for proper preliminary preparation of their vineyard land. Most of these are completely answered in the Departmental publication already referred to. There is one, however, to which it is well to briefly refer here.

It has several times been suggested to the writer, that the physical nature of some of our soils is such that, even though they be thoroughly worked and loosened to a considerable depth in the first place, after undergoing the consolidating influences of two or three winters the subsoil will have set as firmly as ever; in other words, have become as compact as it was in its natural state.

No doubt, some silty soils do set under the influence of abundant moisture, but never to the same extent as to return to the original state. Every one knows the difference between "made" soil and that which has never been disturbed. A hole which has been filled up again, even though the soil were rammed in the process, is always easier to open up again than the undisturbed ground alongside. The natural arrangement of the soil particles, which it has taken countless centuries to bring about, is evidently different to that of the thoroughly stirred soil, even after this has settled down for several years. The higher level of the surface after trenching amply proves that the internal arrangement must be radically different. In this connexion, the condition of the soil when worked is of very great importance. Any soil is more likely to set if worked in a wet or sodden state, when the effect of subsoiling would be merely to puddle it, whereas, if the operation were carried out when proper moisture conditions prevailed, every part operated on would be thoroughly crumbled and the result would be infinitely more lasting. This phase of the question concerns the season for subsoiling.

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*Compiled and translated from European authorities by Raymond Dubois and W. Percy Wilkinson, Department of Agriculture, Melbourne, 1901. Obtainable from the Secretary for Agriculture. Price 9d., postage 3d.

Even admitting a return to something like original compactness after a few years, the value of deep preparation as a means of promoting the establishment of a drought-resistant root system would alone constitute a sufficient argument against ever omitting it. The recent researches of Professors Degrully and Ravaz, of Montpellier, on the root system of the vine, show clearly how considerable an influence deep preparation can exert in this direction.

In the course of these investigations, which were undertaken in connexion with the solution of a rather different problem*, a careful study was made of the root systems of many different vines, accurate measurements of depth and direction, of all important roots, at close intervals, as they were being uprooted, rendered possible the drawing of diagrams exactly representing the root distribution, with an accuracy hitherto not attempted. Three of these diagrams are here reproduced, with the aid of which a few considerations as to the functions performed by the different roots may be briefly examined. The root system of a vine grown from seed differs much from that of one grown from a cutting, the method of propagation exclusively employed in our vineyards. The tap root, so much in evidence in the former case, no longer exists, its place being taken by a varying number of deeply plunging roots, springing either from the original cutting itself or from larger roots having a more or less horizontal direction. The root system of the cultivated vine is thus made up of two classes of root, viz., lateral or horizontal, and dipping or plunging roots. There is no difference between them in structure; in fact, the boundary line between them is not a hard and fast one, and all intermediate degrees are possible between a directly plunging and a horizontal root. Greater differences are to be found in the functions performed by each.

It has been experimentally proved that the greater part of the plant food the vine obtains from the soil is absorbed during the first rush of active vegetation in spring and before the vine commences to blossom.† The surface soil, being richer than the subsoil in phosphoric acid and nitrogen, it is probable that this absorption is chiefly carried out by the lateral roots in the shallower layers of the soil. Later on, whilst the plant is working up and distributing the substances at first absorbed, the main requirement is water, and this is chiefly supplied by the roots situated in the deeper layers of the subsoil.‡

The greater part of the plant food is thus absorbed by the more or less horizontal roots in the richer upper layers of the soil, more especially those substances present in an easily assimilable form, as well as those resulting from the application of manures. The deep roots, on the other hand, constitute the water supply of the vine, and in a dry climate, such as that of Northern Victoria, the vital importance of having vines amply supplied with deeper roots cannot be over-estimated.

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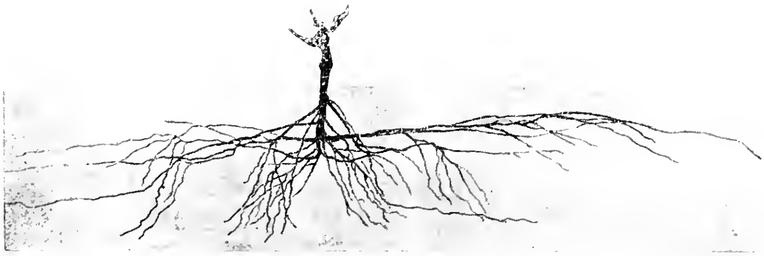
* *Sur la Culture Superficielle de la Vigne*, L. Degrully and L. Ravaz, Montpellier, 1905.

† According to G. Chappaz (*Progres Agricole et Viticole*, Vol. I., p. 521), before flowering the vine has absorbed almost the whole of the phosphoric acid it will require during the year, $\frac{3}{4}$ of its total nitrogen, and $\frac{5}{8}$ of its total potash requirements.

‡ Potash, probably, must also be included here, its absorption continuing longer than that of the other plant food elements, than which it is also more abundantly present in the deeper soil.

As the result of their investigations, in the course of which they examined a large number of different vines, Degrully and Ravaz arrived at the conclusions given below. Though a good deal of difference exists between different varieties, and even between individual vines of the same



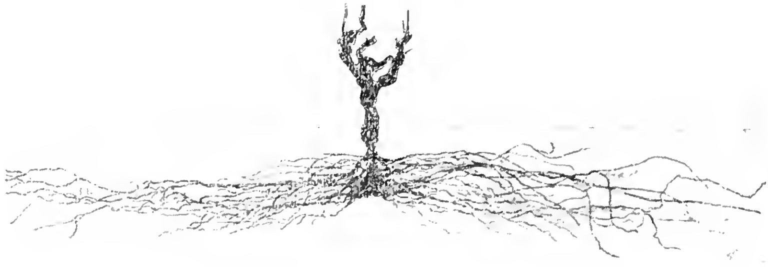
1. ROOT SYSTEM OF RUPESTRIS DU LOT.

variety, in a general way the bulk of the roots of a vine tend to group themselves at a uniform depth, and that this is not far from the surface.

In all the species of vines which we have studied—

1. Roots originating near the surface make at first an acute angle with the vertical. They tend to plunge.
2. Roots originating more deeply, at a level varying according to the cultivation of the soil, are directed at right angles with the vertical. They spread horizontally.
3. Roots originating still more deeply make an obtuse angle, with the vertical. They tend to rise, describing a curve which is the reverse of that formed near the surface.
4. All roots establish themselves, after a time, at the same level, which is no doubt variable . . . but which is fairly close to the surface.
5. From these principal and mainly horizontal roots (*tracantes*) spring, at intervals, other roots (*racines plongeantes*) which plunge into the deepest parts of the soil.

From a comparison of Figs. 1 and 2 it is evident that the root system of Rupestris du Lot, in which plunging roots are largely represented, is far better able to resist drought than that of Vitia Riparia with its horizontal roots. This is abundantly borne out by what actually happens, and, as every one knows, V. Riparia has proved an unsuitable stock in any but deep, moist soils. So much for the influence of variety. But vines of



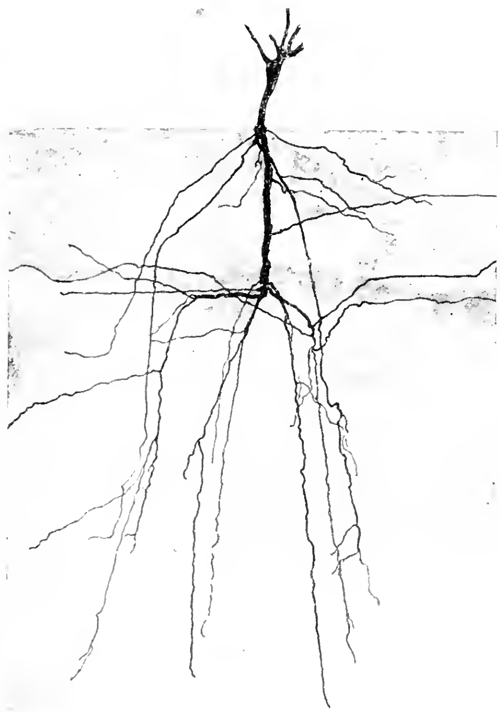
2. ROOT SYSTEM OF V. RIPARIA (18 YEARS OLD).

the same variety, grown in different soils, will not behave alike. Unless the plunging roots found a subsoil into which they could penetrate, it would not be possible for the roots to establish themselves as in Fig. 2. Deep preparation is the most powerful factor in facilitating penetration;

this is very distinctly shown in Fig. 3, concerning which Degrully and Ravaz say—

The roots of young plants raised in a nursery are . . . distinctly plunging. When the soil is favourable they penetrate to a depth of more than 3 feet the same year that they are planted, and this is what all nurserymen know very well.

The difference between the root formation of young vines in subsoiled or unsubsoiled land is too evident, almost, to need pointing out. The vine will always form enough surface feeders or horizontal roots; the difficulty is to get the deep ones properly established, and this from the moment the vineyard is planted. If the ground is penetrable only during the first seasons, this desirable end will be achieved. Even if the soil should set to a considerable extent later on, the deep roots will remain where they have once penetrated and confer upon the vineyard a resistance to drought which it could not otherwise possess.



3. ROOT SYSTEM OF YOUNG VINE (RUPESTRIS DU LOT) PLANTED ON DEEPLY WORKED LAND.

Large areas of very sandy soil exist in the neighbourhood of the rivers Murray and Goulburn. On these wind-formed sand hills, or pine ridges, as they are often called, from the Murray Pines (*Callitris verrucosa* and others), which grow spontaneously on them, many successful vineyards have been established without much care having been given to the preparation of the land. No doubt, in such easy penetrable soils, subsoiling is not so vitally necessary as in stiffer ground; nevertheless, even here, the advantages to be derived from it would amply repay its cost, which, owing to easy execution, is not considerable. Such, at least, is the opinion of Professor G. Foex, the celebrated French authority, who writes as follows concerning the preparation of land for the establishment of the coastal vineyards near Montpellier; planted in almost pure sand, in which immunity from Phylloxera permits the growing of non-resistant French varieties, on their own roots:

Even sea sands, which are so loose that one is obliged to artificially fix the surface,* furnish an infinitely more vigorous vegetation and a much superior yield, when they have been trenched than when they have only been ploughed superficially.

* The cutting effect of the particles of wind-blown sand on the tender shoots is such that the forcing of a certain quantity of rushes into the surface, by means of a special implement, is a regular cultural operation in these coastal vineyards.

Further argument in favour of deep preparation should scarcely be necessary. Those still in doubt may, however, ask themselves if it be logical to suppose that the vast sums expended on the work in the warmer parts of Europe, as the outcome of centuries of experience, are merely so much money wasted? And to remember that scientific opinion has, without exception, not only confirmed but emphasized the views arrived at by generations of practical men.

Looking at it from a purely business standpoint, a very small increase in yield is needed to pay interest on the money spent on proper preparation—say, £3 to £5 per acre. Instead of the few shillings required the increase will certainly amount to several pounds.

Vines will, no doubt, grow and bear fruit on inadequately prepared land, but, to ask them to do their work under such conditions would be a return to the haphazard, thriftless methods of the past, which, not only in viticulture, but in all rural industries, must gradually give way to intense culture.

Exceptions.—Only two cases are admitted by French authorities as being exceptions to the universal rule of deep prepartaion. One is the class of hillside soils known as *Garrigues*. Here, the surface soil, shallow in depth and often mixed with small stones, overlays deeply fissured limestone rock, into the crevices of which the roots can readily penetrate. Soils which can be compared to these, although the geological formation is widely different, are to be found in North-eastern Victoria. On some of the Silurian hillsides, near Rutherglen, for example, in what, at first sight, appear to be very dry situations, vines grow luxuriantly on ground which was neither trenched nor subsoiled. The subsoil, however, is a mass of broken rock more or less intermixed with loose soil. The conditions are much the same as in the French *Garrigues*, and deep preparation does not appear to be more necessary in the one than in the other. The second exception is where permanent underground water is to be found at a small depth, a case not frequent in Australia.

Deep Working for Irrigation.

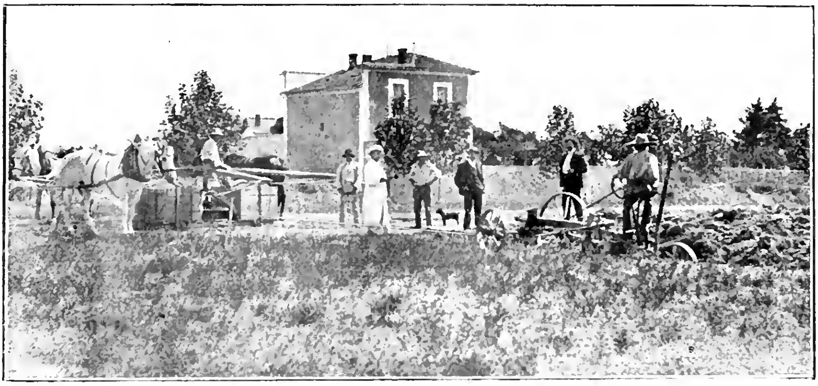
The above applies to situations where artificial watering is not possible. Even in irrigated vineyards, deep preparation is most certainly to be recommended, though the fact is not yet generally admitted in our irrigation districts. No doubt, heavy yields can be, and are being obtained, on land which was simply ploughed to a depth of 6 or 8 inches before being planted. It is under these conditions that yields most nearly approaching those of Hérault are obtained in Victoria.* Nevertheless, the quantity of water used is lavish and the number of applications greater than is desirable, and this often on soils physically most suitable for irrigation.

Better quality fruit is undoubtedly obtained if the final watering is given as long as possible before the grapes ripen. In many of our present irrigated vineyards the vines hold out signals of distress, in the way of wilting foliage at the hottest time of year, and compel the giving of a watering, not long before the grapes must be gathered. The undesirable effects of such a course may not be very noticeable in the case of dried grapes, though, even here, the better the fruit the better the grade obtained. In the case of table grapes, and more particularly of the shipment of fresh grapes, an industry as yet only in its infancy in Australia, and which has an enormous future before it, the injurious effect

* Yields of 3 tons to the acre of dried currants have been obtained at Mildura, equivalent to nearly 9 tons per acre of fresh fruit. 3,000 galls per acre, a very heavy yield near Montpellier, would, on the basis of 77 per cent. of wine, be equivalent to 17 tons of fresh grapes.

of late waterings on the carrying power of the grapes will no doubt prove of capital importance. At least this is the lesson to be learnt in Southern Spain, the birthplace of the fresh grape shipping industry. In Almeria, one of the hottest and driest parts of Spain, the vines are planted on deeply-worked land and the final watering is given in June (December in Australia).

In irrigated vineyards, deep preparation, by insuring a more satisfactory root system (p. 757), and by facilitating penetration and retention of water, will enable equal, if not superior, results to be obtained from the use of considerably less water. As our irrigated areas increase, and such an increase is even now actively encouraged, a time will inevitably come when our present prodigal methods of irrigation will require modification, in order that all demands for water may be met. Even if the supply of water be ample, however, it is evident that the smaller the quantity used the greater the economy. It is worthy of note that, in



4. TRENCHING WITH HORSE WINDING GEAR NEAR MONTPELLIER.

the submersion vineyards of Southern France, where Phylloxera is combated by flooding for six weeks during the winter, the land is trenched to a depth of 60 centimetres (23½ inches) before plantation.

SOUTHERN FRENCH METHODS.

In the whole of the "Midi" (South), deep preliminary preparation is, with the two exceptions above referred to, invariably carried out before a vineyard is planted. The depth of the work varies as a rule between 50 and 60 centimetres (19½ inches and 23½ inches), though it is sometimes carried to an even greater depth. As regards methods of carrying out the work and the plant employed, there have been practically no new developments since the issue by the Department of *Trenching and Subsoiling for American Vines*, in which the leading systems are very fully described. Large vineyards are usually trenched by steam; winding by a cable is invariably practised and never direct draught by the traction engine. Both the double and single engine systems are employed; in the latter case the cable works over an anchor which is moved each time a new furrow is opened, the plough being either hauled back empty with horses, or a reversible plough is used, in which case working is continuous, alternate furrows being ploughed in opposite directions. The double-engine system is already familiar in Victoria.

Horse-driven winding gears or horse gins (*Treuils*, as they are known in French) are largely used; especially by small growers. These also are fully described in *Trenching and Subsoiling for American Vines.* It is to be regretted that this type of machine has not yet found its way to Australia, since it presents several valuable features. The system is extremely simple, the main principle being the multiplication of the horse-power the grower has at his disposal. As in all similar cases, the gain in power is accompanied by a corresponding loss in speed. In France, a small grower who has trenching to do hires a plant and does the work with his own horses in a slack season. In this way it costs him considerably less than if he engaged a contractor with an elaborate steam plant. The slow pace at which the plough moves is a distinct advantage in soils containing stumps or stones, since the horses can be stopped when an obstacle is encountered without danger of breakages.

5. FRONT VIEW OF FRENCH PLOUGH SHOWN ON PREVIOUS PAGE.

On page 759 is an actual photograph of one of these plants manufactured by Pelous Frères, of Toulouse, at work. In this case three horses and wo men were able to do 1 hectare ($2\frac{1}{2}$ acres) in twelve days of eight hours each. The work was being very well done to a depth of $19\frac{1}{2}$ inches. The land, an old lucerne patch, was exceedingly stiff and compact; as hard, in fact, as any I have seen in the Rutherglen district. It was then perfectly dry, the date being 2nd August (2nd February in Australia). As soon as the plough was wound up to the horseworks, one horse was employed to haul it back to the other end of the row, a special arrangement permitting of its being rapidly lifted out of the ground. The diagram reproduced from Guyot's catalogue gives an idea of the arrangement of gin, anchors, and plough.

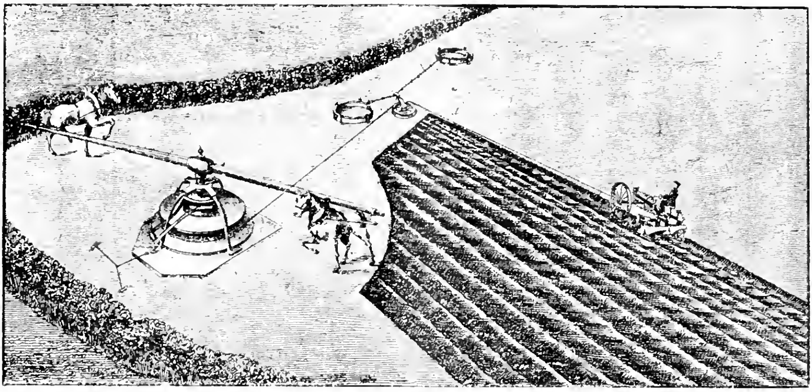
Trenching or Subsoiling.

In France, in the majority of cases land is trenched, the subsoil being brought to the surface. The ground is actually ploughed to the full depth to which it is worked. The plough shown in Fig. 5, the same which is shown on a smaller scale in Fig. 4, is the type generally used.

French preference for trenching is in marked contrast to Victorian experience, which has proved subsoiling* to be more suitable in nearly all our soils. This difference is probably largely due to the fact that the geological formations in the two countries are so widely different. It must also be remembered that most of the vineyard lands of France have been under cultivation at one time or another for many centuries past.

* Subsoiling should scarcely need defining here. By this term is understood the stirring of soil and subsoil to the desired depth, but without altering the natural position of the different layers. Usually, the surface is ploughed with an ordinary plough, the subsoil being worked by a special implement, which stirs it without bringing it to the surface. The two implements may be separate or they may be combined in what is then a subsoil plough. There are several types on the market.

At each plantation the ground has been deeply worked, all parts being thoroughly mixed. There is no longer the marked difference between soil and subsoil which characterizes our virgin lands. Our often more or less silty subsoils, if brought to the surface, render this liable to set after rain. Cases are often met with where the land has been actually spoilt by costly trenching, such as would have given excellent results in France. Each case has to be treated on its merits, and, even in France, one occasionally meets with soils for which subsoiling is prefer-



6. SUBSOILING WITH HORSE WINDING GEAR.

able to trenching. The amount of power necessary in order to work to a given depth is much the same in the two cases.

COST OF TRENCHING IN FRANCE.

This fluctuates considerably, according to the activity of the demand for the work. Ten or fifteen years ago, when the reconstitution of hundreds of thousands of acres was in active progress, contractors with large steam plants usually charged from £4 to £4 16s. per acre for trenching to a depth to 60 to 70 centimetres ($23\frac{1}{2}$ to $27\frac{1}{4}$ inches). At the time of my visit (1907), owing to the number of plants which were idle, contractors could be found to take on the same work at the very reasonable price of £2 8s. per acre.*

SEASON FOR PREPARING LAND

This, the last point we have to consider, is one of the most important, and one which does not always receive due attention from intending planters in this country. Two principal mistakes are made :—

1. The land is worked when it is in an unfit state.
2. It is worked too short a time before plantation.

The drawbacks of subsoiling when the land is wet or sodden have already been referred to (p. 754). Unless the ground be in a crumbly condition good results cannot be obtained. Summer time is really the best time to prepare land. Even though, at this season, rather more power is required, it is amply repaid by the greater efficiency of the work. The ground, under the action of the autumn and winter rains, is in excellent order for planting in the following spring. The trenching

* J. Farcy, *Revue de Viticulture*, 17 Jan., 1907.

illustrated in Fig. 4 was being done in midsummer. As I was informed by one of the owners, who were doing their own work, "*il faut que le sol se refasse*" (the ground must remake itself). Summer trenching is a very common practice in Europe. In Spain, the word *Agostar*, which signifies to trench, has for its literal meaning "to work the soil in August" or midsummer.

It is always well to work the land a considerable time before plantation. After preparation an excellent course is to sow a crop of wheat or oats on it before plantation. By cutting this for hay the land is very efficiently cleaned from weeds. In Victoria it is quite common to see land subsoiled in July and planted the following month. Especially in a dry season, cavities are left in the subsoil which have not had time to fill and which constitute so many air chambers, rendering it exceedingly difficult for the young vine to thrive. The unsatisfactory growth of many young plantations is traceable to these causes. The stiffer the land, the greater is the need for working it some time beforehand and for paying careful attention to its condition as regards moisture.

(*To be continued.*)

IRRIGATION.

C. H. Tolley, Manager, Wyuna Irrigation Farm.

(*Continued from page* 689.)

Levelling Staff.—The staff may be any piece of straight well-planed softwood timber, and can if desired be graduated by the farmer himself. Half inch, $\frac{5}{8}$ in., or $\frac{3}{4}$ in., will be found the most convenient thickness, and of such length as will resist the tendency to bend, and 3 in. wide. To prevent the end sinking into soft ground, attach a piece of red-gum or other hardwood 3 in. x 3 in. x 2 in., and shoe it with a plate of thin metal.

17. Foot for home-made staff.

Staves are all graduated in feet and decimals. Feet and inches may be used, but decimals are much more convenient for working out subsequent results. The following drawing shows method of graduation. The large etched number, "3," generally painted red, represents feet. Black numbers represent tenths of feet, each horizontal line being one-hundredth of a foot. Thus, a reading of the staff at the point marked "A" is 2.96 feet; at B, 2.80 feet, and so on. If a staff is made as described above, the graduations are most easily marked by means of a stencil covering 1-10th of a foot or more, and repeated along the length of the face. Such a stencil can be conveniently cut in a small sheet of thin zinc or copper, or in a piece of oiled paper such as is used in offices with copying letter books. When using the stencil, first carefully measure off and mark the staff at foot intervals, and try the spacing of the stencil before applying stencil brush. Any good black paint will do; the numbers can be painted on when the stencil work has dried. When the whole is dry, cover with at least one coat of clear varnish to preserve from the

18. Graduation levelling staff.

weather. Such a staff will be found both durable and satisfactory. Face graduations printed on paper may be purchased from an instrument maker, but are apt to become distorted when being pasted on.

The best staff is of course that commonly used by surveyors and others, and the most convenient length is 14 feet. It is made on the telescopic principle and when closed is about 5 feet long. Second-hand staves such as these may be bought for about 15s.

Although it appears a simple matter to hold a staff for instrumental observation, care is necessary to insure reliable results, and particularly when the survey is of some extent. The staffman must stand behind the staff and face the level, holding the staff at about breast height with both hands, and keeping the fingers clear of the graduated face. The staff must rest on a firm footing and be held truly vertical, and at all terminal readings, usually the last reading before the level is moved, a small peg should be driven leaving its head slightly above the surface before that reading is made, or some solid object should be chosen, so that when the staff is again read at the same point from another position, there shall have been no movement. With a telescopic staff make sure that the catch holding the leaves in position is acting. It is not often that more than 6 or 8 feet of a staff is used. A little practice will insure a habit of holding it correctly, but if considerable accuracy is desired, the staffman should be provided with a plumbob to check verticality, and in soft ground should see that no mud adheres to the foot of the staff. However, as a rule, a farmer does not require a great deal of nicety when attempting grading work, and some of these pointers may be neglected.

By reference to the plan (No. 12) it will be observed that every peg has a particular designation and is easily referred to. Thus, all lines running E. and W. are numbered 1, 2, 3, &c., and those running N. and S. are numbered a, b, c, &c., and the pegs at the intersections are conveniently known as 1a, 1b, 1c, or 2a, 2b, 2c, as the case may be.

Level Book.—To make this clear a specimen page of level book is appended and indicates how the observations are entered and converted into "Reduced levels," such as are shown on the plan. Books already ruled may be purchased cheaply at any leading stationers. When ordering, send copy of the form here used, as there are others which might easily lead to confusion.. By the term "Reduced levels" is meant that all levels are reduced to some common point of origin, rendering comparison of points at any part of the survey merely a matter of inspection. Thus the "R.L." at peg 0a is 100.00 feet, while that at 7h is 100.97 showing that the last point is the higher by 0.97 feet, practically 1 foot.

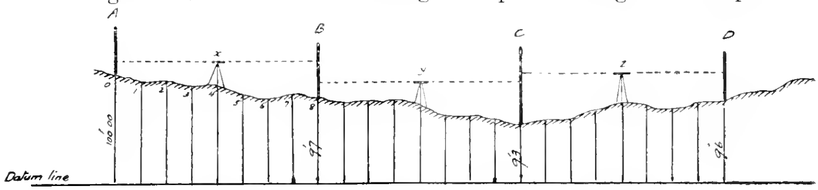
Surveyors and engineers take for the origin of their levels the mean level of the sea, hence in all subsequent operations their height above sea-level is apparent. But, to the man on the land, this is usually a matter of indifference and any convenient height may be assumed, as in the present case at 0a where 100.00 feet has been adopted. It is merely a means of making successive levels comparable, and may be any number or height the observer chooses, but it is important that, once chosen, it should be followed up, or confusion and much annoyance may arise. Frequently, when giving addresses on the subject of levelling, I have had the greatest trouble in making it clear that the staff readings are merely a means to an end—the determination of "Reduced levels." And also, to make it

SPECIMEN OF PAGE OF LEVEL BOOK.

Distance.	Back Sight.	Inter-mediate.	Fore Sight.	Rise.	Fall.	Reduced Levels.	Remarks.
	5·30	..	..	..	..	100·00	Point 0a
	..	5·14	..	·16	..	·16	,, 1a
	..	5·30	..	..	·16	·00	,, 2a
	..	5·30	..	..	..	·00	,, 3a
	..	5·34	..	..	·04	99·96	,, 4a
	..	5·38	..	..	·04	·92	,, 5a
	..	5·36	..	·02	..	·94	,, 6a
	..	5·51	..	..	·15	·79	,, 7a
	..	5·02	..	·49	..	100·28	,, 7b
	..	5·10	..	..	·08	·20	,, 6b
	..	5·01	..	·09	..	·29	,, 5b
	..	4·93	..	·08	..	·37	,, 4b
	..	5·04	..	..	·11	·26	,, 3b
	..	5·02	..	·02	..	·28	,, 2b
	..	4·99	..	·03	..	·31	,, 1b
	..	4·92	..	·07	..	·38	,, 0b
	..	4·56	..	·36	..	·74	,, 0c
	..	4·37	..	·19	..	·93	,, 1c
	..	4·50	..	..	·13	·80	,, 2c
	..	4·44	..	·06	..	·86	,, 3c
	..	4·53	..	..	·09	·77	,, 4c
	..	4·55	..	..	·02	·75	,, 5c
	..	4·65	..	..	·10	·65	,, 6c
	..	4·70	..	..	·05	·60	,, 7c
	..	4·37	..	·33	..	·93	,, 7d
	..	4·32	..	·05	..	·98	,, 6d
	..	4·34	..	..	·02	·96	,, 5d
	..	4·16	..	·18	..	101·14	,, 4d
	..	4·21	..	..	·05	·09	,, 3d
	..	4·15	..	·06	..	·15	,, 2d
	..	4·09	..	·06	..	·21	,, 1d
	..	4·20	..	..	·11	·10	,, 0d
	..	4·02	..	·18	..	·28	,, 0e
	..	4·03	..	..	·01	·27	,, 1e
	..	4·16	..	..	·13	·14	,, 2e
	..	4·21	..	..	·05	·09	,, 3e
	..	4·13	..	·08	..	·17	,, 4e
	..	4·26	..	..	·13	·04	,, 5e
	..	4·21	..	·05	..	·09	,, 6e
	..	4·32	..	..	·11	100·98	,, 7e
	..	4·46	..	..	·14	·84	,, 7f
	..	4·33	..	·13	..	·97	,, 6f
	..	4·21	..	·12	..	101·09	,, 5f
	..	4·14	..	·07	..	·16	,, 4f
	..	4·11	..	·03	..	·19	,, 3f
	..	4·09	..	·02	..	·21	,, 2f
	..	3·98	..	·11	..	·32	,, 1f
	..	3·93	..	·05	..	·37	,, 0f
	..	3·76	..	·17	..	·54	,, 0g
	..	3·69	..	·07	..	·61	,, 1g
	..	3·96	..	..	·27	·34	,, 2g
	..	3·89	..	·07	..	·41	,, 3g
	..	3·84	..	·05	..	·46	,, 4g
	..	4·08	..	..	·24	·22	,, 5g
	..	4·22	..	..	·14	·08	,, 6g
	..	4·33	..	..	·11	100·97	,, 7g
	..	4·33	..	..	..	·97	,, 7h
	..	4·25	..	·08	..	101·05	,, 6h
	..	4·24	..	·01	..	·06	,, 5h
	..	3·99	..	·25	..	·31	,, 4h
	..	4·05	..	..	·06	·25	,, 3h
	..	3·92	..	·13	..	·38	,, 2h
	..	3·55	..	·37	..	·75	,, 1h
	..	..	3·56	..	·01	·74	,, 0h
	1·74	..	..	4·29 1·74	2·55		

NOTE.—The figures 1·74 will be noticed at foot of column. In the first case, they indicate the difference between Back Sight and Fore Sight; in the second, difference of summation of Rise and Fall columns, and are equal. The summation of the Rise column being greatest, indicates a rise as shown by the last Reduced Level, 101·74, which is 1·74 greater than the first Reduced Level. This proves that the Reduced Levels have been properly worked out, and is a check that should never be neglected.

comprehensible, that it is of no importance what the height of the instrument may be. The *difference in readings* will be the same in any case. Then, again, the shifting of the level from one point to another has been a stumbling-block, which the following example is designed to explain.

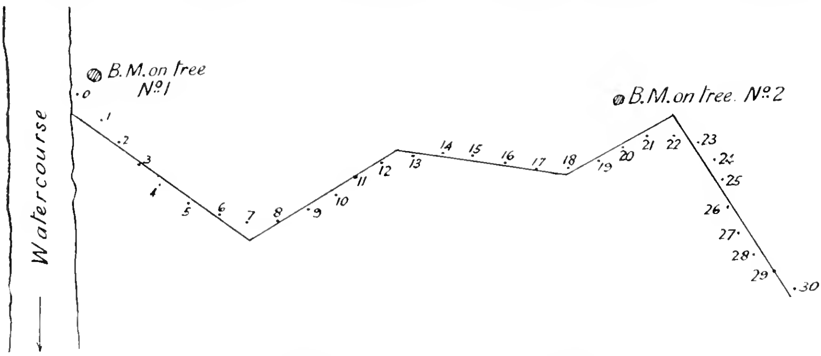


19. METHOD OF TAKING A SERIES OF LEVELS.

The etched line represents the earth's surface, as would be seen by an observer located in a railway or other cutting. The *datum line* or line of reference is made 100 feet below the surface at A. With the instrument set up at x between the points A and B and carefully levelled the dotted horizontal lines represent the lines of sight, parallel with the datum line, consequently if a reading of the staff at A were 2 ft. and at B 5 ft., B is lower than A by 3 ft., and the surface of the earth at that point is 100 ft. − 3 ft. = 97 ft. above datum. The instrument is then moved forward to y, and a reading is taken at B on exactly the same spot as the previous reading and is 2 ft.; the reading on C is then taken and found to be 6 ft., consequently C is 4 ft. lower than B and the surface at C will be 97 ft. − 4 ft. = 93 ft. above datum. Move the instrument forward again to z and the readings on C and D are respectively 7 ft. and 4 ft., consequently D is 3 ft. higher than C and the surface at D will be 93 ft. + 3 ft. = 96 ft. From the drawing it is now obvious that C is 7 ft. and D is 4 ft. lower than A, and that the system may continue to infinity. The vertical lines shown intermediate to the points A B C D may be any distance apart, according to irregularities of natural surface, but are generally 1 chain in flat country, and when levels are required at these points, or any other points in the same series, according to the degree of minuteness with which it is required to determine the surface, they are all entered in the "Intermediate" column of the level book as shown in the specimen given below, and their respective R.L.'s ascertained by successively adding "Rises" and deducting "Falls" from the original "Reduced Level" 100.00.

Distance.	Back Sight.	Intermediate.	Fore Sight.	Rise.	Fall.	Reduced Level.	Remarks.
0c	2.00		...	...		100.00	Station A Point 0
1c		2.40	...	...	.40	99.60	" " 1
2c	...	2.40	...	.		99.60	" " 2
3c	...	2.50	..	...	.10	99.50	" " 3
4c	...	2.55	...		.05	99.45	" " 4
5c	...	4.50	...	...	1.95	97.50	" " 5
6c	...	5.10	...	..	.60	96.90	" " 6
7c		4.70	...	.40		97.30	" " 7
8c	2.00	...	5.00		.30	97.00	" B " 8
16c	7.00	...	6.00		4.00	93.00	" C "
24c	...	...	4.00	3.00	..	96.00	" D "
...	11.00	...	15.00	3.40	7.40	...	...
			4.00		4.00		

The "Remarks" column indicates the places at which the staff was held. There was no necessity to write in "Point 1, 2, &c., as the "distance" column already shows the measurements in chains, but it was added in the endeavour to make everything clear. The first of a series of readings is always called a "Back sight" and the last a "Fore sight," all others being "Intermediate" no matter where taken. The R.L.'s are found by adding or subtracting the rises or falls deduced from successive sights. If it becomes necessary to turn over a leaf of the level book, enter the last sight taken before doing so as a "Fore" sight and on turning over enter it again at the top of the page as a "Back" sight and proceed with the series of readings as before. To prove that your work is correct as shown in level book, add up the columns marked "Back sight, Fore sight, Rise, and Fall." The differences between the first two and the second two should be equal and equal also to the difference between the first and last R.L., as shown in the specimen of level book. This should be done on every page. It is well to remember that when a Fore sight is greater that a Back sight it indicates Fall, and *vice versâ*. With the aid of the drawings and specimen pages given, and with a little practice, it is hoped that the operation of taking a series of levels over



20. SETTING OUT A CONTOUR CHANNEL.

any piece of country has been so explained and simplified as to remove many imaginary difficulties and to encourage land-holders to attempt it for themselves.

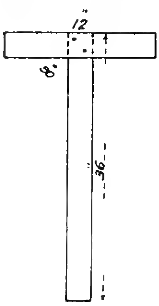
Further on will be found a drawing showing *level* contours, and later, level head ditches are referred to. Such contour or level lines may be projected over country independent of any system of chessboard levelling. Starting from some point selected for its convenience for distributing a supply of water, set the instrument up distant therefrom about 4 or 5 chains and as nearly on the same level as the eye can estimate. Read the staff at the initial point and cause the staffman to pace along the estimated line, one or two chains, or more or less according to the accuracy of location desired. Cause him then to move the staff up or down the slope of the land and as nearly as may be at right angles to the estimated course, until the staff reading shall coincide with that first taken. Fix a stake there (stakes 24 ins. or 30 ins. long are convenient) and repeat until he shall have reached 8 or 10 chains, *i.e.*, 4 or 5 chains beyond the instrument. At that point cause him, in addition to a stake, to fix a short peg flush with or slightly above the surface of the ground, the top of which shall give the same staff reading. Repeat the process as far as may be necessary, and it will be well to number the stakes consecutively, starting with o at the initial station. By thus identifying them it simplifies references should it be desired to lay off laterals from the original line. With the stakes all in position, it is a simple matter to average them and produce a series of straight lines, shorter or longer according to the natural slope of the country. An example is given on the opposite page. With the plough mark out the straight lines shown, but making easy curves or bends at each angle, or bend, and proceed to construct a head ditch or channel as described later.

Contours.—Where water has to be carried some distance as in a channel, "contours on grade" are marked out, *i.e.*, contours having a regular fall per mile. The only variation from the method above described is to make the staff reading on each *change* peg (that is, the last peg before moving the instrument) that proportion of the amount of fall per mile determined upon, that the distance between back and fore sights bears to one mile. For example, assuming the desired fall to be 6 inches = .50 ft. per mile, and that the distance between back and fore sights is 8 chains. If the staff-reading at original peg No. 0 is 4.50 ft., then the peg at 8 chains, No. 8 (= 1-10th of a mile), must be set so that the staff reading is 4.55 ft., or .05 ft. lower (= 1-10th of .50 ft.). The intermediate stakes Nos. 1 to 7 may all be set at the original staff reading of 4.50 ft.; in the majority of cases nothing is gained by interpolating values for them. The process may of course be continued to infinity, but to guard against errors and to provide easy reference for any extension of the system afterwards, or the determination of foundations for works such as bridges, culverts, &c., it is well to take note of the levels of some fixed points at intervals of 20 or 40 chains along the route. Such fixed points are called Bench Marks (written B.M.) and are conveniently cut upon existing trees, and in such a manner that the bark is removed from live trees as shown by the shield in the drawing. The wood is cut into far enough to admit of a small bench being left at the foot upon which the staff is held. Letters are cut in the barked space as may be desired. Where there are no trees fix permanent posts or pegs, and always in such positions right or left of the route that they will not be disturbed in the course of building the channel. These B.M.'s will have a permanent R.L. (reduced level) and are easily recorded in the level book for future reference.

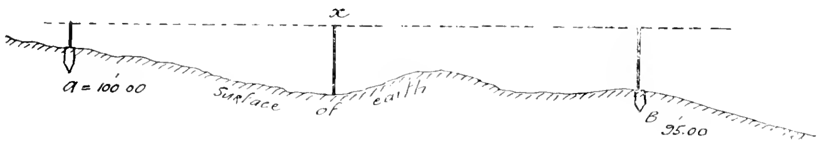
21. BENCH MARK ON TREE.

Boning Rods.—There is, however, another way by which a fairly accurate knowledge of the surface may be ascertained where a land-holder may not have an instrument at command, but it rests on the pre-determination of some points with the level. The cost of establishing these points would be very small compared to that of engaging a surveyor to make a chessboard survey of the whole area. I refer to the use of "Boning Rods," so familiar to contractors.

A boning rod is easily made from a piece of flooring board or any other handy timber and will be best understood from the sketch. The size may be varied to suit the needs of the operator. With a set of 3 of these rods and a few points whose level is known it is a simple matter to determine a series of points over small areas. The following sketch will serve to show the method of working along a particular line, and having other fixed points it may readily be inferred that any number of interpolations are possible. Take the case of a block of land 10 acres in extent and measuring 10 chains square and having known levels established at its four corners. It is required to ascertain the surface inequalities along one of the sides. A and B are pegs 10 chains apart whose levels have been ascertained to be 100 ft. and 95 ft. respectively. Fix a 3-ft. boning rod at A, B being 5 ft. lower; the boning rod to be fixed there must be made 8 ft. long by temporarily nailing on a piece of quartering. Then the line of sight over the cross-bars of the boning rods, shown dotted above, will be horizontal, and it follows that another rod held at some intermediate point (as at x) and made to coincide with the dotted line will indicate the difference of level. Measure the x rod, subtract 3 ft. (height of the rod at A) and the difference is the number of feet



22. BONING ROD.

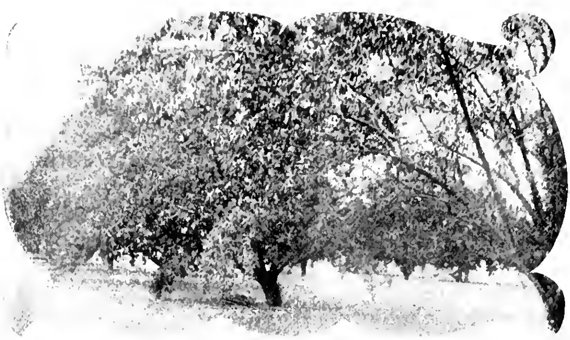


23. LEVELLING WITH BONING RODS.

the surface at x is below that at A. Sometimes the rods are rather difficult to see for any distance, but that may be largely got over by wrapping the head of the rod with a piece of white or coloured paper and sighting towards that one the sun may be shining on.

There are various devices for taking levels by means of an ordinary carpenter's level fitted with sights; glass tubes set vertically and connected to a horizontal metal tube and partly filled with water, &c., but I do not know of any that are reasonably satisfactory. My advice is to dispense with all makeshifts and face the expense of a surveyor's level.

(*To be continued.*)



SOME NOTES ON AUSTRALIAN METEOROLOGY AND WEATHER FORECASTING.

H. A. Hunt, Commonwealth Meteorologist.

The continent of Australia, by reason of its insularity, geographical position, and absence of extreme physiographical features, is freer from extremes of climate and violent wind experiences than any of the others. There is not, therefore, the occasion here for the elaborate system existing in America for giving warning of blizzards and of the devastating floods which occur in its mammoth rivers, nor is it necessary to have the extraordinary cyclone warning system of the Indian Meteorological Service. Nevertheless, we have our weather troubles, though they be of a character less severe than those of may less favoured countries.

Australia lies in the path of what is known as the dry southern anti-cyclonic belt, *i.e.*, the region of high barometric pressure lying between the regions of the south-easterly and the westerly trade winds of the southern hemisphere.

If the course of this high pressure (which is composed of immense anti-cyclonic links) were uniformly regular both in latitude and daily rate of progression, our continent would undoubtedly be dry and arid, and forecasting of the weather would be very simple, but, fortunately for Australia, the movements of those anti-cyclonic links when traversing Australia are erratic, and swing to and fro between the equator and the South Pole, thereby bringing the equatorial and antarctic low pressure belts with attendant and abundant rains alternately over southern and northern parts of the continent. The north-eastern half of Australia mainly benefits from the equatorial intrusion during the summer months and the south-western half, *i.e.*, roughly, south of a line joining Geraldton, in Western Australia, and Cape Howe, on the New South Wales coast, from the Antarctic intrusion during the winter months. Farmers and pastoralists may, therefore, reasonably look for their best seasonal rains according to the relation of their holdings on or near to this line.

It is regrettable that, owing to the infancy of the science of meteorology, together with the complexity and the evasiveness of the subject, no law in any part of the world has yet been established that will justify reliance being placed upon seasonal forecasts. The value of such forecasts is of the greatest moment to the future of Australia in particular, and many lines of investigation are being undertaken for the solution of the problems involved, with the hope of success in the no distant future. Meanwhile, the Australian service is doing its best in the issuing of 24 to 48 hours' forecasts, and, at times, even for longer periods, with a fairly high percentage of accuracy.

These forecasts, if availed of, should be of value in the following ways:—

Wool scouring, drying preserved fruits, salt manufacturing, and like industries depending upon an out-door exposure.

To the farmers and pastoralists as a guide as to when to sow and reap; the housing of sheep during the shearing season to avoid waste of time and money owing to the liability of wool getting wet; the repair of decaying shelters when violent winds are threatening; the conveyance of stores to and produce from farms to railway stations, which depend upon a good condition of roads; the removal of stock from areas likely to be flooded.

To the Railway Departments and conveyors generally, giving them an opportunity to protect perishable goods from impending rain, heat or cold.

To growers, by notice of impending frosts, &c., and finally to the shipping companies, underwriters, and marine travelling public.

It should, however, be realized that Australia is a huge area with various physiographical features, and, further, limitation of time, of information and of facilities of transmission only permit the forecasts at present to be framed in general terms. In New South Wales and in South Australia, the metropolitan press, by the publication of the daily isobaric chart, enables the individual, after comparatively short experience, to forecast more accurately for himself, having a knowledge of local peculiarities and the effect of physical obstructions during the passages of disturbances. It is hoped that the country residents in the other States may shortly be similarly catered for. With regard to Victoria, I am happy to say that an influential and largely circulated Melbourne paper is, at the present time, favourably considering the possibility of giving us the space for such a map.

THE NATURE AND USES OF HARD SEEDS.

Bertha Rees, Government Research Bursar.

All agriculturalists are familiar with the fact that in samples of many seeds belonging to the Bean family (*Leguminosæ*), there is found a certain proportion which is not capable of germination without treatment of some kind. If soaked in water, these seeds will not swell as do those which are freely germinable, and it is owing to this fact that they are commonly known as hard seeds. The number of such hard seeds present in samples varies considerably, and appears to be influenced by climate and environment. For example, Lucerne (*Medicago sativa*) contains an average of 10 per cent. of hard seeds but I have examined samples from Hunter River containing over 50 per cent., and again Lucerne from Arizona may contain as much as 90 per cent.

It appears, in fact, that plants which have this tendency produce a higher percentage of hard seeds when grown in a dry climate than when grown in a moist one, and similar differences occur in the harvest of seed from the same locality according to whether the season is a moist or dry one. To some extent, the effect of a dry season may be compensated by harvesting the seed at a slightly earlier stage than usual, but this requires care and judgment, since if the seeds are unripe the percentage of germination may be very low even although no hard seeds are present. The various Clovers (*Trifolium*) usually contain an average of 8 to 13 per cent. of hard seeds, but as is the case in Lucerne, the number may be considerably greater. The Acacias (Wattles) produce hard seed in great abundance and in this group the maximum of resistance appears to be reached.

Plants which produce hard seeds are not confined to the order *Leguminosæ* although they occur most commonly in it. They are found also in the Mallow family (*Malvaceæ*), which includes some species of Hibiscus, Abutilon, &c., and in one plant belonging to the Salt-bush family (*Chenopodiaceæ*) called White Goosefoot (*Chenopodium album*) which is a very troublesome weed. Another familiar instance of hard seed occurs in ordinary Canna (*Canna indica*), the rounded black seeds of which are often called "Indian Shot."

As might be expected, the plant reaps certain benefits by forming seeds of this kind, the chief being as regards the advantageous distribution of its offspring. There are two great methods of distribution, one of which may be termed distribution in space and, to accomplish this, the plants provide the seed with various mechanisms such as spines, tufts of hair, &c., by means of which they are carried from place to place by such agencies as wind, water or animals. In this way the danger of over-crowding is avoided to a great extent. In the second method,—distribution in time—the structure of the seeds is such that they germinate after varying periods, and by this method, the seeds of one year may provide seedlings for many successive seasons. Plants which have adopted this method of distribution produce hard seeds freely. All the soft seed will germinate the first season and the hard ones will remain dormant in the soil. Gradually, the impermeable covering will be removed by various agencies, the least resistant seeds will germinate first, the harder ones remaining for longer period until perhaps the parent plant has been removed as the result of drought, bush fires or some other cause.

From this it is obvious that hard seeds must retain the power of germination for many years, as otherwise the great object of their formation would be defeated. Professor Ewart has divided seeds into three classes according to their duration of life.

The *Microbiotic* seeds which do not live for more than three years,
The *Mesobiotic*, which last from three to fifteen years and
The *Macrobiotic*, which may retain the power of germination from fifteen to over one hundred years.

All the hard seeds are included in the last class; they remain unharmed by great extremes of heat and cold and are, in fact, the most resistant of all living organisms.

In Acacias and other allied plants the formation of hard seeds may be regarded as a special adaptation to bush fires which, in previous ages, were probably more prevalent in Australia than at the present time on account of the numerous volcanic eruptions. The effect of such fires would be to burn off the existing vegetation and the humus on the surface of the soil; the seeds themselves would be saved from injury by the presence of the hard covering which, however, would become wholly or partially charred by the flames, thus rendering the seeds permeable to water and enabling them to germinate. Any seeds which escaped charring would be gradually rendered permeable by the action of the alkaline ash of the humus which becomes dissolved in rain water. By this means, the species is not only enabled to survive the devastation but is instrumental in replacing the vegetation of the cleared part.

There have been several theories advanced to account for this hardness. Percival, in his *Agricultural Botany* (p. 626), states that the hardness "is due to the large proportion of ash ingredients, especially silica and lime," contained in the seed coats. This theory was disproved by Leake[1], who compared the proportions of ash present in the seed coats of two species of Indigo plants (*Indigofera arrecta* and *Indigofera sumatrana*), and found a greater quantity present in the softer freely-germinable variety (*I. sumatrana*). Later, Jarzymowski[2] suggested that the hardness was probably due to the small size of the cell cavity of the outer palisade cell covering the seed, but Bergtheil and Day[3] made comparisons between the cells of the above-mentioned seeds and found no

1. *Journ. Roy. Hort. Soc.*, Vol. XXIX. 2. *Inaugural Dissertation*, Halle, 1905. 3. *Annals of Botany*, Vol. XXI, 1907.

difference in the size and shape of the cavities in the two cases. They found, however, that outside the palisade cells of the hard seeds of *I. arrecta* was a thin membrane through which water could not penetrate but, probably owing to a defective stain, they were unable to determine the exact nature of this membrane.

In 1908, Dr. White[4] made a further examination of these seeds and of a large number of other hard seeds and found that the membrane was composed of a material known as cuticle, which is impermeable to water, and further, that a similar membrane was present on each seed she examined. The presence of the cuticle is detected by using certain stains which colour the cuticle in a characteristic manner. The stain used in this case was chloro-zinc-iodine, which colours cuticle dark-brown, the soft cell-walls blue or magenta and the living cell contents a lighter brown. Fig. c of the plate shows a small portion of the seed coat of the Blackwood (*Acacia melanoxylon*) stained in this way and the extreme thickness of the cuticle can be clearly seen. The cuticular material is not always confined to the outer membrane, but may be laid down also in the walls of the palisade cells and in some cases, the whole cell-wall may become cuticularised in this way. An instance of this is found in the seed of the Bottle-brush Wattle (*Albizzia lophantha*). In Fig. f there is a double row of palisade cells, the outer row being entirely cuticularised and the inner only partially. Seeds of this type are naturally more resistant than those in which the cuticularisation is confined to the outer membrane. Of all the hard seeds examined by Dr. White and myself, in one case only, the Canna, was there no well defined cuticle outside the palisade cells, and it is evident that this seed must owe its impermeability entirely to the cuticularised walls of these cells.

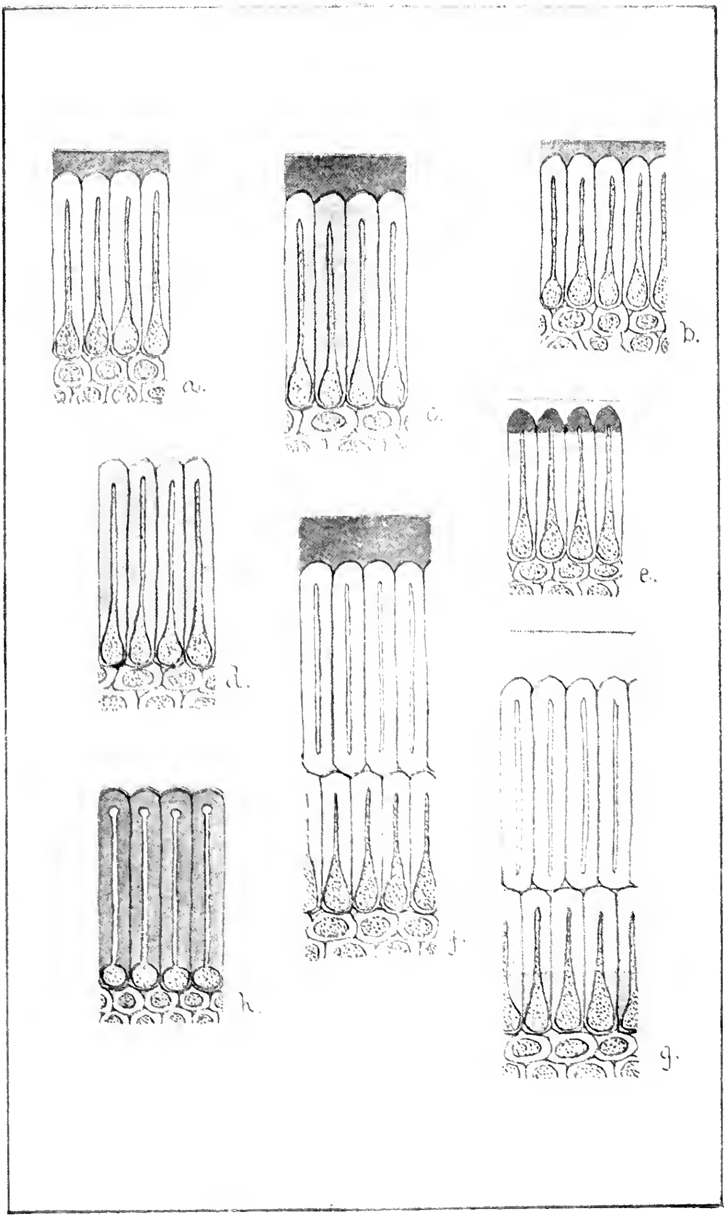
As to the nature of cuticle, it is believed to be formed by the laying down of particles of waxy or fatty substance in the already-existing cell-wall. A cuticle consists therefore of the original cell-wall, which is made up of cellulose or some similar material, permeated through and through with particles of wax. Such a membrane would differ from unchanged cellulose just as a sheet of waxed or oiled paper differs from one of blotting paper; water would be held by the former but would pass readily through the latter, and the more complete the impregnation with wax the greater would be the resistance to the passage of the water.

EXPLANATION OF PLATE.

(*a*). Seed coat of *Indigofera arrecta* after treatment with chloroform.
(*b*). Similar preparation of *Cytisus albus*.
(*c*). Untreated seed coat of Blackwood.
(*d*). Same after treatment with sulphuric acid.
(*e*). Seed coat of Melilot after chloroform treatment.
(*f*). Untreated seed coat of Bottle-brush Wattle.
(*g*). Same tested after four months soaking in chloroform.
(*h*). Seed coat of Canna tested after treatment with chloroform.
(All the preparations after testing with chloro-zinc-iodine.)

We have now to consider the various methods by which it is possible to render hard seeds permeable to water. There are several ways by which this can be done, one is to scratch or remove the outer cuticle, while another is to extract the waxy material from it by means of certain chemicals or to subject it to the action of hot water. The former method is the most practical and is more commonly employed in the case of very

4. *Proc. Roy. Soc. Vict.*, Vol. XXI, Pt. 1.



Bertha Rees, Del

SECTIONS OF SEED COATS OF HARD SEEDS

large seeds, whereas for small seeds the other methods are more effective. If the cuticle is broken at any one point, water will enter and spread to all parts of the seed, so a single scratch which passes through the cuticle is sufficient to render a seed permeable. The scratching is performed by a file in the case of large seeds, or in the smaller ones, by treating the seeds with hard sand either by shaking them up with it or by passing them through revolving cylinders lined with cement in which the sand is embedded. Another method for removing cuticle is to treat the seeds with some strong corrosive agent such as concentrated sulphuric acid and if the treatment is sufficiently prolonged, the cuticle will be completely removed. Fig. d shows a portion of the seed coat of Blackwood after treatment of this kind and if this be compared with Fig. c, it will be seen that in the former (d), the cuticle is entirely gone and the ends of the palisade cells are exposed on the surface; such a seed would now swell readily if placed in water. The duration of treatment required to remove a cuticle varies from fifteen minutes to several hours according to the resistance of the seed. As has been already indicated, similar results may be obtained by charring or by the action of alkalis.

The second method, viz. that of extracting the waxy substances from the cuticle is perhaps of scientific rather than commercial importance. The seeds are treated with certain chemicals which are recognised fat solvents such as chloroform, ether or hot alcohol, but of these I found chloroform to be the most effective. The duration of treatment required again varies but is usually from three to four months. At the end of that time sections stained and compared with similar preparations of untreated seeds show a marked contrast, which can, perhaps, be best appreciated by comparing Figs. f and g. These are sections of the seed of Bottle-brush Wattle before and after treatment, and it will be noticed that all the parts which in f were stained dark brown, are of a reddish colour in g.

Figs. a and b are of treated specimens of *Indigofera arrecta* and *Cytisus albus* respectively, and, in these, the outer layer only was cuticularised. Fig. e is of special interest, as it represents a different type of seed coat. It is the seed of a Melilot (*Melilotus albus*) often called Bokhara Clover. In it, the outer membrane is not cuticularised but only the ends of the palisade cells. This figure was made after prolonged treatment with chloroform and the dark coloured ends of the cells are the parts which gave the cuticular reaction in the untreated seeds. I am led to believe that, in this case, the function of the outer membrane is to act as a kind of cement substance which holds the cuticularised ends of the cells closely together, and so prevents water from pushing its way in between them. The last Fig., h, shows a section of the treated seed coat of *Canna indica*, after long soaking in chloroform; in this, all the thickened cell-wall now coloured blue was completely cuticularised in the original seed.

The common practice of soaking hard seeds in hot water to make them swell may be explained in the following way. The effect of the heat is to melt the particles of wax which are distributed through the wall. When they are melted they will tend to run together to form larger isolated drops and, in this way, spaces will be left through which the molecules of water can push their way into the seed causing it to swell and germinate.

SEED TESTS.

(Fourth Series.)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany and Plant Physiology in the Melbourne University, and Bertha Rees, Government Research Bursar.

In continuation of the previous tests, the present one was carried out on a more extended scope and had for its primary object, to determine whether any relationship could be detected between the duration of their voyage, in the case of imported seeds, and their germination power on arrival. The whole of the seeds were obtained through the Customs authorities,* and were tested as soon as possible after arrival. Since, however, nothing was known as to the condition of the seeds when they commenced their voyage, too much importance cannot be attached to the results, and to obtain absolutely satisfactory data, it would be necessary to test the seeds before the voyage began as well as when it was completed. Some interesting cases can, however, be seen, by reference to the table printed beneath. For instance, Linseed from India, after a voyage of three weeks, gave 92 per cent. germination, whereas a similar sample from New Zealand, after a shorter voyage of six days, gave 100 per cent. germination. Again, ten samples of Rye Grass from New Zealand, after a voyage of six days, gave an average germination of 78.5 per cent. A sample from Ireland, after a voyage of six weeks, gave a percentage germination of 78. This difference is not worth consideration, but the New Zealand samples contained two unusually bad ones, and if these are omitted, the remaining eight had a percentage germination of 88, which may indicate that the longer voyage of the Irish seed had affected its percentage germination.

Lucerne seed has better keeping properties than Rye Grass. The first four samples examined, however (33 to 36), which were Australian grown, all gave a higher percentage germination than samples which had been submitted to a sea voyage, the average in the two cases being, for the Australian-grown seed 92 per cent., and with the non-Australian seed, 76 per cent., which is a very appreciable difference. In this comparison, sample 37 from New South Wales is omitted, as it was a thoroughly bad and diseased sample full of fungus spores and weed seeds. Even if it is included, the Australian-grown seed showed a 7 per cent. better germination as compared with the imported seed.

It is only natural where not more than a couple of samples are available for examination, that these may show discrepant results, as for instance, in the case of the two samples of Millet, Nos. 45 and 46. That from Turkey, with a voyage of thirty-six days, gave a percentage germination of 91, whereas that from India, with a shorter voyage of twenty-one days, gave a lower percentage germination of 74. Again, No. 3, a sample of Onion seed supposed to be locally grown, gave only 3 per cent. germination, whereas one from France with a voyage of five weeks gave 55 per cent. germination. The first sample was, however, a thoroughly bad one

Finally, of two samples of Hemp, one from Japan with a voyage of three weeks gave 53 per cent. germination, while one from Turkey with a

* Through the assistance of Dr. Norris, Director of Quarantine, and Mr. J. G. Turner, Chief Quarantine Officer (Plants), Victoria.

TABLE OF SEED TESTS.

Botanical Name.	Common Name.	Place of Origin.	Duration of Sea Voyage.	Percentage of Weed Seeds.	Percentage of Germination.	Proper Percentage of Germination.	Fungus Spores Present.
1. Acacia mollissima	Black Wattle	(?)	..	Nil	39		
2. Allium Cepa	Onion	(?)	..	Nil	2		
3. Allium Cepa	Onion	(?)	..	Nil	3		
4. Allium Cepa	Onion	France	5 weeks	Nil	55	..	None
5. Brassica alba	Mustard	(?)	..	Few	96	Over 90	
6. Brassica oleracea	Kale	England	5 weeks	Few	76	Over 90	None
7. Brassica rapa	Rape	Holland	6 weeks	Nil	94	Over 90	None
8. Brassica rapa	Rape	Holland	6 weeks	Nil	93	Over 90	None
9. Cannabis sativa	Hemp	Japan	3 weeks	Nil	56	Over 90	None
10. Cannabis sativa	Hemp	Turkey	(?)	Nil	81	Over 90	None
11. Carum Carvi	Caraway	Holland	6 weeks	Nil	39	Food article	None
12. Coriandrum sativum	Coriander	Morocco	40 days	3	52	Food article	None
13. Dactylis glomerata	Cocksfoot	New Zealand	6 days	Nil	54	Over 80	Chlamydospores of Bunt (*Tilletia*)
14. Dactylis glomerata	Cocksfoot	New Zealand	6 days	Few	68	Over 80	Chlamydospores of Bunt (*Tilletia*)
15. Daucus carota	Carrot	Germany	6 weeks	Nil	79	Over 70	Spores of Early Blight (*Macrosporium*) and Pin Mould (*Mucor*)
16. Ernum Lens	Lentil	Germany	6 weeks	Nil	90	Over 95	None
17. Fagopyrum esculentum	Buckwheat	Japan	5 weeks	Nil	88	Over 85	None
18. Glycine hispida	Soja or Soy Bean	China	3 weeks	Nil	80	Over 95	
19. Holcus lanatus	Yorkshire Fog Grass	New Zealand	6 days	2	64	Over 80	None
20. Linum usitatissimum	Linseed	India	3 weeks	2	92	Over 90	None
21. Linum usitatissimum	Linseed	New Zealand	6 days	1·5	100	Over 90	None
22. Lolium perenne	Rye Grass	New Zealand	6 days	Few	83	Over 90	None
23. Lolium perenne	Rye Grass	New Zealand	6 days	Nil	57	Over 90	None
24. Lolium perenne	Rye Grass	Ireland	6 weeks	1	78	Over 90	None
25. Lolium perenne	Rye Grass	New Zealand	6 days	0·5	91	Over 90	None
26. Lolium perenne	Rye Grass	New Zealand	6 days	Nil	96	Over 90	None
27. Lolium perenne	Rye Grass	New Zealand	6 days	2	52	Over 90	None

TABLE OF SEED TESTS—*continued*.

Botanical Name.	Common Name.	Place of Origin.	Duration of Sea Voyage.	Percentage of Weed Seeds.	Percentage of Germination.	Proper Percentage of Germination.	Fungus Spores Present.
28. Lolium perenne ..	Rye Grass ..	New Zealand ..	6 days	Nil	81	Over 90 ..	None
29. Lolium perenne ..	Rye Grass ..	New Zealand ..	6 days	Nil	79	Over 90 ..	None
30. Lolium perenne ..	Rye Grass ..	New Zealand ..	6 days	Few	73	Over 90 ..	Chlamydospores of Bunt (*Tilletia*)
31. Lolium perenne ..	Rye Grass ..	New Zealand ..	6 days	1	87	Over 90 ..	Chlamydospores of Tilletia
32. Lolium perenne ..	Rye Grass ..	New Zealand ..	6 days	1	86	Over 90 ..	Chlamydospores and Uredospores
33. Medicago sativa ..	Lucerne	(?) ..	(?)	1·5	91	96–98	
34. Medicago sativa ..	Lucerne	(?) ..	(?)	0·3	92	96–98	
35. Medicago sativa ..	Lucerne	(?) ..	(?)	0·4	95	96–98	
36. Medicago sativa ..	Lucerne	(?) ..	(?)	1·5	92	96–98	
37. Medicago sativa ..	Lucerne	New South Wales	(?)	12	44	96–98 ..	Uredospores and teleutospores of Rust
38. Medicago sativa ..	Lucerne	Germany ..	6 weeks	1·5	86	96–98 ..	None
39. Medicago sativa ..	Lucerne	France.. ..	36 days	2·5	72	96–98 ..	None
40. Medicago sativa ..	Lucerne	New Zealand ..	6 days	Few	79	96–98 ..	None
41. Medicago sativa ..	Lucerne	France.. ..	36 days	1·2	70	96–98 ..	None
42. Medicago sativa ..	Lucerne	France.. ..	36 days	1	75	96–98 ..	None
43. Nelumbo nucifera ..	Lotus	Germany ..	6 weeks	4	83	Over 95 ..	Spores of mould
44. Paspalum dilatatum	Golden Crown Grass	Richmond River	..	Nil	Nil	Over 75 ..	Fungus spores (sp. ?)
45. Panicum miliaceum	Millet (White) ..	Turkey ..	36 days	0·5	91	Over 95 ..	None
46. Panicum miliaceum	Millet (Yellow) ..	India	21 days	Nil	74	Over 95 ..	None
47. Phalaris canariensis	Canary Seed ..	Turkey ..	4 weeks	1·6	71	Over 90 ..	Uredospores
48. Phalaris bulbosa ..	Toowoomba Canary Grass	(?) ..	(?)	1	56	Over 90 ..	
49. Phleum pratense ..	Timothy Grass ..	Germany ..	6 weeks	0·2	89	Over 90 ..	None
50. Sesamum indicum ..	Sesame	China	3 weeks	Nil	Nil	Over 90 ..	None
51. Trifolium hybridum	Alsike Clover ..	Canada ..	6 weeks	Few	89	96–98 ..	None
52. Trifolium minus ..	Suckling Clover ..	New Zealand ..	6 days	7·5	36	Over 75 ..	None
53. Trifolium repens ..	White Clover ..	New Zealand ..	6 days	2·5	65	95–98 ..	None
54. Trifolium repens ..	White Clover ..	New Zealand ..	6 days	1	60	95–98 ..	None
55. Bromus unioloides ..	Prairie Grass ..	Victoria ..	..	8	72	Over 90 ..	Smut spores

much longer voyage gave 81 per cent. germination. It is evident, therefore, that too much value should not be attached to these limited comparisons. A point of considerable importance is in regard to the number of samples which contained the spores of injurious or parasitic fungi. This applies to samples 13 and 14 (Cocksfoot), 15 (Carrot), 30, 31 and 32 (Rye Grass), 37 (Lucerne), 43 (Lotus), 44 (Paspalum), 47 (Canary Seed), which all contained fungus spores, and, with the exception of sample 43, would be unfit to use for planting on that account. It is of great importance that seed should be free from the spores of parasitic fungi, since, otherwise, the farmer is bound to suffer loss and may have his crop entirely ruined.

Seed for planting should never be harvested from crops showing any sign of disease. This is one of the most important methods in preventing the spread of disease in cultivated plants.

NOTES ON SAMPLES TESTED.

1. *Acacia mollissima* (Black Wattle).—This sample contained 97 per cent. of hard seeds and required repeated soakings in boiling water to make them swell in water. The germination was very slow and after three applications of boiling water, the power of germination was lost altogether. None of the seeds which swelled without treatment germinated.

2 and 3. *Allium Cepa* (Onion).—Probably old seed. Sent in by a seedsman to whom they had been supplied as good sound seed.

4. *Allium Cepa* (Onion).—Clean sample of seed, free from weeds but percentage of germination too low.

5. *Brassica alba* (Mustard).—Contained a few seeds of Charlock (*Brassica Sinapistrum*), otherwise quite clear of weeds. About 2 per cent. of the seeds were imperfectly developed and they varied in size from 1.5 to 2.5 mm. in diameter.

6. *Brassica oleracea* (Kale).—Sample was free of weed seeds, but many of seeds were withered and the diameter varied from 1.5 to 2.5 mm.

7. *Brassica rapa* (Rape).—Fairly good sample, with exception of presence of some imperfectly ripened and damaged seeds.

8. *Brassica rapa* (Rape).—Good.

9. *Cannabis sativa* (Hemp).—Poor sample; seeds varied in size from 2 to 4 mm., and had low percentage of germination.

10. *Cannabis sativa* (Hemp).—Sample free of weeds, but contained 2.7 per cent. (by weight), of foreign matter.

11. *Carum Carvi* (Caraway).—This sample was probably intended for culinary use and not for germinable seed.

12. *Coriandrum sativum* (Coriander).—Very slow in germinating; probably, like preceding sample, intended as food article. Weeds present included some doubtful species of Umbellifers.

13. *Dactylis glomerata* (Cocksfoot).—Sample free of weed seeds, but otherwise poor and bad seed for planting on account of spores of Bunt present in it.

14. *Dactylis glomerata* (Cocksfoot).—Percentage of germination very little better than preceding sample. There were very few weed seeds present, mainly Dock (*Rumex*) and one Composite (sp. ?).

15. *Daucus Carota* (Carrot).—Although sample was free of weeds it contained a quantity of other foreign material, and the spores of Blight and Pin Mould were unusually plentiful.

16. *Ervum Lens* (*Lentil*).—The percentage of germination was below the proper average and this was mainly due to the broken seeds present in the sample.

17. *Fagopyrum esculentum* (Buckwheat).—Good seed.

18. *Glycine hispida* (*Soja Bean*).—Five per cent. damaged, but this alone does not account for low germination percentage.

19. *Holcus lanatus* (Yorkshire Fog grass). — Weed seeds included Wild Caraway (*Carum Carvi*), Italian Rye (*Lolium italicum*), Rye Grass (*Lolium perenne*), Sorrel (*Rumex sp.?*), White Clover (*Trifolium repens*) and Chickweed (*Stellaria media*). Ergot was also present.

20. *Linum usitatissimum* (Linseed).—Weed seeds present were Spurrey (*Spergula arvensis*), Sorrel, Italian Rye, and one Composite (sp.?). In addition to this, about 7 per cent. (by weight) of the seeds were broken or damaged.

21. *Linum usitatissimum* (Linseed). — Principal weeds present were Spurrey, Rye Grass, and 8 per cent. (by weight) were damaged in various ways. The high percentage of germination is due to using sound seeds only for the tests.

22. *Lolium perenne* (Rye Grass).—Only foreign seeds present were a few Cocksfoot. Grains were rather discoloured, probably not a sample of fresh seed.

23. *Lolium perenne* (Rye Grass). Clean sample, but percentage of germination low; seed probably old.

24. *Lolium perenne* (Rye Grass).—Seeds very small size; weeds present included Sorrel, Crested Dog's Tail (*Cynosurus cristatus*), Composite (*Crepis fœtida*) and one other Composite (sp.?).

25. *Lolium perenne* (Rye Grass).—Weed seeds present were Sorrel, Italian Rye, and another grass (sp.?).

26. *Lolium perenne* (Rye Grass).—Best sample of Rye Grass seed in the consignment. Contained no weed seeds or fungus spores and had a high percentage of germination.

27. *Lolium perenne* (Rye Grass).—Weed seeds included Italian Rye and *Crepis fœtida*. As there is nothing in the appearance of the seed to account for the low germination percentage, it is safe to conclude the seed is old.

28. *Lolium perenne* (Rye Grass).—Sample free from weed seeds and fungus spores, but germination percentage not high enough.

29. *Lolium perenne* (Rye Grass).—About the same as sample 28.

30. *Lolium perenne* (Rye Grass).—Very few weed seeds present, Dock, *Crepis fœtida*, and Timothy Grass (*Phleum pratense*).

31. *Lolium perenne* (Rye Grass). — Many of the grains were dark coloured as a result of the presence of fungus *Tilletia* (Bunt). Weed seeds present were Italian Rye, Darnel (*Lolium temulentum*), Dock, and *Crepis fœtida*.

32. *Lolium perenne* (Rye Grass).—The fungus spores present were those of Smut or Rust, and the weed seeds included Dock and White Clover.

33. *Medicago sativa* (Lucerne).—Contained nine kinds of foreign seeds:—Plantain (*Plantago lanceolata*), Red Clover (*Trifolium pratense*), White Goosefoot (*Chenopodium album*), two composites, one of which was Field Chamomile (*Matricaria inodora*), and Dodder (one in 3,000). It contained 5 per cent. of hard seeds.

34. *Medicago sativa* (Lucerne).—Weeds included White Goosefoot, Plantain, and one Composite (sp. ?). Four per cent. of hard seeds.

35. *Medicago sativa* (Lucerne).—Weeds present were *Phalaris* (sp. ?), Charlock, White Goosefoot, and a Composite (sp. ?). Two per cent. hard.

36. *Medicago sativa* (Lucerne).—Weeds included Dock (2 species), Plantain, Red Clover, White Goosefoot, and two species of Composites. Four per cent. hard.

37. *Medicago sativa* (Lucerne).—Very dirty seed; weeds included White Goosefoot, Sorrel, one species of Composite, also Dodder (1 in 4,000). The sample contained also 17 per cent. (by weight) of unfertilized seeds and other foreign matter. Four per cent. hard.

38. *Medicago sativa* (Lucerne).—Weeds present were White Goosefoot, and Red Clover. Six per cent. hard.

39. *Medicago sativa* (Lucerne).—Weed seeds were Plantain and Red Clover. Six per cent. hard.

40. *Medicago sativa* (Lucerne).—Sample of good clean seed; practically free of weeds with the exception of a few (1 in 500) seeds of Rye Grass. The lower percentage of germination is due to the sample containing 15 per cent. of hard seeds.

41. *Medicago sativa* (Lucerne).—Weeds included Plantain, Red Clover, White Goosefoot, and a species of Umbellifer. Eight per cent. hard.

42. *Medicago sativa* (Lucerne).—Weed seeds in the sample were Dock, Plantain, Wild Caraway, White Clover, and one species of Composite; also 1.5 per cent. of total bulk was broken seeds and other foreign material. Five per cent. hard.

43. *Nelumbo nucifera* (Lotus).—The only weed seed present was Plantain, which was very plentiful, also 6 per cent. of the seeds were shrivelled.

44. *Paspalum dilatatum* (Golden Crown Grass).—Seed smelt very musty and contained spores of mould. Many of the glumes were empty or the fruits were unripe.

45. *Panicum miliaceum* (*Millet*).—Contained few weeds, chiefly White Goosefoot and Sorrel.

46. *Panicum miliaceum* (Yellow Millet).—Seeds varied from pale colour of White Millet to dark brown or almost black. No record of a similar sample was to be found.

47. *Phalaris canariensis* (Canary Seed).—0.5 per cent. were broken, and others contained Ergot, rust spores were also present. Weed seeds included Dock, Millet, and Johnston Grass (*Andropogon Halepensis*).

48. *Phalaris commutata*.—Sample contained a quantity of husks and other foreign matter in addition to weed seeds—*Crepis fœtida* and Wild Caraway.

49. *Phleum pratense* (Timothy Grass).—Weed seeds present were White Clover, Plantain, and one species of Composite.

50. *Sesamum indicum* (Sesame).—Probably a sample of old seed.

51. *Trifolium hybridum* (Alsike Clover). Sample contained a few seeds of Sorrel. The seed looked good on the whole, though some were the pale yellow of immature seed and others the dark reddish colour of old seed. The seeds were dyed, but evidently because they were light coloured and not, as is more usual, to disguise old seed.

52. *Trifolium minus* (Suckling Clover).—The chief weed seed was Sorrel. Sixty per cent. hard.

53. *Trifolium repens* (White Clover).—Chief weed seeds present were Spurrey, Plantain, and White Cockle (*Lychnis alba*). One per cent. hard.

54. *Trifolium repens* (White Clover). — The sample was obviously dyed, probably to disguise old seed. A number were pierced by borers, the remains of which were present in the sample. The weed seeds included Plantain, Sorrel, a species of Composite, Alsike Clover (*Trifolium hybridum*), and Purple Cockle (*Agrostemma Githago*). Five per cent. hard.

55. *Bromus unioloides* (Prairie Grass) (local).—Offered to seedsman for sale; 6 per cent. of grains filled with smut; 72 per cent. germinated. Contained burrs of *Medicago denticulata* (Burr Medick); 8 per cent.

BUILDING HINTS FOR SETTLERS.

XIV.—MALLEE ROLLER.

A. S. Kenyon, C.E., Engineer for Agriculture.

The accompanying drawings show the usual type of roller in the Mallee districts. The roller itself varies in length from 8 feet to 12 feet, and in diameter from 1 ft. 6 in. to 3 ft. 6 in., and may be either a log, an old boiler, or a specially constructed iron cylinder.

Round timber is preferable to sawn for the framework, especially for pole and brace, if a suitable natural fork can be obtained. The pole is usually about half as long again as the roller. The angle formed by brace should be such that the scrub is bent forward and not brushed aside. This is very important, as the brace, if properly fixed, does a large amount of the work of breaking down the mallee. The framework is fixed together with clamps.

The wheel is an ordinary dray wheel, the axle of which after passing through wheel and arms of bridle is turned up and works in a hole at the end of the pole. On the vertical portion of the axle is an iron collar fastened with a set screw. The end of the pole rests on this and may be raised or lowered by altering the position of collar. The bridle is made of 3-in. by $\frac{3}{4}$-in. wrought iron, bolted together as shown and having a slot 2 inches by $\frac{3}{4}$ inch in front. The bridle moves freely on the axle and will come to any position required, by the raising or lowering of end of pole.

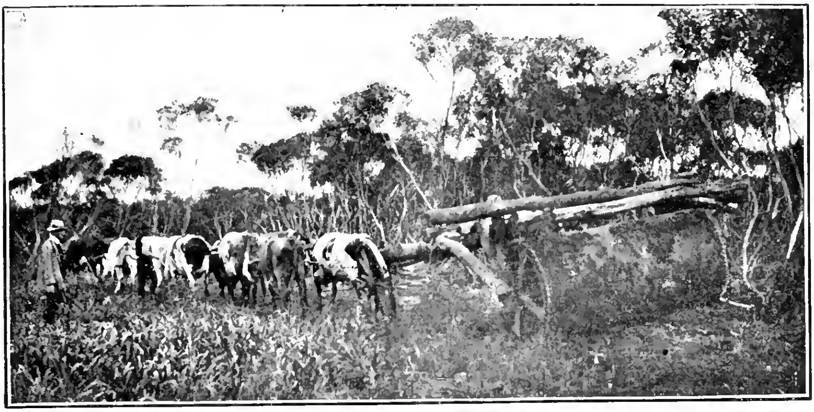
The chain is connected to a piece of iron bolted to the frame as shown. The chain passes under the brace and through a hook on the pole, which converts the chain from a diagonal to a direct pull parallel to the pole. The hook is made of $1\frac{1}{8}$-in. iron threaded for a nut on outside of the pole. The chain runs through the hook but is not fastened to it. The loose end of chain is fastened to a piece of iron, $1\frac{1}{2}$ in. x $\frac{5}{8}$ in. x 1 ft., which passes through the slot in the bridle. This piece of iron has holes in it for a pin, so that, when the chain is tight, the pin, being placed in hole nearest the back of bridle, will draw the wheel.

The axle of roller is fixed to a cross piece of 4-in. x $\frac{3}{4}$-in. wrought iron, welded at the join and a hole punched for the axle. The axle projects at each end and works in a block of hardwood which is bolted to iron supports with $\frac{7}{8}$-in. bolts. The supports are of 4-in. x $\frac{3}{4}$-in. wrought iron, bolted to framework as shown, with $\frac{7}{8}$-in. bolts.

The above dimensions may, of course, be varied considerably to suit conditions. No matter how well made the roller is there will be considerable giving in the joints, particularly when rolling big mallee; hence the use of clamps in construction of the frame as they allow of taking up and adjusting any movement.

In use, a horse team will give the best results, but the risk of staking a valuable horse on a "snag"— a projecting sharp stump—is so great that bullocks are generally preferred. Up to 20 acres a day may be covered in easy country. Teams vary from 10 to 16.

The roller is not very effective when there are many "spring-backs," such as young mallee, broom, &c. Some have tried fixing angle irons to the roller to chop and bruise the light stuff so as to make a better burn. Others have tried logs or even railway rails, hitching a team to each end and thus dragging down the scrub, but it cannot be said that these arrangements are satisfactory. A considerable amount of work in cutting the "spring-backs" by hand is inevitable. In large mallee, pines, &c., the roller can be replaced by hand-cutting. This method obviates risk of snags in subsequent cultivation but it is surprising what large sizes of mallee can be rolled by a little judicious "nicking" ahead of the roller.



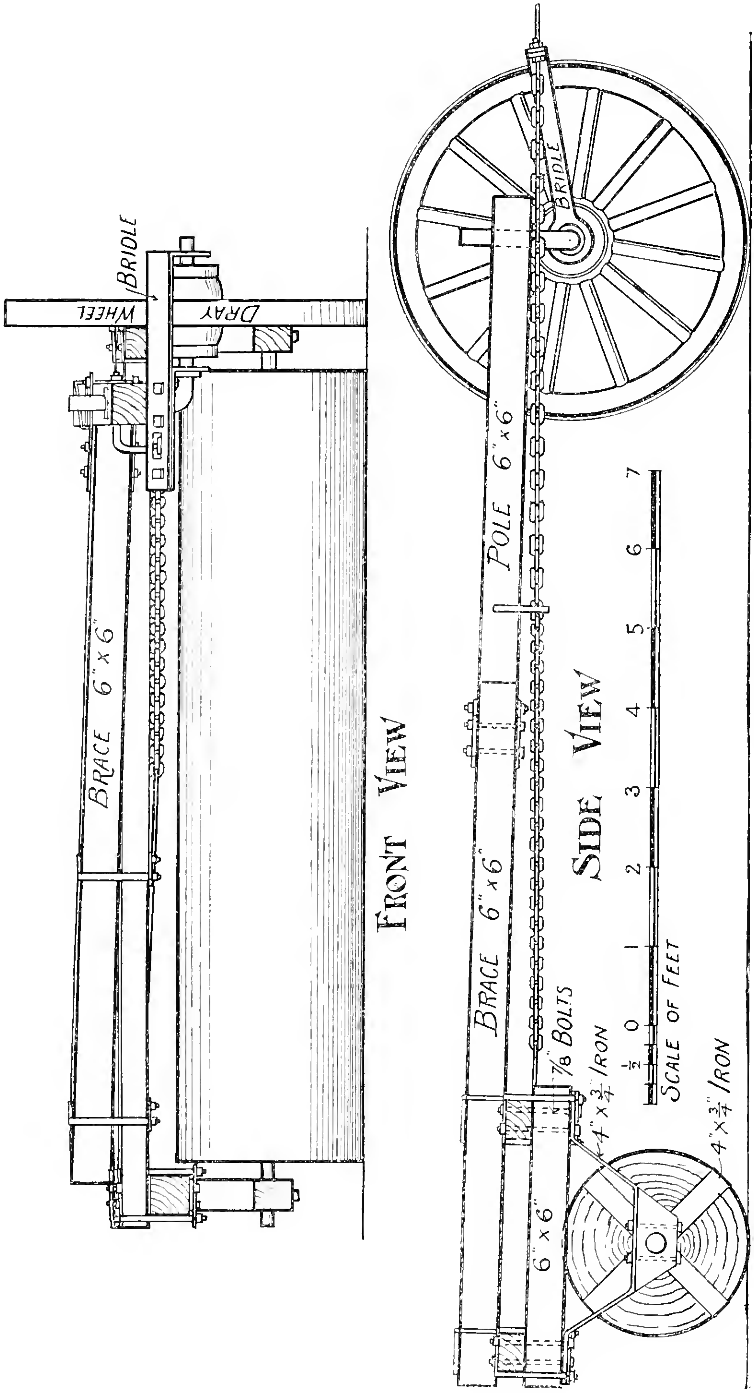
ROLLING DOWN THE MALLEE.

Rolled scrub, being all laid in one direction, gives a much better burn than hand-cut, and as a good burn is the greatest of benefits, the roller is seldom abandoned.

Rolling costs from 3s. 6d. to 5s. per acre and the subsequent snagging about 9d. to 1s. 6d.

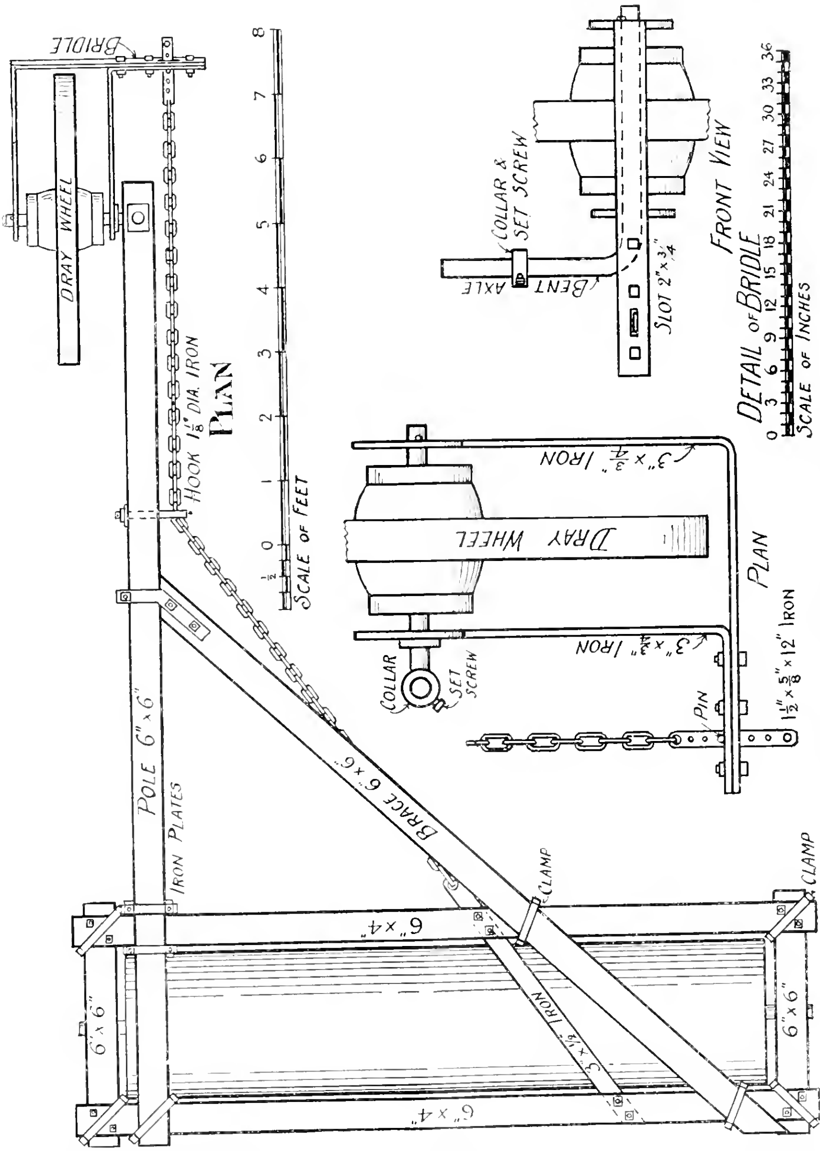
The Government is rolling mallee scrub in the Murrayville (Pinnaroo to Cow Plains) district by means of a traction engine drawing three rollers, totalling 58 ft. in width of cover. More rollers could be pulled but the difficulty of spreading the hauling cables prevents this. A spreader of over 30 ft. in width, made of two 6-in. H girders supported by specially strong wheels on the outsides and an ordinary wheel in the middle, carries the cables pulling the rollers. The cost of running is low, being only about 1s. per acre; but with repairs, shifts, &c., it mounts up a little over 3s., not much cheaper than by bullocks.

Traction engines with the ordinary wheels are useless, either in soft or sandy ground. In the sandy country the difficulty is overcome by using Bottrill's patent Dreadnought attachments, which, although expen-



MALLEE ROLLER.

sive (about £250 per engine), enable it to cross the loosest of sand country pulling a full load. These attachments have already been described in the *Journal* for May, 1908. There are two considerable drawbacks to the use of the steam traction engine in mallee scrub, viz.:—difficulty in



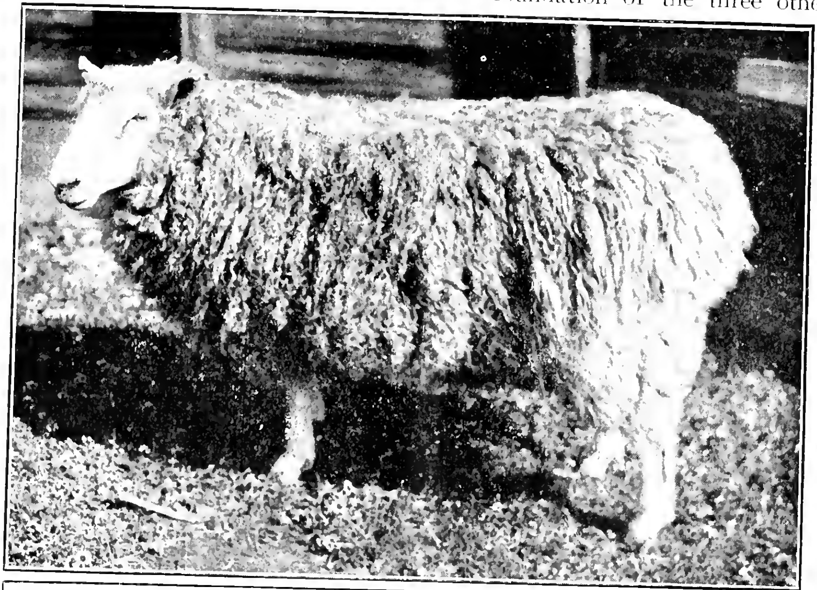
PLAN OF ROLLER AND DETAILS.

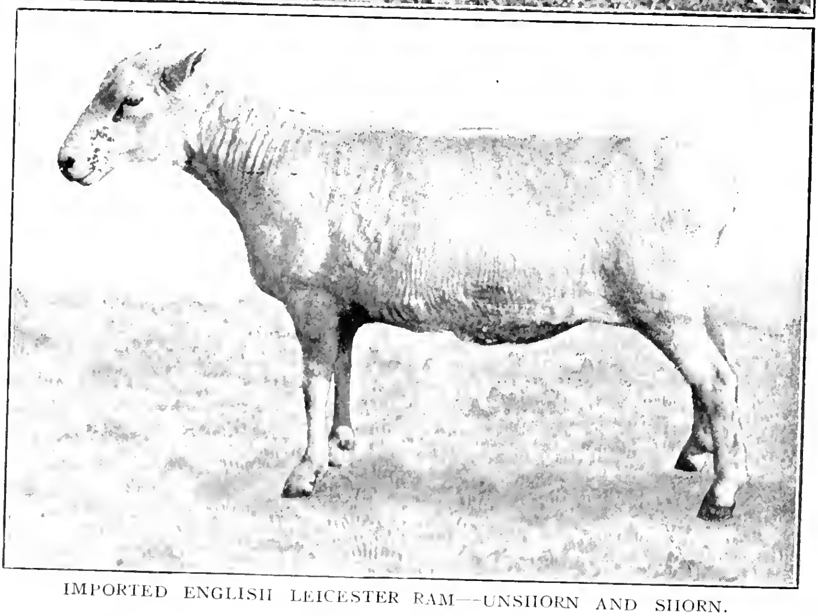
obtaining sufficient water (about 120 gallons per hour) and liability to start bush fires. An oil tractor has been tried with Bottrill's attachments, but it is not sufficiently heavy or powerful. It is likely, however, that the oil tractor will eventually prove the most useful.

ENGLISH LEICESTER SHEEP.

H. W. Ham, Sheep Expert.

The English Leicester is one of the oldest and purest breeds of long-wool sheep in the world. It is also the foundation of the three other



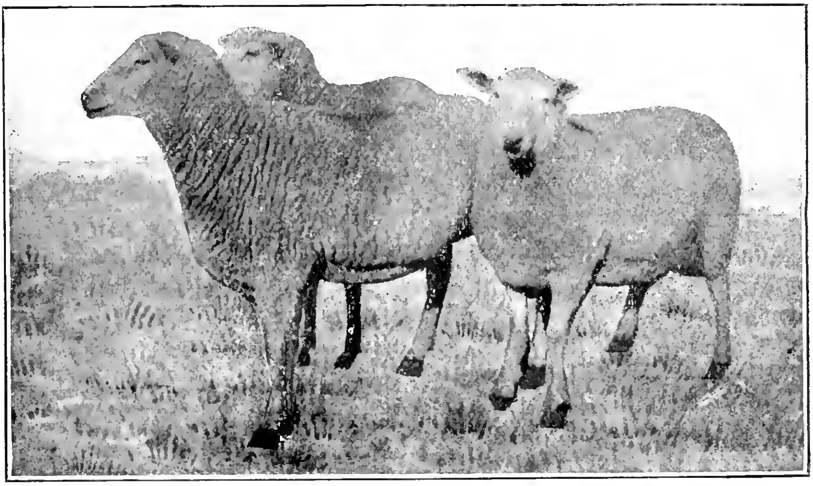


IMPORTED ENGLISH LEICESTER RAM—UNSHORN AND SHORN.

principal English grazing breeds, one of which is considered in the best parts of Australia and South America, where wool-growing is regarded as important, to be better for wool-crossing purposes, than the English Leicester itself. The three breeds evolved from English Leicester sires are the Lincoln, Border Leicester, and Romney Marsh.

English Leicesters, as a breed, are thick-set, shapely sheep, low to the ground, being bred more towards neatness, substance, and quality of flesh and wool than for mere size. They possess proportionate heads and neat bone, and on sound country thrive quickly.

The fact of having short necks, level shoulders and backs, with medium bone, makes them specially suitable for mating with small merino ewes, thus giving less lambing troubles than the larger long-wool breeds. In New Zealand, they are a favoured breed for mating with all classes of ewes, but particularly with small ewes and two-tooths. It is the ill-shaped, deep fore-quartered, rams of any breed that give rise to most of the lambing troubles—width of front and shoulder is not responsible to anything like the extent that depth is.



FOUR-TOOTH WETHERS BY ENGLISH LEICESTER RAMS.

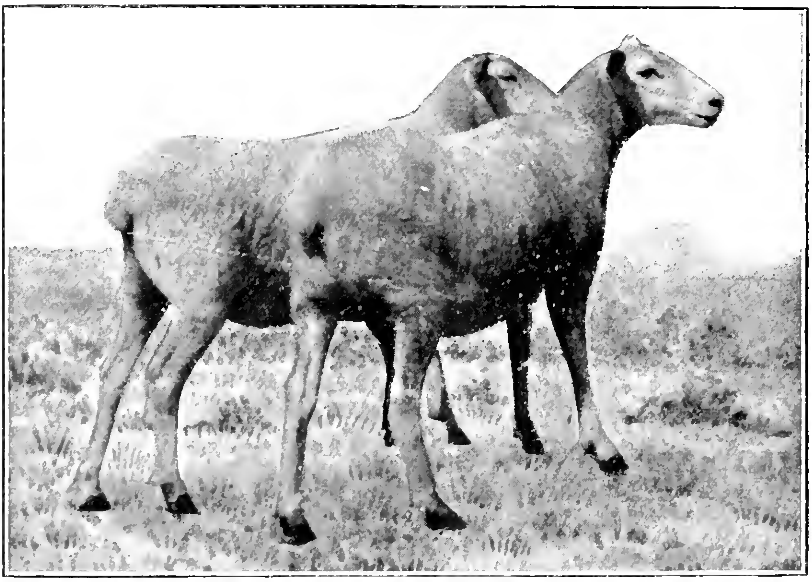
This breed could with advantage be more extensively used with under-sized merino ewes, especially those grown in the colder parts, for these ewes are usually small and difficult to lamb to heavy-boned breeds. For mating with small woolly-headed short-stapled merino ewes, there is no breed of rams more suitable.

From the wool point of view, English Leicesters do not carry quite the same weight of fleece as the Lincolns. They secrete less yolk and are finer in grade of wool and rather thinner lock. These points cause the lesser weight per head as compared with the Lincoln. The wool, however, is equal in lustre and has just as much character and style. Being finer in grade of wool they are also finer in grain of flesh and this, considered with the moderate amount of yolk produced, means a good quality sappy mutton when fattened.

Merely a top-knot, no more and no less, is the aim in respect of head covering. The head should be neat and breedy in appearance, bluish-white in colour, with very little if any arch of nose, as compared with the Border Leicester, for instance. (Of course, rams of any breed are inclined to show this point of masculinity to a certain degree.) Full clear cut eyes, mellow soft ears on the short side, dark muzzle and black hoofs, are also essential.

The English Leicester occupies a peculiar position in respect to colour of face and ears. With the other long-wool breeds, Lincoln, Romney Marsh, and Border Leicester, the aim is towards pure white; especially in the case of the latter. Yet the dark colour round the eyes and the spots on the ears, inherited from the English Leicester, are frequently met with, cropping up even after generations of breeding.

These minute details are often made too much of, and should never be considered more desirable points of type than evenness of carcase, character and covering of wool, and general outline. The outline or shape of face, eyes, and ears, is far more important in deciding merit in these four similar breeds than the colour of the face. An anæmic white face is, of course, a sign of weakness.



TWO TOOTH WETHERS BY ENGLISH LEICESTER RAMS.

The illustrations of the imported English Leicester ram are from photographs supplied by Mr. A. M. McArthur, of "Coonmoor," Lindenow. This ram is grass-fed, and has been running in the open, as will be seen by the rough outward appearance of the fleece. The three wethers, by English Leicester rams from fine wool ewes, were the second prize four-tooth wethers at the last Melbourne Royal Show. They averaged 130 pounds dressed weight.

The two wethers, also by English Leicester rams, are sixteen months old, and are the property of Mr. R. C. Buchanan, Ormidale Estate, Tallangatta.

EXPORT LAMBS.

H. W. Ham, Sheep Expert.

Wether Lambs "Plainer" than Ewe Lambs.

As a rule, ewe lambs are graded into higher qualities than wether lambs. A visit to one of the large freezing works would be educational to many lamb-raisers. It would, or should, cause them to improve their methods. The sexes are easily distinguished, as ewe lambs "dress" more neatly about the udder than the wethers do about the purse.

In some well bred and well fed flocks, ewe lambs go into first grades at the rate of 80 to 90 per cent., whereas wether lambs of the same flock go no more than from 40 to 50 per cent. Even in badly fed flocks, the ewe lambs "dress" better than wether lambs. Whilst it is natural that ewes should fatten more quickly than the ram lambs, the difference should not be so great. Wethers are the plainest on the forequarters and neck, and show the most lean.

Late marking is, however, the real cause and, added to this, the old rough and ready method of drawing out the testicle, cord, and vein, makes matters worse. Marking as early as practicable is the course recommended, but once a ram lamb has been allowed to develop, "proud" castration should then be practised, for it is at that stage when most of the plainness of the forequarters is brought about. While the ewe lamb keeps going, the wether lamb has to make up what he has lost owing to unnecessarily severe castration. For example, in some flocks, 3 to 4 per cent. of ram lambs are found to be uncastrated. These strip better on the forequarters than do the wether lambs of the same flock, unless the latter were marked young. Ram lambs often go first grade. Should they be put lower, it is only one grade, as a rule, and that mainly on account of dressing unsightly at the purse through the testicles being removed by the butchers.

When lambs are over a month old, just the soft interior of the testicle should be removed, leaving the blood vessel, cord and casing undisturbed. The slight "cordiness," only found on careful handling, even in two and three year old wethers, has not been found detrimental in any way, either from the standpoint of the grazier or the butcher.

Careful tail-searing has assisted towards early maturity and quality, but early castration of all ram lambs is still more important. Where this has not been practised, proud cutting is the next best method.

Whilst it is wrong to allow lambs to go over three weeks before being marked, it is, under some circumstances, inadvisable to muster ewes before all have lambed, or to mark lambs during wet or stormy periods.

Nearly every farmer knows that quality of feed, not always quantity, is indispensable for producing good quality lamb. It is not, however, realized by half of our farmers that, if lambs are bred from narrow forequartered merino-type stock, and the ram lambs are marked late in the rough style, the latter cannot help but dress plain on the fore-ends, no matter how well fed they may have been. They will also be lighter than ewes, and early-marked wether lambs from stock of more thickness.

(To be continued.)

SHEEP DIPPING ACT 1909.

For the information of sheep-owners in Victoria it is notified that the above Act is now in operation. Forms of application for a clean certificate may be obtained on application to either the District Stock Inspector, the local Dairy Supervisor, or direct to the Chief Inspector, Department of Agriculture, Melbourne.

The following notice and epitome of the Act have been printed in the form of a leaflet for the guidance of sheep-owners.

NOTICE TO SHEEP-OWNERS RE DIPPING.

Clean Certificate.—It is hereby notified that, in accordance with the provisions of the *Sheep Dipping Act* 1909, No. 2216, it is necessary for all owners* of sheep or lambs to apply for a clean certificate for such sheep or lambs, which certificate will, when granted, continue in force until cancelled. (Sec. 3 (1-3).)

Declaration.—The application is to be supported by a declaration that the sheep and lambs in respect of which the application is made are free from ticks and lice. (Sec. 3 (2).) Penalty for false declaration, £50. (Sec. 15.)

Inspection.—If deemed necessary by the Chief Inspector, such sheep or lambs will be inspected by the Inspector under the Act. (Sec. 3 (1).)

Dipping after Shearing.—It is further notified that every sheep-owner shall dip all his sheep and lambs immediately after shearing and directly from the shearing board in every year, or, if they cannot conveniently be dipped from the shearing board, all such sheep and lambs shall be placed and kept in a securely fenced paddock, and dipped within sixty days of being shorn. Penalty, £20. (Sec. 4 (1).) Sheep or lambs in respect of which the owner holds a clean certificate will not necessarily require to be so dipped. (Sec. 4 (4).)

Return.—Every sheep-owner shall within one month after he has dipped his sheep and lambs make a return to the Chief Inspector in the prescribed form, copy of which is enclosed. Penalty for failing to make return, £5. (Sec. 4 (3).) Penalty for making a false return, £50. (Sec. 15.)

Annual Shearing Compulsory.—Sheep and lambs, except those lambs it may be intended to keep as hoggets, are to be shorn annually within the shearing time—1st July in any year to 1st March next ensuing. Penalty, £20. (Secs. 2 and 4 (5).)

Dipping on Inspector's Order.—It may be required by the Chief Inspector that sheep or lambs found to be carrying ticks or lice be dipped within fourteen days of his order, excepting in the months April to November, both inclusive. (Sec. 6 (1, 2).) Penalty, £10; for each further period of seven days after date of conviction, £20 additional. (Sec. 6 (3).)

Sheep not to be Travelled.—No sheep or lambs carrying ticks or lice may be travelled or placed in any sale-yard or public place or other place at which sheep or lambs are offered for sale. Penalty, £5. (Sec. 10.)

Notification of Ticks and Lice.—The owner of any sheep or lambs for which a clean certificate has been given shall give immediate notice to the Chief Inspector should such sheep or lambs at any time be found to have ticks or lice on them. Penalty, £5. (Sec. 12.)

Application to be Made.—Application for clean certificate should be forwarded on receipt of this notification.

* "Owner" includes superintendent, overseer, occupier, or person in charge.

Artificial Manures Acts.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN VICTORIA UNDER THE PROVISION OF THE ARTIFICIAL MANURES ACTS.

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture. Found.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric acid. Water Soluble. Found.	Water Soluble. Guaranteed.	Citrate Soluble. Found.	Citrate Soluble. Guaranteed.	Insoluble. Found.	Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.	Potash. Found.	Potash. Guaranteed.	Estimated Value of the Manure per Ton.
			%	%	%	%	%	%	%	%	%	%	%	%	%	£ s. d.
754	Nitrate of Soda	Cuming, Smith, and Co., Melbourne	1·46	15·40	15·50	..	..	..	..	..	..	..	..	..	..	13 9 6
729	Superphosphate	Australian Explosives and Chemical Co., Melbourne	8·04	..	..	18·02	17·00	1·96	1·00	1·97	2·00	21·95	20·00	..	..	4 14 4
764	,, ...	Cuming, Smith, and Co., Melbourne	9·59	..	..	17·08	17·00	1·03	1·00	2·67	2·00	20·78	20·00	..	..	4 8 2
784	,, ...	Mt. Lyell M. and R. Co., Melbourne	9·75	..	..	17·64	17·00	1·39	1·00	2·47	2·00	21·50	20·00	..	..	4 11 8
769	Thomas Phosphate and Superphosphate	,, ,, ,, ,,	3·69	..	..	1·67	5·00	12·76	11·00	4·41	1·50	18·84	17·50	..	..	3 10 8
758	Animal Fertilizer	J. Cooke and Sons, Melbourne ..	6·47	5·64	5·35	..	..	..	..	..	..	11·70	12·10	..	..	4 19 11
752	Bone Fertilizer	Cuming, Smith, and Co., Melbourne	7·43	2·70	3·00	..	..	4·28	3·50	18·31	14·50	22·59	18·00	..	..	4 19 9
771	,, ,, ...	,, ,,	6·36	2·60	3·00	..	..	4·92	3·50	13·00	14·50	17·92	18·00	..	..	4 6 7
756	,, ,, ...	H. J. Feore and Co.	10·26	3·12	2·43	..	..	2·71	..	12·22	..	14·93	16·28	..	..	4 1 11
762	,, ,, ...	,, ,, ...	9·48	3·67	2·43	..	..	2·89	..	11·35	..	14·24	16·28	..	..	4 6 9
776	,, ,, ...	Mt. Lyell M. and R. Co., Melbourne	6·75	3·15	3·00	..	..	7·50	3·50	11·45	14·50	18·95	18·00	..	..	4 19 3
777	,, ,, ...	,, ,, ,, ,,	8·33	2·80	3·00	..	..	8·63	3·50	9·01	14·50	17·64	18·00	..	..	4 12 10
687	Nitro Superphosphate	Australian Explosives and Chemical Co., Melbourne	5·99	1·04	1·10	14·20	13·00	1·35	1·00	6·05	5·00	21·60	19·00	..	..	4 18 6
753	Dissolved Bones	Cuming, Smith, and Co., Melbourne	10·44	1·24	1·00	11·55	10·01	2·27	3·88	6·90	5·48	20·72	19·37	..	..	4 14 11
773	,, ,, ...	,, ,, ,, ,,	9·66	1·05	1·00	13·49	10·01	4·03	3·88	5·88	5·48	23·40	19·37	..	..	5 5 7
775	Orchard Manure	Australian Explosives and Chemical Co., Melbourne	8·53	1·54	1·80	14·42	13·22	1·08	0·78	1·64	1·55	17·14	15·55	6·35	8·00	6 4 0
759	Maize Manure	Cuming, Smith, and Co., Melbourne	5·59	2·25	2·38	15·49	13·94	1·63	0·82	4·64	1·64	21·76	16·40	1·41	1·80	6 9 1
760	Orchard and Vine Manure ..	,, ,, ,, ,,	7·44	2·34	2·40	14·58	12·92	1·74	0·76	1·82	1·52	18·14	15·20	6·52	7·18	7 6 3
761	Potato Manure	,, ,, ,, ,,	11·41	1·07	1·20	15·95	14·62	0·87	0·86	0·95	1·72	17·77	17·20	3·90	4·15	5 17 5
757	Ohlendorf's Peruvian Guano ..	Gibbs, Bright, and Co., Melbourne	10·22	5·54	5·73	9·26	9·40	2·41	2·55	1·15	0·81	12·82	12·76	1·50	1·47	7 1 8
767	Maize and Fodder Crop Manure	Mt. Lyell M. and R. Co., Melbourne	6·03	2·82	3·00	12·52	11·00	2·82	1·25	0·89	1·75	16·23	14·00	0·34	1·00	5 11 5
768	Potato Manure	,, ,, ,, ,,	4·55	1·19	1·20	13·12	14·50	2·63	1·00	0·89	1·70	16·64	17·20	4·86	4·15	5 15 3
751	Blood Manure	J. Cooke and Sons, Melbourne ..	19·06	10·94	11·65	..	..	..	..	..	..	2·32	2·18	0·20	0·19	6 18 9

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES, ETC.—*continued.*

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.				Estimated Value of the Manure per Ton.
								Fine.		Coarse.		
			Found.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
			%	%	%	%	%	%	%	%	%	£ s. d.
770	Bonedust	J. Cockbill, Melbourne	7·96	5·60	3·50	16·40	18·25	61·00	31·43	39·00	68·57	6 4 9
774	,, ...	,, ,, ...	14·27	3·90	3·50	18·02	18·25	49·50	31·43	50·50	68·57	5 7 6
750	,, ...	J. A. Dundas and Co., Footscray ..	6·63	2·70	3·00	15·43	18·00	65·40	54·65	34·60	45·35	4 7 6
765	,, ...	,, ,, ,, ,, ..	6·58	2·77	3·00	16·83	18·00	56·60	54·65	43·40	45·35	4 11 6

P. RANKIN SCOTT,
Chemist for Agriculture.

Government Laboratory,
Melbourne, 6th October, 1910.

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.				Estimated Value of the Manure per Ton.
								Fine.		Coarse.		
			Found.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
			%	%	%	%	%	%	%	%	%	£ s. d.
788	Bonedust	J. R. Elsworth, Ballarat ..	6·90	3·49	3·00	19·61	19·00	67·50	40	32·50	60·00	5 12 4
807	,, ...	,, ,, ,, ..	9·94	3·81	3·00	17·88	19·00	58·50	40	41·50	60·00	5 8 0

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES, ETC.—*continued.*

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture. Found.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Water Soluble. Found.	Water Soluble. Guaranteed.	Citrate Soluble. Found.	Citrate Soluble. Guaranteed.	Insoluble. Found.	Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.	Potash. Found.	Potash. Guaranteed.	Estimated Value of the Manure per Ton.
			%	%	%	%	%	%	%	%	%	%	%	%	%	£ s. d.
780	Superphosphate, Federal, O.S. ..	Aust. Explosives and Chemical Co., Melbourne	8·76	..	..	14·26	17·00	2·94	1·00	2·90	2·00	20·10	20·00	..	..	4 3 11
792	" Florida, Sickle..	Cuming, Smith, and Co., Melbourne	7·50	..	..	16·60	17·00	2·15	1·00	3·78	2·00	22·53	20·00	..	..	4 13 8
796	" "	" " "	12·11	..	..	17·36	17·00	1·14	1·00	3·20	2·00	21·70	20·00	..	..	4 11 6
793	" No. 1 " ..	Mt. Lyell M. and R. Co., Melbourne	7·47	..	..	17·51	17·00	2·59	1·00	1·72	2·00	21·82	20·00	..	..	4 13 9
794	" " ..	" "	11·00	..	..	18·87	17·00	0·66	1·00	1·45	2·00	20·98	20·00	..	..	4 11 7
783	" " ..	Wischer and Co., Melbourne	6·93	..	..	14·75	17·00	2·46	1·00	1·89	2·00	19·10	20·00	..	..	4 11 4
790	" " ..	" " "	7·80	..	..	17·30	17·00	1·30	1·00	1·75	2·00	20·35	20·00	..	..	4 7 10
781	Bone Fertilizer ..	Aust. Explosives and Chemical Co., Melbourne	5·52	2·61	3·00	..	..	4·30	..	14·60	..	18·90	18·00	..	..	4 8 8
779	" " Sickle	Cuming, Smith, and Co., Melbourne	5·10	2·55	3·00	..	..	7·42	3·50	10·09	14·50	17·51	18·00	..	..	4 8 0
782	" " "	" " "	5·99	2·50	3·00	..	..	6·31	3·50	16·53	14·50	22·84	18·00	..	..	5 0 9
797	" " "	" " "	7·25	3·05	3·00	..	..	5·24	3·50	14·35	14·50	19·59	18·00	..	..	4 17 0
798	Dissolved Bones, Sickle ..	" " "	9·79	0·83	1·00	13·95	10·01	2·32	3·88	3·90	5·48	19·27	19·37	..	..	4 8 7
808	Bonedust and Superphosphate ..	A. H. Hasell, Melbourne	7·40	1·03	0·80	12·26	12·78	4·14	1·37	2·73	5·44	19·13	19·59	..	..	4 11 7
803	Nitro Superphosphate	Kitchen and Sons, Melbourne	7·51	1·54	1·39	11·85	13·17	4·55	1·50	4·38	2·67	20·78	17·34	..	..	5 2 1
813	" "	" " "	8·41	1·25	1·39	12·62	13·17	3·24	1·50	4·14	2·67	20·00	17·34	..	..	4 16 1
795	Bonedust and Superphosphate, No. 1	Mt. Lyell M. and R. Co., Melbourne	6·60	1·58	1·50	5·99	8·50	4·32	1·50	10·79	9·00	21·10	19·00	..	..	4 12 10
791	Potato Manure, Sickle ..	Cuming, Smith, and Co., Melbourne	11·85	0·94	1·20	15·47	14·62	1·29	0·86	1·04	1·72	17·80	17·20	3·90	4·15	5 13 2
799	" " " ..	" " "	12·25	1·08	1·20	14·66	14·62	1·79	0·86	1·67	1·72	18·12	17·20	4·05	4·15	5 13 0

Government Laboratory,
Melbourne, 15th November, 1910.

P. RANKIN SCOTT,
Chemist for Agriculture.

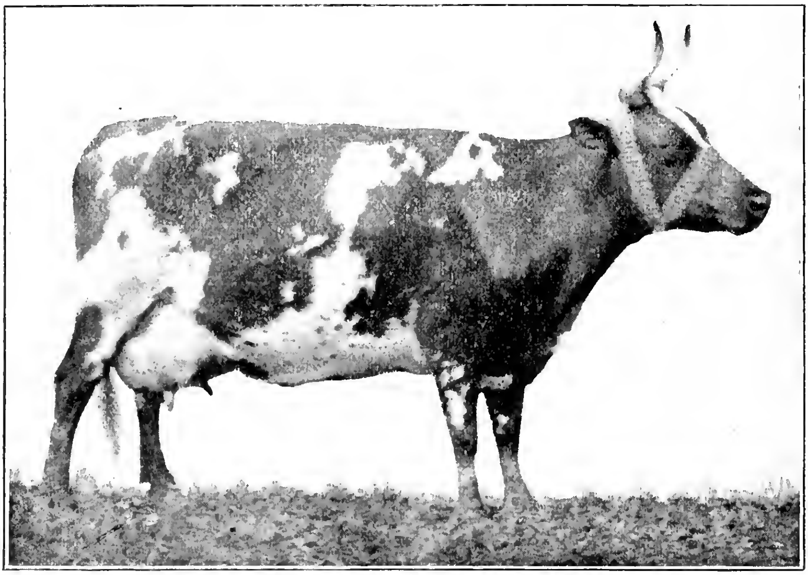
FARM MILKING TESTS.

Swan Hill Agricultural Society's Competition.

G. A. Ryland, Dairy Supervisor.

The above competition, which was carried out in connexion with the recent Swan Hill Agricultural Show and judged by me, was a great improvement on previous methods of deciding the best dairy cow entered for show in this splendid dairying district.

Dairy cow tests held in connexion with agricultural shows are often unsatisfactory, inasmuch as the cows competing do not receive a fair chance to show what they can produce in a stated time. The greatest cause for dissatisfaction among the owners of the animals, and incidentally with the cows themselves, is that the animals are taken from their home surroundings and milked in a strange place amidst excitement. It is a well-known fact among dairymen that when a milch cow is excited she does not yield the same quantity of milk, and it may be stated that, as a rule, the better the cow for milk production, the more nervous her temperament and consequently the more easily upset.



"ELSIE," WINNER OF TEST, 16.986 LBS. COMMERCIAL BUTTER PER WEEK.

Prior to 1910 the method adopted by the Show Committee at Swan Hill was that the cows were brought to the yards on the evening previous to the show and milked in the presence of the stewards. They were milked again on the following morning, the milk weighed, and a sample tested for percentage of butter fat. This was no test for a dairy cow for two main reasons, namely, that the cows are not in their usual surroundings and are consequently excited; and that the sample tested was certainly not an average sample of the cow's milk for the day.

At my suggestion the Agricultural Society at Swan Hill adopted the following conditions which were duly carried out and gave general satisfaction. The cows were seen milked out before the day's trial.

CONDITIONS.

1. The cows to be milked at their homes under the supervision of Officers of the Department of Agriculture for a period of 24 hours in the two weeks previous to the show, and the day's butter production to be taken as the basis in deciding the cow's yield.

2. In the event of two cows obtaining the same highest yield of butter, the prize to go to the cow that gave the most milk.

3. All cows entered to be shown on the day of show.

4. No test or butter returns to be made available until cows are in pens at show yard on the day of show.

To give some idea of the interest taken prior to entering any cows, it may be said that over 40 milk samples were tested for owners by the proprietors of the Swan Hill Butter Factory, besides numerous trial tests made by other owners having a testing outfit on their farms. This competition has been the means of making owners take more interest in the returns from their cows and has put testing apparatus into more general use. Thirteen entries were ultimately received, two of which were later disqualified for non-appearance at the Show. Several entries were withdrawn mainly owing to exaggerated rumours being afloat as to what certain cows were yielding. It is to be regretted that people take so much notice of what they hear, and also that they have so much fear of being beaten. It is anticipated that the entries will be much larger next year. The following are the results:—

Owner.	Cow.	Lbs. Milk One Day.	Percentage Butter Fat.	Butter Fat Result.	Lbs. Commercial Butter per Week.
E. Hobson	"Elsie" ..	52·00	4·0	2·080	16·986
E. Hobson	"Plum" ..	54·50	3·8	2·071	16·913
R. Hastings	"Dulcie" ..	63·75	3·2	2·040	16·660
R. Prince	"Jess" ..	44·00	4·5	1·980	16·170
R. Prince	"Pet"	49·50	3·9	1·930	15·761
R. Prince	"Baby" ..	43·75	4·2	1·837	15·002
E. Johnson	"Pet"	39·50	4·6	1·717	14·022
G. Snell	"Pansy" ..	51·50	3·1	1·596	12·034
N. Brown	"Teresa" ..	36·25	4·0	1·450	11·831
N. B. Bryan	"Mayflower" ..	37·50	3·8	1·425	11·637
E. Hobson	"Baby" ..	31·50	3·8	1·197	9·775

The figures in the butter fat result column show how keen the competition was for first place.

It was unfortunate that, on the day of the trial for the two leading cows, a cold southerly wind was prevalent, which decreased their milk yield for the day by several pounds. To have all the cows milked at the same time would require an army of stewards. Figures taken previous to the competition showed each of the two leading cows to be yielding 6 gallons per day.

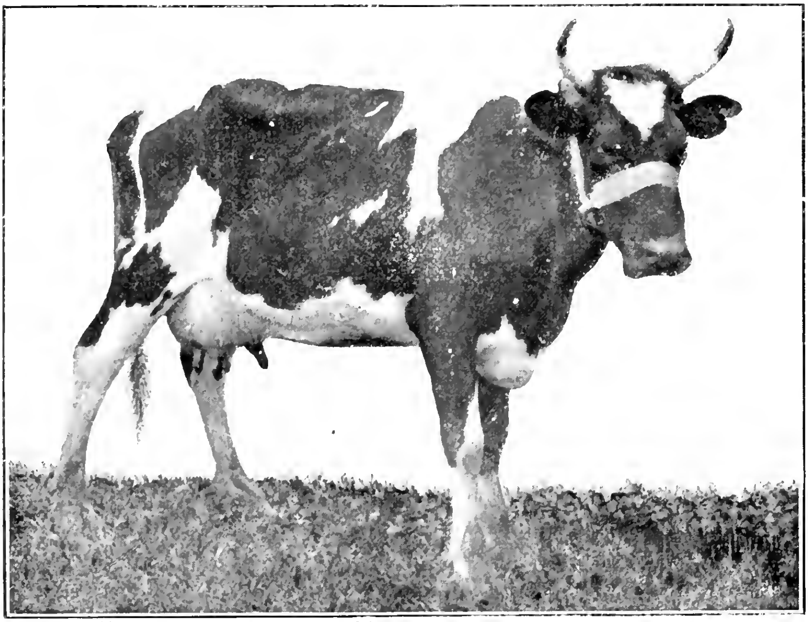
The three cows owned by Mr. R. Prince gave close results, and the returns should be gratifying to the owner. Mr. Prince keeps a milk chart in regular use and so has accurate records of the performances of individual members of the herd, which is a distinct step in the right direction.

The accompanying photographs are those of the three best cows entered.

"Elsie," whose parents were bred by Messrs. McNab, "Oakbank," Tullamarine, is a typical dairy cow in shape. She was sired by "Duke," by "Glen Elgin's Bruce"; dam "Granny."

"PLUM." SECOND AT TEST. 16.913 LBS. COMMERCIAL BUTTER PER WEEK.

"Plum," also of the same strain, is a bigger cow, sired by "Duke", dam "Lucy."



"DULCIE." THIRD AT TEST. 16.660 LBS. COMMERCIAL BUTTER PER WEEK.

The owner of "Elsie" and "Plum," Mr. E. Hobson, is an ardent admirer of the Ayrshire and has proved the value of the pure bred animal.

"Dulcie," who, with $63\frac{3}{4}$ lbs., secured the prize for the greatest weight of milk and third place in the butter returns, is owned by Mr. R. Hastings. This cow is a Holstein-Ayrshire cross and is now on her second calf. She was bought as a heifer for the sum of £14, and is a splendid example showing how a cow can convert fodder into milk. Although she has a large appetite and good digestion she is always in low condition.

The organization of farm milking tests in the dairying districts of this State is a work which would prove of wonderful value to all dairymen. It is to be greatly regretted that at present cows cannot be bought on reliable figures giving records of what they can produce.

It is hoped that the commencement made at Swan Hill will be taken up by other Agricultural Societies, and will lead to more attention being given to the establishment of records.

ECHUCA DAIRY HERD COMPETITION.

J. S. McFadzean, Dairy Supervisor.

There were six entries for the Echuca Dairy Herd Competition, and the judging took place on the 17th and 18th October. Four of these farms are within the irrigation channel area, and obtain their water supply from that source, while the other two depend on the rainfall to supply the requirements of both stock and cultivation.

Throughout this district the season has been very favourable for grass; and there is abundant pasture everywhere, principally of trefoil and barley grass. On the irrigable farms lucerne has been sown broadcast in some of the paddocks; but, being pastured, does not last long, and is soon crowded by the native grasses and weeds. Oats and wheat are sown for hay and grain; but owing to the unsystematic working of the land, these crops are frequently smothered by the growth of wild oats. A little maize is sown for summer greenstuff on the old-fashioned broadcast method; and the yields obtained are not heavy.

Silage had been made on only two of the six farms inspected. If the heavy growth of wild oats, thistle, barley grass, trefoil, &c., that is going to waste on many farms here this season were made to silage, not only would this fodder be found most valuable in assisting the milk production during the dry months, but it would help to clean the cultivation land for future cropping. The wild oat seeds so much earlier than the sown grain crops that it has shed its seed before the latter are ripe enough to harvest; and consequently each year of hay or grain cropping leaves the land so much more foul with its seed. To feed down this weed growth generally results in a lot of the seed being trampled into the ground, as well as being distributed in the manure from the stock; so that harvesting this rubbish for silage when green is the most practical way of cleaning the cultivation land.

On the farms in the channel area the pastures are watered when the rainfall is insufficient to promote satisfactory growth; and, while some people claim that it is not profitable to irrigate pasture land if the water has to be paid for, those who have given it sufficient trial have found it most satisfactory in its results. On the other hand, it is more than probable that if the lucerne crops were properly drilled in, cultivated, and cut for hay, or if maize growing for silage was carried out on a more satisfactory system, the water used on the pasture land could be made to bring in a much greater return if utilized in connexion with the growing of these crops.

The general quality of the stock had, in every instance, to be judged from their appearance, for no definite information was obtainable on any of the farms as to the amount or quality of the milk given either individually or collectively. No one could say how much milk the cows had given any one day; and the factory cream dockets were the only record of returns available. One owner's guess at the milk yield, when checked by the cream and factory test, would indicate that the cows were giving milk with 6 per cent. of butter fat all round; and others were equally unreliable. It was also the exception to find a dairy farmer who weighed his cream before sending it to the factory. Grain is weighed, and poultry and eggs counted before sending to market; but cream at 5d. per lb. is apparently not considered worth keeping check of.

The first farm inspected was that of Mr. Wilson, which is made up of five 20-acre blocks, subdivided into fifteen paddocks—all within the irrigation area. Seventeen acres are sown with oats and wheat. Two 10-acre lots have been planted with lucerne and paspalum; and are used in their turn as grazing paddocks. Two acres are also sown with maize and Planter's Friend. A small silo that was filled last season with green oats, unchaffed, has not been opened; but a stack of similar fodder was used by the cows during the past winter. This is the third year of silage-making on this farm.

The milking herd includes 23 cows, of which 20 are at present in profit. They are a mixed lot, showing principally Shorthorn blood; but there are a few showing some Jersey breeding.

The dairy buildings on this farm were of the most primitive description, and not well situated; and in competition many points were lost on this account.

Mr. Glanville's farm was the next visited. Here, 80 acres are subdivided into eighteen paddocks; water for stock and irrigation being supplied by the channel, with a good clay "tank" as a standby. Six acres of lucerne and 2 acres of maize are sown for green fodder; no silage is made; and also no hay crop has been sown this season, as a surplus of over 20 tons is still on hand from last year.

The milking herd of 17 head are all in profit except two. They are mostly a very nice class of Shorthorn; but possibly the best of the lot is a fine framed Ayrshire that is said to be a local prize-winner. A heifer calf from this cow stood out from the rest in "dairy" appearance, showing both fine bone and good frame. Almost without exception, the stock on the farms inspected—young and old—were in good condition.

The barn and other shedding on this farm are roomy; and the various buildings and yards are fairly well situated, and tidily kept.

The third farm seen is that worked by Mrs. Felgenhauer and family on the "Shares" system. This place has only recently been taken over for dairying, and is not yet in proper working order; most of the necessary steading having still to be built. The 130 acres are cut up into fourteen paddocks, all of which are watered by the channel. Thirty acres are in oats; and one paddock of 9 acres has lucerne growing on it. It is proposed to make more than half of the oat crop to silage, either in pit or stack.

The dairy herd of 23 cows and 5 springers have nearly all been recently purchased, and are mostly Shorthorn heifers—two only showing Ayrshire blood—and, on the whole, they are a promising looking lot.

With building to be done, harvest time almost at hand, and the flush of the dairy work now on, the family has a busy time ahead.

On the next farm inspected, which is owned by Mr. Wilkins, the conditions are almost the opposite from those last mentioned. There are here 37 acres worked in conjunction with 131 acres of rented land adjoining. The smaller block has been worked as a dairy farm for many years to supply retail milk to Echuca, and the buildings on it are extensive.

The 37 acres are subdivided into several paddocks. Eleven acres are sown with wheat, 10 acres with lucerne, and $1\frac{3}{4}$ acres with maize. Of the 131 acres, 41 are carrying a heavy crop of self-sown oats and wheat; and the rest is used for grazing.

A pit silo about 40 feet long, 13 feet wide, and 10 feet deep, divided into two sections and roofed over, has been in use each season for several years past. Convenient to the silo and the barn is a 17-stall feeding shed, slab floored and brick drained. The milking is done in other shedding nearer to the dairy. Several handy little labour-saving contrivances, especially in regard to the water service, are to be seen on this farm, and the place is neatly kept.

The milking herd, however, does not show the evenness that might be expected on such a long established farm, though the cows were as good as the average of those seen. Only 14 of the 24 cows on the place were in profit; but in upholding the milk supply for retail purposes, it is more advisable to have cows coming in at each month of the year than for the general calving to take place at the spring season, as is evidently the case with the stock on the other farms. Some of these dry cows also were being fattened for slaughter. The bull on this farm is paddocked and housed apart from the milking herd. He is a white Shorthorn, showing rather more dairy quality than was generally met with.

The fifth farm, in order of inspection, was that of Mrs. Hill, at Wharparilla North, who looks after the herd of 10 cows herself. This farm is 163 acres in extent, divided into three paddocks, and watered by two good dams. None of the land is under cultivation; the owner preferring to content herself with the returns obtainable from the natural grazing rather than have the bother of hiring the labour and keeping the plant necessary to cultivate.

Mrs. Hill makes no pretensions to having an up-to-date farm; but the dairying is carried out in a cleanly manner; and it was to show her appreciation of, and interest in this dairy farm competition, that she came forward with her nomination.

Several of the cows on this farm show good dairy quality; and their fine bone, lean necks, and bright clean looking skins suggest that there has been a Jersey cross somewhere in their breeding. Three of the 9 cows in milk had recently come in; and the cream returns showed the other 6 to have averaged $7\frac{1}{2}$ lbs. of butter fat the week previous.

The sixth and last of the farms to be dealt with was Mr. Muller's, also of Wharparilla. This is more of a grazing than a dairy farm. On the 680 acres of good grazing land, only 23 cows are kept, and 20 of these are milking at present. The main part of the land is used for sheep and cultivation. No silage is made; and the cows are allowed to dry off in January and February of each year; and the dairy work is suspended till the following spring calving.

The water storage here is something exceptional in the way of a dam, on a small creek; and the quantity in sight is sufficient for the irrigation of a few acres of land, if desired, as well as providing for the full requirements of the stock.

There are substantial roomy buildings on the farm; and, with its quality of land and abundance of water, the place could easily be made into a large and profitable dairy farm.

The judging of these farms was done on the point system; 100 points being allowed as the maximum for each section of (1) Stock, (2) Feeding and Care, (3) General Management. These sections were further subdivided into a total of 38 sub-sections, so that each item of the whole work could be separately dealt with. The principal of these are here given:—

		Possible Points.	Wilson.	Glanville.	Felgenhauer.	Wilkins.	Hill.	Muller.
100	Stock—Quality ..	75	36	34	34	44	39	32
	Condition ..	25	16	17	18	19	19	19
100	Pasture—Subdivision ..	10	10	10	10	8	2	3
	Quality ..	12	8	7	8	7	6	7
	Cultivation and Fodder..	36	24	10	16	30	..	10
	Water	26	18	21	19	18	17	21
	Shelter	16	4	2	2	14	11	6
100	Buildings and Utensils ..	62	26	47	34	50	46	46
	Fencing, Gates, Yards, Roads	18	4	9	9	11	9	11
	Manure, removal ..	6	2	3	3	3	3	4
	Farm book-keeping ..	14	5	1	6	2	1	2
		..	153	161	159	206	153	161

1st .. Mr. Wilkins.
2nd .. Messrs. Glanville and Muller (equal).
3rd .. Mrs. Felgenhauer
4th .. Mrs. Hill and Mr. Wilson (equal).

The success of the winning farm was due to the more general attention given to each department of the dairy-farm work, whereas the others each fell short in some particular section.

Most of the farms get their highest points in connexion with the pasture, water, and condition of the stock. The cattle, as a whole, are a long way from being good dairy stock. There are some very nice cows on each of the farms; but there are too many that are evidently indifferent milkers also kept. The bulls on all the farms were Shorthorns; and, with few exceptions, the calves gave promise to develop into better butcher's cattle than dairy stock. On no farm was there any evidence of advancement being made by way of breeding. Broadly speaking, the Shorthorn is not a dairy breed, more especially in the hands of a beginner; and breeding mixed quality stock, such as are seen on these farms, is wasting valuable time. The use of a Jersey or Ayrshire bull in the herds would, in a few years, make a great improvement in their milking quality.

Shelter from the extremes of heat and cold is a most important matter in the care of the dairy herd; and on some of the farms this item had been almost lost sight of. Cows will seek the protection of trees, hedges, or buildings from either hot sun or cold winds when such is available; and their milk yield will be sustained in proportion to the efficiency of the shelter thus provided them.

The majority of the farms possessed roomy milking shed and dairy accommodation; but the floorings of these were not such as would class them as anywhere near perfection. Where cows are milked, and where milk and cream are handled, experience shows that an impervious floor is very necessary in order that the work of cleaning can be done both quickly and effectively; and the inside walls of all dairy buildings may be kept clean at little expense by lime-washing. An earth-floored dairy, no matter how well kept, cannot be considered altogether satisfactory, for dust must rise in it if swept; and it cannot be scrubbed.

Fencing, gates, yards, and roads will give satisfaction in accordance with their condition. Poor gates and fencing are a source of endless annoyance to both the owner and his neighbours. Bad roads and yards increase the work of the farm.

On every farm some system of keeping tally of the work done, and the various happenings, is highly essential; and, in dairying, to overlook this may easily become an expensive matter. Some people neglect this work because they have not learnt book-keeping; and are misled in the belief that some special knowledge is required for it. On many farms the records of events are kept in the shape of a daily diary; and for general work little more is necessary. To know when each cow is expected to calve may frequently be the means of its life being saved by giving some extra care or attention at that time; and to know how long she continues in milk is one step towards an estimate of her value as a producer. To have each animal distinguished by a name or number is of much assistance in keeping note of their value as breeding stock. To know the breeding of the sire of a line of good heifers would be worth pounds to any one about to buy a bull for use in his herd; and many a farmer would give a good deal for such information that he should have made note of when available. Five minutes would have done the writing; but nothing will cover its neglect.

Then, as regards keeping account of the milk and butter fat returns from each individual cow—no work done on the farm will pay better than this; and five minutes per cow a week will do it. To grass-feed a cow costs at least £2 per year; while the work of milking her for the year cannot be estimated at less than 30s. With butter fat at 10d. per lb., this means that each cow must give 240 gallons of 3.5 per cent. milk per year, or 84 lbs. of butter fat, in order to pay for her keep; and numbers of cows do not reach this standard. Quite a large proportion of dairy farmers are at present losing money keeping such cows, because they will not take the trouble to find them out. Imagine the folly of milking 240 gallons of milk from a cow for 6 or 7 years for no profit—keeping her in grass and water, driving her to the yard, milking her, separating the milk, taking the cream to the station year in and year out, and not being any better off for it. It is this that causes the oft-heard statement "There is nothing in dairying." If every dairy farmer would get down to the fact that there is no profit from a cow till she clears 240 gallons of milk in the year, he would soon find time to cull out his poor milkers, and profit by the work.

SULLA CLOVER.

A Valuable Fodder Plant.

H. W. Budd, Dairy Supervisor.

The accompanying photograph shows a plant of Sulla Clover (*Hedysarum coronarium*, L.), which was referred to in the January issue as having been grown successfully at Longerenong from seed brought out from Europe by Mr. F. de Castella. The Hon. James Cameron, Acting Minister for Lands, records the successful growth of this clover many years ago in East Gippsland.

SULLA CLOVER.

The specimen shown was grown by one of the settlers on the Overnewton Estate, St. Albans, on a clay soil and under circumstances that proves it to be a very hardy plant and worthy of trial for fodder purposes in any district.

The seed was obtained through one of the Melbourne seed firms and sown in November, 1909 Rather a poor germination resulted, but sufficient plants grew to enable a good trial of its possibilities being made. It was sown on land that had previously grown a crop of oaten hay which had been manured with superphosphate and bonedust at the rate of 1 cwt. per acre.

The plants received one watering by hand and on 10th July they had attained an average height of 5 feet. They were then cut and another growth of 2 feet has since resulted (October). The plants flower freely and look very attractive, even from an ornamental standpoint. They also seem to have a special attraction for bees.

The plant is eaten greedily in its green state by cattle, and it should prove an eminently satisfactory crop for dairy winter feeding or for ensiling.

Mr. P. R. Scott, Chemist for Agriculture, has kindly furnished the following analyses of the first and second growths referred to:—

—	Sample 5 feet high.		Sample 2 feet high.	
	Original Sample.	Dry Basis.	Original Sample.	Dry Basis.
	Per cent.	Per cent.	Per cent.	Per cent.
Moisture	80·15	..	84·34	..
Ash	2·49	12·55	2·20	14·05
Protein (Nx.6·25)	1·36	6·85	1·54	9·83
Crude Fibre (pentosan free)	5·09	25·64	2·59	16·54
Nitrogen Free Extract	10·57	53·25	8·89	56·77
Ether Extract	0·34	1·71	0·44	2·81
The Ash is composed of—				
Phosphoric Acid	0·0645	..	0·061	..
Lime	0·140	..	0·209	..
Potash	0·410	..	0·250	..
Undetermined	1·8755	..	1·680	..
Ash	2·490		2·200	

ANALYSES OF SAMPLES OF ARSENATE OF LEAD.

P. Rankin Scott, Chemist for Agriculture.

Since the publication of the analyses of samples of arsenate of lead in the October issue of the *Journal*, I have collected four additional samples, the anlayses of which are shown in Table I. together with the previous list for the purpose of comparison. A few remarks are also made respecting the quality and properties of the arsenates, variation in constitution, &c.

TABLE I.—WET BASIS.

Brand.	Moisture.	Total Arsenic Oxide.	Total Lead Oxide.	Water Soluble Arsenic Oxide.	Water Impurities Soluble other than Arsenic Oxide.
	%	%	%	%	%
Swift's	41·89	16·00	38·20	0·58	3·72
Elephant	40·18	14·89	40·70	1·19	3·20
E. de Haen	67·67	10·09	20·98	0·18	1·27
Sherwin-Williams	55·84	10·61	31·80	0·06	2·14
Our Jack	50·13	13·91	34·11	0·16	1·98
Federal	49·50	13·46	31·30	0·72	3·67
Austral	21·37	16·35	53·44	0·11	8·85
Bluebell	44·05	17·98	34·43	0·13	3·50
Electro	33·66	20·25	41·89	0·18	1·57
Cobra	43·65	15·58	39·14	0·19	1·64
Red Seal	49·07	15·08	33·02	0·17	1·58
Carlton	41·78	17·62	36·69	0·87	3·88
Additional Samples Analyzed.					
Cobra	47·76	16·67	33·77	1·54	2·11
Hemingway's (bulk sample)	49·08	17·64	31·19	0·58	2·22
Hemingway's (in tin)	57·81	14·49	26·12	0·45	2·29
Orchard	17·70	24·32	53·18	4·17	4·83

Assuming a standard arsenate of lead contains approximately 50 per cent. water and 12.5 per cent. arsenic acid, considerable variation will be noted in the brands mentioned above. The water content varies from 17.70 per cent. to 67.67 per cent. while the arsenic oxide content ranges from 10.09 per cent. to 24.32 per cent.

TABLE II.—DRY BASIS.

Brand.	Total Arsenic Oxide.	Total Lead Oxide.	Water Soluble Arsenic Oxide.	Water Soluble Impurities other than Arsenic Oxide.
	%	%	%	%
Swift's	27·35	65·75	1·00	6·40
Elephant..	24·96	68·06	2·00	5·35
E. de Haen	31·21	64·90	0·57	3·93
Sherwin-Williams ..	24·03	72·03	0·14	4·86
Our Jack	27·91	68·40	2·14	3·96
Federal	26·66	61·99	1·43	7·27
Austral	20·80	67·99	0·14	11·26
Bluebell	32·14	61·55	0·23	6·25
Electro	30·52	63·13	0·27	2·36
Cobra	27·64	69·45	0·33	2·91
Red Seal	29·60	64·83	0·33	3·10
Carlton	30·27	63·02	1·87	7·13
Additional Samples Analyzed.				
Cobra	31·92	64·65	2·95	4·05
Hemingway's (bulk sample)	34·65	61·26	1·15	4·35
Hemingway's (in tin) ..	34·36	61·92	1·08	5·42
Orchard	29·58	64·60	5·06	5·87

This Table shows the composition of the dry material as eaten by the insects. The arsenic oxide varies from 34.65 per cent. to 20.80 per cent., the lead oxide from 72.03 per cent. to 61.26 per cent., the water soluble arsenic oxide from 5.06 per cent. to 0.14 per cent., and the water soluble impurities from 11.26 per cent. to 2.36 per cent. The variation in the latter content is evidently due to some of the salts which are formed as by-products in the process of manufacture not being thoroughly washed out. Considering the comparatively recent introduction of this particular material as a spray an improvement will no doubt be effected in this direction when the result of experience is brought to bear on the preparation and manufacture of the article.

It will be evident to the grower that some of the arsenates under review contain a very high percentage of water, and this may appear unusual, but the reason advanced is that a better and more uniformly mixed spray can be made from the moist article. If the lead arsenate has been allowed to dry, great difficulty is likely to be experienced in preparing a mixture for use, as the material has, to a certain extent, lost its colloidal property of remaining in suspension. A moisture content of from 40 to 50 per cent. has been found to give good results. For the reason given it is advisable that, when a tin or vessel of arsenate of lead is opened and only partly used up, the unused portion be covered with at least an inch of water and that the vessel be covered in a manner which will prevent evaporation as much as possible.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

The weather during the current season has been quite the opposite of last year. Last year, very dry conditions prevailed, which rendered cultivation work difficult. This season, exceptional rains prevailed at the blossoming period, and occasional showers have been experienced since. This augurs well for the coming crop.

The soil should be worked as frequently as necessary, so that no surface caking shall be allowed to remain. All weeds should be kept down by use of the scarifier, harrows, or light disc.

All young trees and grafts should be mulched with a light mulch, using the mulch more for coolness and protection than for manurial purposes. Frequent syringings or sprayings with water, especially during hot weather, will be very helpful to these ; it will materially assist in procuring a vigorous growth. This work is also very beneficial to newly-planted citrus trees.

Spraying.

Spraying for Codlin Moth, owing to the value of arsenate of lead for this purpose, is neither so formidable nor frequent as it was formerly. The most frequent sprayings are necessary when the fruit is growing ; as no matter what the strength of the spray, there is no expansion of this, while the fruit is growing and increasing in size every day.

The annual appearance of the moths is generally coincident with the blossoming period, at the same time the insects appear to be fairly consistent in the time of their appearance. In 1908 the first moths recorded, appeared during the second and third weeks in October. In 1909, the first moth observed at Burnley for the season was on 20th October. This year, the first moth at Burnley was noticed on 21st October ; and during the succeeding week, a large number were observed.

It is generally advised to give the trees the first spray as soon as the petals have fallen. If this had been done during the present season, it would seem, according to the time of the coming of the moths, to be too early for pear trees at least ; as, in the Burnley orchards, most of the pear trees had finished blooming in the second week in October. At the same time, the third week in October would be too early for some varieties of apples. It is therefore most difficult to decide definitely on an exact time for the first spray. This must be left to the judgment of the grower, who will have to consider the varieties of fruits he grows ; remembering that it is better to be a week too early than a day too late. It should also be remembered that once the larva of the moth has eaten its way into the fruit, it is almost impossible to kill it with the spray.

Cherry trees should be watched for visitations of the pear and cherry slug. As soon as this insect appears the trees should be sprayed with hellebore or tobacco water. If there is no fruit on the trees, arsenate of lead should be used as a spray. The slug should not be allowed to defoliate the tree, after the fruit has been picked. Loss of leaves at any season is weakening and injurious to the trees.

Vegetable Garden.

All weeds must be hoed out of the beds, and if these are at all abundant they may either be dug in as green manure, or they may be used for mulching the tomato, melon, marrow, and such plants. Tomato plants should be staked, all lateral growths pinched out, and they should be now well manured and well watered. If not manured, a good weekly watering with liquid manure is necessary.

Asparagus beds should be allowed to mature their growths, and all cutting should now cease. A top dressing of manure will be helpful to the crowns.

Potato and onion beds will require constant hoeings, and it may be necessary to break down the tops of the onions, so as to prevent a too vigorous growth of the top, or the formation of flower heads, and so as to strengthen and increase the value of the bulbs.

The long runners and the weak lateral growths of plants of the melon family should be pinched back, and liberal supplies of water should be given.

French beans, peas, lettuce, cabbage, cauliflower, &c., should now be sown, the beds being made moist and cool for the planting.

Flower Garden.

As frequently emphasized in the "Garden Notes," surface cultivation is very necessary at this time of the year. To secure a constant earth mulch, as friable as possible, should be the aim of every gardener during the hot months of the year. After every watering, or rainfall, the surface should receive a good stirring.

The season has been a very favourable one for roses, and the flowers have been produced in very fine profusion. To add to their perfection, the annual visit of Thrips was very much later than usual, these insects delaying their appearance generally until November. For the next two months the roses should have a rest from blooming, so that the autumn crop of flowers may be produced as fine as possible. Water may be almost wholly excluded during this period, provided that the beds or plants be earth-mulched, or mulched with some light and non-stimulating material, such as grass or straw.

Late spring-flowering bulbs should now be lifted, and stored in a cool dry place. It is advisable to allow the bulbs to become dry before storing them away, by leaving them on the surface, and shaded, for a day.

All annuals, biennials, and herbaceous plants which are approaching the period of bloom should receive frequent supplies of water; and a mulching of well-rotted manure will help them greatly.

Dahlias should now be planted out, making two or three plantings extending to the end of the month. The young plants should be firmly planted in the soil; and, in order to prevent overcrowding when the plants are full grown, the plants should be spaced at least 3 feet apart each way.

Chrysanthemums will now require considerable attention; the weak and unnecessary shoots should be removed, and the remaining growths well staked. All side shoots should be removed as the plants mature. The soil must be kept cool and moist, but excessive or even abundant water must be avoided until the plant has well grown.

Sowings of seeds for late flowers may now be made, especially of such plants as Zinnias, Asters, and winter-flowering Stocks.

BITTER PIT AND THE ENZYMES OF THE APPLE.

Jean White, D.Sc., Lecturer on Botany in the Melbourne University.

The question of Bitter Pit in apples has lately been occupying the attention of various Agricultural Departments in different parts of the world.

A short account of what has been regarded as the correct explanation of this disease was quoted by Mr. D. McAlpine in the *Journal* for April, 1910. This explanation was first put forward by Mr. Pole Evans (*Technical Bulletin, No. 1*, Transvaal Department of Agriculture), who concluded that the disease was due to the sudden cessation at night of transpiration, causing cells near the surface to accumulate so much water as to produce their rupture, and a consequent decay spreading to neighbouring cells. This theory is not based upon any sound experimental evidence, and entirely fails to explain not only the incidence of the disease, but also why certain varieties are more liable than others, why it is usually more developed at the upper end of the fruit, and why it does not occur in other stored succulent fruits, such as melons or bananas.

A paper on this subject was also contributed by Mr. C. P. Lounsbury, in the *Agricultural Journal of the Cape of Good Hope*, August, 1910, which he says consists for the most part of extracts from a paper by Mr. G. Massee in the *Kew Bulletin, No 6.*

As it was considered possible that a microscopic examination of diseased fruit might yield some facts of interest, a supply of material was obtained from the Government Cool Stores. Sections cut through the pitted areas, which are tough and porous, show that the surface parenchyma cells are not altered in any way, and as a rule there are about ten to twelve layers of these normal cells above the affected ones.

The affected cells are seen to be larger than the normal cells surrounding them, their outline being also more irregular, and the cell wall broken in places. Except for a small amount of protoplasmic contents which is adherent to the cell wall, and a large number of starch grains which are most abundant near the periphery, the cells are apparently empty. Treatment of the normal cells with aqueous solution of iodine shows no sign of the presence of starch grains, so that, in the living healthy cells, any starch which may be produced during assimilatory activity must be either immediately hydrolysed to form sugar by some diastatic enzyme, or worked up into other compounds by some metabolic processes.

The presence of so much starch in the diseased cells suggested a possible connexion between the disease and the occurrence of enzymes in the cells of the apple, and as no references to any work relating to this subject could be found, I performed a series of experiments on the pulp of sound, healthy apples, on the sound pulp of pitted apples, and on the cells composing the affected areas of these fruits. All the specimens examined had been stored for five months.

The pulp of these fruits was minced up in a coffee grinder, care being taken to insure sterilization after each operation, and the enzymes were precipitated in the same manner as was followed in my paper on "The ferments and latent life of resting seeds," published in the *Proceedings of the Royal Society of London*, B. vol. 81, 1909. In every instance, the enzyme solutions were found to be neutral, and the antiseptic employed was chloroform.

The average results thus obtained from several experiments performed on similar materials were as follows:—

Pulp of Sound Apples (Yates).

Weight of Material.	Reaction to Fehling.	Reaction to Biuret.	Reaction to Tryptophane.	Cytase.
About 50 grms.	Strong ..	Strong ..	Very slight ..	?

Pulp of Pitted Apples (Five Crown), the Sound Parts only used.

Weight of Material.	Reaction to Fehling.	Reaction to Biuret.	Reaction to Tryptophane.	Cytase.
About 60 grms.	Strong ..	Strong ..	Very slight ..	?

No precipitate was thrown down from the affected cells of the pitted specimens which were treated in exactly the same way, so that apparently no enzymes are present, but as the experiments were performed on the cells in about the most advanced stages of Bitter Pit, and as no material was available in which the disease was in its earlier stages, nothing definite can be stated in this way until next year's pitted crops are procurable.

The above-mentioned enzymes were found to be present in the very earliest stages of the formation of the fruit, the only differences which were manifest being that the diastatic action produced by the enzymes precipitated from the minced-up receptacles and ovaries before fertilization was rather more pronounced, while the Biuret reaction was somewhat less so, as shown in the following table:—

Unpollinated Receptacles of Apples (New York Pippin).

Weight of Material.	Reaction to Fehling.	Reaction to Biuret.	Reaction to Tryptophane.	Cytase.
About 30 grms.	Very strong ..	Slight ..	Very slight ..	?

The facts that there is no apparent difference between the enzymes of the sound pulp of the pitted apples, and the pulp of the normal apples, and that the enzymes are present in the receptacles before pollination and are absent in the most advanced stages of the diseased cells, show that there must be some stage in the formation of the pit at which the enzymes disappear.

Whether this is a gradual or a sudden process can only be determined by watching the coming crop for the first signs of pitting, and experimenting on these specimens at regular intervals of time. Of necessity the above comparisons were made between different varieties. It would naturally be of importance to make similar comparisons between healthy and diseased material of the same variety.

As far as can be judged from the somewhat imperfect data at present available, the enzymes appear to persist in the diseased cells for a short time after these have died, which would appear to show that the disappearance of the enzymes is not a cause of the disease, but is a secondary consequence of it.

Although the above investigations could not be fully completed until the following and subsequent seasons, it has been judged advisable to publish them now as far as they go, since it is probable that a special investigator will be appointed to carry out researches into the origin of this disease, and it is necessary to leave the ground clear for his work.

SLUGS AND SNAILS.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist.

It is, perhaps, hardly necessary to mention the amount of damage that slugs and snails may do, especially on moist, heavy ground and among young seedlings. It is curious to note how such plants as peas, broad beans, beet, parsnips and parsley, are usually left untouched, whereas young lettuce, tomatoes, turnips, cabbages, cauliflowers and even carrots often suffer severely and may be destroyed in a single night. It can hardly be due to the presence of anything unpleasant in the flavour of the leaf or to any peculiarity of a particular group of plants, since the first leaves of the French bean are often badly attacked. It may be dependent upon the rapidity with which the outer skin of the plant hardens or upon its developing special protective hairs, as in many weeds and in the tomato when beyond the seedling stage.

Two methods often employed of warding off their attacks are by the use of lime, wood ashes, &c. The effect of these rarely lasts for more than a day or two, and any heavy shower of rain renders them immediately useless. It may therefore be of interest to record a method which I found to be most effective in preventing their ravages, and which is at the same time very cheap and easily applied, so much so, that it may prove useful on a larger scale than in gardens. It is, for instance, much cheaper than the use of tobacco powder and has not the danger attaching to the use of metallic poisons, while it is, at the same time, much more effective and permanent in its action than the use of salt or sand, and does not involve the labour needed to catch slugs and snails at night or capture them by means of cabbage leaves, &c.

The method is, in brief, to add one or two large tea-cups of phenyle to ten or twenty cups of water, and use the mixture to moisten a bucket of sawdust. The sawdust is then spread round the rows of plants to be protected, or around single plants; if the area enclosed is a large one, it is also sprinkled on the surface of the soil. The protective action is remarkable. It persists even after a heavy rain if the sawdust is not washed away and it lasts for a considerable time. During wet weather a stronger solution can be employed, since the phenyle slowly washes out of the sawdust. No injurious action is exercised on the plants nor upon the soil as the sawdust slowly works into it. The effect of depriving the animals of their food is to cause a marked decrease in their numbers, quite apart from any poisonous action. The labour and cost involved are exceedingly small—a bag of sawdust at 1s., allowing 6d. for carriage, and 1s. worth of phenyle at 3s. 6d. per gallon will be sufficient for a fairly large garden.

The method is particulary effective and useful for protecting young tomato plants, which, in the young seedling condition, are often destroyed by slugs or snails when planted out, by being eaten at the base near the ground. As soon as the epidermis or skin of the plant thickens, and acquires its proper hairy covering, the plants are immune to their attacks, whereas such plants as cabbages, &c., are liable to attack so long as the weather is moist and hence need longer protection.

Mr French (*Journal*, July, 1906), mentions the use of carbolized sawdust. The carbolic acid, however, washes out more rapidly than the phenyle, and is hence less permanent in its action.

A point of some interest is as regards the nature of the peculiarities which serve to protect certain plants from the attacks of slugs and snails. There can be no doubt that in many cases, it is a question of taste or flavour, and this seems to hold good for widely dissimilar, vegetable-eating animals. For instance, fowls and well-fed cows usually refuse to touch rhubarb, onions and bean-tops, and although cows will eat pea-straw, they do not seem to be fond of it even when green. Even if they are hungry, they do not appear to fill themselves with it in the same way that they will with fresh grass or clover. All these plants disliked by cows are also refused by slugs and snails. The parallel does not however hold good in all cases. For instance, birds and stock generally will eat sow thistle readily, whereas slugs and snails usually leave it untouched. It may be that when it is fully turgid and succulent, the slugs and snails find some difficulty in rasping through the stretched skin of the plant by means of their rough or saw-like tongues. It can, in fact, often be noticed, particularly when planting out young seedlings such as lettuces, cabbages, &c., that the leaves are most rapidly devoured when slightly drooping. Apparently, it is when the tissues are loose and flaccid, that the snails and slugs find it most easy to bore into them.

In other cases, as for instance, in that of beet-root, it is difficult to understand what protects the plants, and in any case, the protection is only a partial one since the plants are not always immune to attack. Fowls and cows will eat the leaves but do not appear to be as fond of them as might be expected from their sugar content. It has been suggested that the red colour of the leaves of garden beet and other plants, by simulating blood colour, may act as a warning colouration, frightening away herbivorous animals. Stahl, who first made this suggestion, remarked that the natives in Java often grow as hedge plants around their gardens, those with red vegetation, and suggested that they may do this to frighten away various large and small animals. As a matter of fact, the natives are fond of bright colours, and a few thorns are more effective in keeping out large animals than any quantity of red foliage. Stahl tested his theory, as regards the relation between colour and taste, by feeding animals, including slugs and snails, with slices of vegetables, some of which were coloured red by carmine, and found very commonly that the uncoloured slices were eaten first. This was, however, merely due to the fact that the colour used gave the coloured slices an unpleasant taste, and it is difficult to see how any colour could possibly serve as a protection against slugs and snails, which normally feed in darkness or in very feeble light where colour is indistinguishable, at least to our eyes.

It is evident that several interesting problems remain to be solved in regard to the psychology of slugs and snails, particularly in regard to their sensations of taste and palatability. Putting this on one side, however, there remains the fact that the use of sawdust soaked in phenyle seems to be the most effective, cheapest and most permanent means of preventing their ravages in gardens and in small plots under intense culture. It does not kill them unless a strong solution is employed, but by keeping them from their usual supplies of nutritious food, their numbers are soon strictly limited, for animal pests only become so numerous as to be troublesome, when they are provided with a safe, abundant and easily accessible food supply.

FOUL BROOD OF BEES.

R. Beuhne, President, Victorian Apiarists' Association.

In view of the heavy losses resulting from Foul Brood, when once it has obtained a good start in an apiary, and the great amount of labour involved in its eradication, it is desirable that every owner of bees should be able to recognise this disease when it appears in one or more of his hives. He will then be able to deal with it before it has made any great headway.

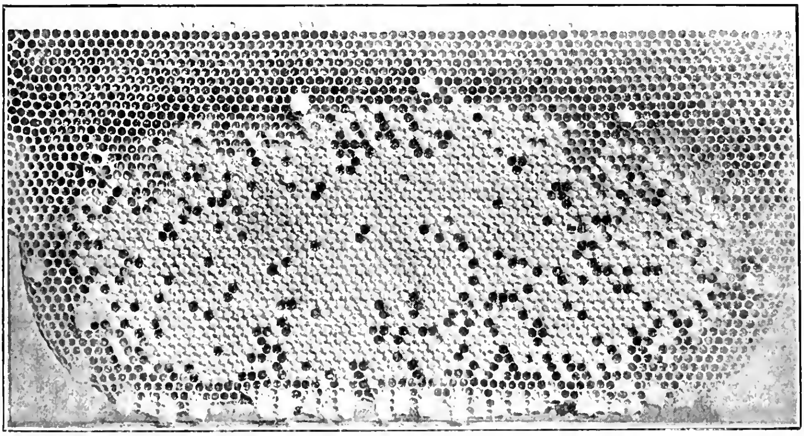
Unfortunately, there are still some bee-keepers who do not discover the presence of this disease amongst their bees till the small number of bees in several of the hives indicates that there is something wrong. When hives have been affected sufficiently long to show marked decline in the number of bees, the disease is likely to spread rapidly; the remaining bees are usually inactive and do not defend their hives against robber bees from strong healthy colonies, which in turn fall victims to foul brood. It is therefore important that vigilance should be exercised whenever combs are handled, so that the disease may be discovered and treated when still in its first stage.

The cause of foul brood is a micro-organism growing in the tissue of the larvæ of the bee and sometimes also in the adult insect. It was named *Bacillus alvei* by Cheshire and W. Cheyne in 1885. Since then American investigators have discovered that there are two types of foul brood, European Foul Brood caused by *Bacillus alvei* and American Foul Brood caused by a micro-organism differing from the former and named *Baccilus larvæ* by Dr. G. F. White of United States Department of Agriculture in 1907. The general appearance of the diseased brood is, however, the same in both and the same treatment is necessary to effect a cure. Whether foul brood in Australia is caused by *B. alvei* or *B. larvæ* has up to the present not been scientifically tested; probably both are present.

To describe diseased brood to any one not well acquainted with the subject it is best to contrast its appearance to the eye with that of brood in a healthy state. Normal healthy brood shows in compact masses in the comb, that is to say, considerable numbers of adjoining cells contain larvæ of the same age (Fig. 1). In a diseased comb the brood appears irregular and scattered. Healthy larvæ are of pearly whiteness, plump, and lie curled up on the cell bottom almost in the shape of the letter C. Diseased larvæ are pale yellow, and, further on, turn brown; the grubs appear flabby and are not so much curled up as healthy larvæ of the same size.

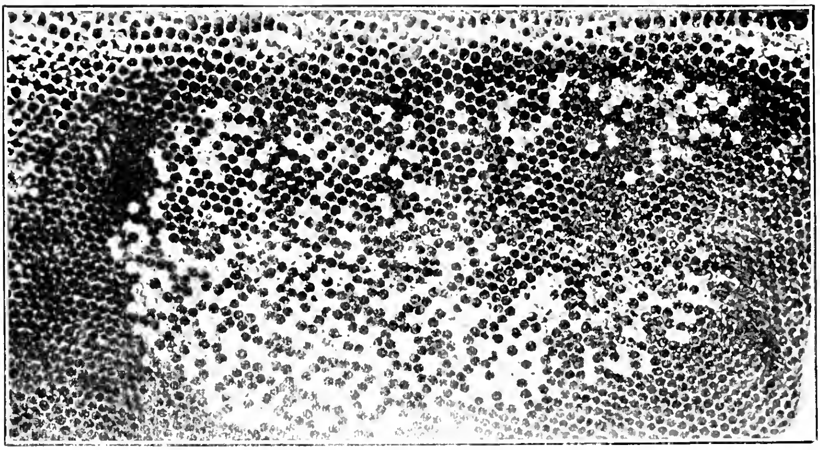
When the larvæ do not die till after the cells have been capped over, cells will be found here and there darker in colour than healthy ones alongside; the cappings usually will be indented instead of convex and will frequently show irregular holes (Fig. 2). If these cells are opened a brown mass is visible which, when touched with a match or straw, draws out stringy or ropy. The ropiness is the surest practical way of identifying the disease and the test should be applied to any suspicious-looking cells which may appear amongst the brood. I would here point out that although the cappings of brood, particularly those of black bees, have when healthy the appearance shown in Fig. 1, there are some bees of the yellow races which cap the cells quite flat; also, that the scattering of the brood is by itself not necessarily an indication of disease, and may be due to the irregular laying of an inferior queen.

If foul brood is discovered in a hive, the remaining hives in the apiary should be carefully examined to see whether there are other cases. If more are found the strongest of the infected colonies should be dealt with first.



1. COMB OF HEALTHY BROOD; QUEEN CELLS ALSO SHOWN.

To cure a colony of foul brood it is necessary to remove from the hive all the infected material. This is done by shaking the bees into a clean hive on clean frames with small strips of foundation. The healthy larvæ of the brood may be saved, provided there is enough of it to be worth



2. COMB OF DISEASED BROOD, SHOWING FLAT, SUNKEN, AND PERFORATED CAPPINGS.

while, by putting the combs of the first hive or hives shaken down, on top of the weaker diseased colonies. After a week or ten days, all the healthy brood which was sealed at the time of shaking will have hatched out. The combs should then be removed and the colony also treated.

The shaking of the bees from the combs should not be done at the time when bees will rob and thus spread disease; otherwise, shaking down should be done under cover. It can be safely done in the evening after bees have ceased to fly. If there is no honey flow at the time, sugar syrup should be fed to the bees shaken down. This is made by dissolving the best quality sugar in an equal weight of boiling water; late in the season two parts of sugar to one of water should be used.

Great care should be taken to keep all infected material away from the other bees till after hive, stand, and frames have been thoroughly cleaned in boiling water containing washing soda.

The combs may be boiled and the wax pressed out, the refuse being burned. The solar wax extractor should not be used for melting the combs, the heat being insufficient to kill the spores of foul brood.

When examining combs for disease, a match or straw, not the fingers, should be used, and these prickers should not be thrown down but burned; a fresh one should be used for each hive.

To prevent the bees swarming out after being shaken down on starters, as they are often inclined to do, the queen should be confined in a cage to which the bees have free access. A cage such as that described in September issue of the *Journal* may be used.

The use of drugs in the treatment of foul brood is not advisable, because disinfectants strong enough to kill the germs would destroy the bees. The shaking-down treatment is the recognised method adopted in all countries.

In a few instances the disease may reappear, owing to the bees after the shaking-down process continuing to carry home honey from infected sources, such as a diseased bee's nest in a tree or a neglected hive in the neighbourhood.

It is of the greatest importance that the bee-keeper should have the aid of the law to compel the owners of diseased hives to either treat them or to destroy them.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. **Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know.** ***All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.*** This is very necessary, as sometimes insufficient information is furnished by the inquirer.

Blindness.—O.G. writes:—"I have a two-year-old filly that became blind about two months ago. Three weeks ago I examined her and found a big swelling under the chest. Now it has moved up the chest in the shape of a Y. At first the lump was big and soft, now it is hard and smaller. The centre of the eye is of a bluish colour, and there is a black spot on the edge of the sight of the right eye. The filly is in good condition."

Answer.—Many cases of blindness are reported from districts were plants of the same order as Tobacco grow, and also where the plant known as "Paddy-Melon" or "Tipperary Gooseberry" is found. Have you any such plants in your district? If so, supply information as to feed, &c., of filly. Also state whether the blindness came on suddenly and whether any others have been similarly affected. Sufficient particulars are not given on which to say whether the chest swelling and blindness are related in any way, but it is not likely. Name and address of O.G. should have been supplied.

Bone-chewing Habit.—A.W.S. inquires as to cause of cows becoming addicted to chewing bones.

Answer.—The bone-chewing habit in cows is caused by a deficiency of earth salts in the pasturage. A lick composed of equal parts of bonemeal (sterilized) and sheep salt, placed in boxes accessible to the cattle, will overcome the habit.

Dehorning Calves.—R.H.J. asks how to dehorn calves.

Answer.—The best time to dehorn is before the calf is five days old. Clip the hair from about the base of the horns, slightly moisten the end of a stick of caustic potash, and rub the tip of each horn for about a quarter of a minute. This should be done two to four times, at intervals of five minutes. If a little blood shows at the centre of the horn, very slight further rubbing will be necessary. Care should also be taken to rub the centre of the horn, and not the sides, and not to have it too moist, for if it runs on to the skin a troublesome sore will result. A piece of brown paper should be wrapped round the caustic to protect the fingers.

Pig Lice.—M.B. states that he has about 100 pigs, mostly stores about four or five months old, and that are all affected with some kind of lice or tick. The insect is about half the size of a sheep tick and flatter in appearance. Some of the pigs have been washed with phenyle, and apparently the treatment has killed the insects. He further states that, as this method is slow and tedious, he has an idea of constructing a small cheap wooden dip, and dipping the pigs similarly to the style adopted for treating sheep.

Answer.—The parasite affecting your pigs is the ordinary pig louse. Washing with a solution of Washing Soda, and afterwards applying an oil with a brush, is an effective way of destroying them. There is no reason why the dip you suggest should not be tried, *if care be exercised in its use.* To free the pens thoroughly, wash them with the washing soda solution, followed by a solution of some strong antiseptic.

Actinomycosis.—F.D.B. writes:—"About three months ago I noticed a slight swelling immediately under the jaws of one of my cows. Within three weeks it had increased to the size of a football. Whilst bathing it one morning it burst and the putrid matter from it half filled a small bucket. I made a good gash with the knife and kept on bathing it until the swelling had disappeared. Lately, it seems to be rising on one side of the opening. The cow is in milk, looks in perfect health, and feeds well. Is there any danger in using the milk or any likelihood of the other cows becoming similarly affected?"

Answer.—Your cow has evidently suffered from an attack of Actinomycosis. There is no danger in using the milk, but if a second abscess forms and bursts the contained material will be infective to other cows, or may get into the milk and be harmful.

Parturient Paralysis.—J.R.M. states that one of his heifers calved last week —her first calf, which was larger than usual, and was born dead. Since calving the heifer has lost the use of her hind legs; otherwise she is in good health.

Answer.—Your cow is suffering from Parturient Paralysis. Give a drench composed of Epsom salts, 1 lb.; treacle, 1 lb.; ground ginger, ½ oz. Apply a blister to the loins and give daily the following drench:—Carbonate of ammonia, ½ oz.; Tincture of Nux Vomica, 1 oz.; in a quart of beer.

Injured Quarter.—C.P. desires advice respecting treatment of a heifer whose milk became slightly tinged with blood about a fortnight ago. The udder is swollen and hard on the back quarter. On the day of writing more blood than milk came from the affected quarter. About the top of the teat, near the udder, there appears to be something thick, like a clot of blood, in the passage. It cannot, however, be moved.

Answer.—Your heifer has received some injury to the quarter. Continue milking the quarter; bathe with warm water, dry, and rub well with camphorated oil. The lump felt in the teat is a small muscle. Its function is to retain the milk, and, being involved in the general inflammation, is now larger than it is naturally.

Subterranean Clover (*Trifolium subterraneum*, L).—H.J.S. inquires as to the value of Subterranean Clover as a pasture plant.

Answer.—Subterranean Clover is an annual, but on account of its heavy seeding habits it can almost be regarded as a perennial. Once it is firmly established there is no occasion for further seeding. It affords good feed, and also helps to suppress annual weeds. Seed should be sown at the rate of 12 lbs. per acre in well prepared land. Under normal conditions, provided a good seed bed is established before sowing, the seed will germinate early in poor or rich soil; plants are often found growing well on dry sandy and gravelly soils.

The Index of Vol. VIII. will be supplied with the first number of Vol. IX., viz., 10th January, 1911.

G. R.

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